Alfred P. Sloan Foundation

ANNUAL REPORTS

1991 ANNUAL REPORT

ALFRED P. SLOAN FOUNDATION

Alfred P. Sloan, Jr.
1878–1966

LIFE OF ALFRED P. SLOAN, JR.

Alfred Pritchard Sloan, Jr., was born in New Haven, Connecticut, May 23, 1875, the first of five children of Alfred Pritchard Sloan, Sr., and Katherine Mead Sloan. His father, a machinist by training, was then a partner in a small company importing coffee and tea. In 1885 the family moved to Brooklyn, where it was particularly active in the Methodist Church. (Young Alfred's maternal grandfather was a Methodist minister.) Alfred, Jr., excelled as a student both in the public schools and at Brooklyn Polytechnic Institute where he completed the college–preparatory course. After some delay in being admitted to the Massachusetts Institute of Technology (which considered him too young when he first applied), he matriculated in 1892 and took a degree in electrical engineering in three years as the youngest member of his graduating class.

Mr. Sloan began his working career as a draftsman in a small machine shop, the Hyatt Roller Bearing Company of Newark, New Jersey. At his urging, Hyatt was soon producing new antifriction bearings for automobiles. In 1898 he married Irene Jackson of Roxbury, Massachusetts. The next year, at age 24, he became the president of Hyatt, where he supervised all aspects of the company's business. Hyatt bearings became a standard in the automobile industry, and the company grew rapidly under his leadership. In 1916 the Hyatt Roller Bearing Company, together with a number of other manufacturers of automobile accessories, merged with the United Motors Corporation, of which Mr. Sloan became President. Two years later that company became part of the General Motors Corporation (itself established in 1908 as the General Motors Company), and Mr. Sloan was named Vice President in Charge of Accessories and a member of the Executive Committee.

He was elected President of General Motors in 1923, succeeding Pierre S. du Pont, who said of him on that occasion: "The greater part of the successful development of the Corporation's operations and the building of a strong manufacturing and sales organization is due to Mr. Sloan. His election to the presidency is a natural and well–merited recognition of his untiring and able efforts and successful achievement." Mr. Sloan had developed by then his system of disciplined, professional management that provided for decentralized operations with coordinated centralized policy control. Applying it to General Motors, he set the Corporation on its

course of industrial leadership. The next 23 years, with Mr. Sloan as Chief Executive Officer, were years of enormous expansion for the Corporation and of a steady increase in its share of the automobile market.

In 1937 Mr. Sloan was elected Chairman of the Board of General Motors. He continued as Chief Executive Officer until 1946. When he resigned from the chairmanship in 1956, the General Motors Board said of him: "The Board of Directors has acceded to Mr. Sloan's wish to retire as Chairman. He has served the Corporation long and magnificently. His analysis and grasp of the problems of corporate management, his great vision and rare good judgement, laid the solid foundation which has made possible the growth and progress of General Motors over the years." Mr. Sloan was then named Honorary Chairman of the Board, a title he retained until his death on February 17, 1966. For many years he had devoted the largest share of his time and energy to philanthropic activities, both as a private donor to many causes and organizations and through the Alfred P. Sloan Foundation, which he established in 1934.

Mr. Sloan, as a realist as well as a humanist and philanthropist, looked upon the Foundation as an extension of his own life and work. Although he recognized the inevitability of change that might dictate a different course, he expected that the Foundation would "continue as an operating facility indefinitely into the future...to represent my accomplishments in this life." His accomplishments during his lifetime were of the highest order, and in themselves provide the most dramatic and lasting tribute to his extraordinary talent. Through the Foundation, his accomplishments have been extended and expanded.

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1991 GENERAL INFORMATION

INTRODUCTION

"In managerial technique I emphasize the necessity of the scientific approach; this affects men, tools and methods. Many associate the word scientific with physics. But it means a constant search for the facts—the true actualities—and their intelligent, unprejudiced analysis. Spend any proper amount of money to get the facts. Only by increased knowledge can we progress, perhaps I had better say survive."

—Alfred P. Sloan, Jr.

The Alfred P. Sloan Foundation, a philanthropic non-profit institution, was established by Alfred P. Sloan, Jr. in 1934. During the past year, the Sloan Foundation has made grants of $30 million. The total assets at the end of 1991 were $728 million.

PROGRAMS AND INTERESTS

The main interests and programs of the Foundation are concentrated primarily in four areas:

- Science and Technology
- Education in Science, Technology, and Management
- Economic Growth and Industrial Competitiveness
- Selected National Issues

This section provides a brief description of the Foundation's evolving program in each of these areas.

FELLOWSHIPS

Sloan Research and Dissertation Fellowships make up a significant part of the Science and Technology Program ($3.8 million in 1991). The ***Sloan Research Fellowships*** are given in chemistry, physics, mathematics, the neurosciences and economics. These are competitive grants, given to young faculty members with high research potential on the recommendation of department chairmen and other senior scientists. Information on these fellowships and the ***Sloan Dissertation Fellowships*** in mathematics and economics may be obtained by separate inquiry to the Foundation.

DIRECT SUPPORT OF RESEARCH

This is an area which government agencies such as NSF and NIH dominate, operating on a scale far beyond that of a private foundation. To be useful here, the Sloan Foundation seeks areas that are or have the potential to become significant but have not received sufficient attention. They may be newly emerging topics or subjects that do not fit into a disciplinary or program orientation of one or another of the government science agencies.

One current area for direct support of research is Molecular Evolution. The program consists of four main elements: postdoctoral awards, sabbatical awards, short courses, and workshops and symposia. Since 1992 will be the final year of substantial funding for this program, the Foundation is searching for other possible areas of science to support in a similar way. The Foundation is also exploring other outstanding major science proposals. An example of this type is a major sky survey project, to be funded in early 1992. Other areas of research will also be considered.

INDIRECT SUPPORT OF RESEARCH

Indirect Support and Understanding of the Research Process is another continuing area of interest. Since 1990, funding has been provided for a number of conferences and workshops including those in physics (string theory), mathematics (topology), mathematical aspects of molecular biology, and for visitors' programs in mathematical physics (Harvard and MIT). Another example is a grant to the American Association for the Advancement of Science for a new Executive Branch Fellowship program to bring industrial expertise to the White House Office of Science and Technology Policy. In addition, the Foundation is supporting the Board of Mathematical Sciences of the National Research Council in conducting a study of factors affecting the production of Ph.D.s in mathematics (from the choice of research topics to faculty guidance and support).

The Foundation is also interested in learning more about the working of the university science and engineering establishment. There is a need for a deeper understanding of how graduate students enter, progress through or leave the system, and how they fare in their careers. Similarly, the numbers of faculty who are active researchers and Ph.D. mentors in each scientific or technical discipline is not well established. The Foundation plans to pursue this area.

HISTORY OF SCIENCE AND TECHNOLOGY

Another aspect of the Foundation's science program is the support of the ***History of Science and Technology***. In 1991, several major Foundation supported projects culminated in book publications. Abraham Pais's Niels Bohr's Times was published and the Science Book Series was concluded with the publication of Victor Weisskopf's Joy of Insight and Herbert Simon's Models of My Life. In addition, Sloan support is continuing for the editing of the papers of Albert Einstein and Thomas Edison.

The Foundation has begun a Technology Book Series as a sequel to the Science Book Series. The new series will tell the stories of some of the major technologies of the twentieth century in an effort to broaden public understanding of the great technical events of our time and their role in our society. While the Science Book Series provided autobiographical accounts by leaders of modern science, the Technology Book Series will focus on the development of specific technologies, in a broad range of fields, narrated by professional writers.

EDUCATION IN SCIENCE, TECHNOLOGY, AND MANAGEMENT

Current programs build upon this area of long-standing interest to the Sloan Foundation.

Strengthening education and interest in scientific and engineering fields has many dimensions. Enhancing ***Scientific and Technical Literacy*** among college students not majoring in science and engineering is one aspect. Another key area is ***Career Choice:*** how and why people choose (or do not choose) to enter fields in science and technology. Among those who pursue these fields, the question of ***Retention*** becomes critical. There is also the need to address the ***Interests of Highly Motivated Students,*** both through active involvement with technical facilities as well as through opportunities for ***Independent Learning Outside the Classroom*** using computer technologies. Other important issues involve examining the role of ***Immigration*** as a significant source of talent, and supporting efforts to ameliorate the ***Underrepresentation of Women and Minorities in Science and Engineering***. Another major emphasis in this program is ***Education and Training for Manufacturing***. Related to and influencing all this is the ***Public Understanding of Science and Technology***.

SCIENTIFIC AND TECHNICAL LITERACY

The Sloan program in the ***New Liberal Arts (NLA)*** can be regarded as an effort to inject an appreciation of technology into the curriculum of non-technologists. Although grantmaking was concluded in 1990, work on existing NLA grants will continue for the next two years. Most of the activity involves disseminating the program's diverse collection of books, monographs, and syllabi to colleges and universities throughout the country.

The Foundation is now exploring other possibilities for enhancing technical literacy of university undergraduates not majoring in science and engineering.

CAREER CHOICE

The long range objective in this area is to understand how interest in and knowledge of science and engineering develop in American students, how people choose to enter these fields, and what influences that choice. The Foundation has funded a study at MIT to examine why students choose to study science and engineering. A grant has also been made to the University of Chicago to examine how career and work understanding evolves in general, in an effort to gain insight into the process of how interests in different vocations and professions develop.

RETENTION

The Foundation is supporting research to deepen understanding of the factors influencing the supply of graduates trained in science and technology. One aspect of supply is the retention of science and engineering undergraduates in those fields of study. Studies supported by the Foundation at the University of Colorado, the University of Michigan, Dartmouth College, and MIT are providing hypotheses and clues. For example, a preliminary finding of the Colorado study is that students who switch out of science and engineering and those who don't are similar in preparation and grades, as well as in knowledge about their selected fields. It appears that teaching practices oriented toward "weeding out" may be a key influence on the decision to switch. The scope of the Colorado study is being extended and other studies are yielding additional data and insights. The Foundation plans to continue its interest in scholarly assessments of issues in this area.

HIGHLY MOTIVATED STUDENTS

The Foundation is encouraging the development of active peer group societies of high school students interested in science and engineering. The principal goals are to support and to assist secondary school students with such interests, while counteracting the powerful peer pressures that operate against pursuing activities in science and technology.

A model institution of this type, the Junior Academy of Sciences of the New York Academy of Sciences, is now being emulated with Foundation support by the Franklin Institute in Philadelphia. This new group of junior scientists is in the process of developing its own computer-based communication network, with connections via

the Franklin Institute. If successful, this network could be extended to the New York Junior Academy membership as well.

The science and technology centers and museums that have been developed in most metropolitan areas provide a promising infrastructure for such high school peer groups. During 1992, the Foundation will consider a small number of proposals for similar developments in other cities.

Another approach which the Foundation is pursuing is to work with special secondary schools, where the objective is to educate high performing students at an advanced level. In 1991, the Foundation made a grant to The National Consortium of Specialized Schools of Mathematics, Science, and Technology for the awarding of a $2500 prize to twenty outstanding graduating high school seniors from among the thirty-five schools in the consortium. The aim is both to recognize academic achievement and to help the schools raise money for long term support of the awards from local industries.

LEARNING OUTSIDE THE CLASSROOM

The Foundation is supporting innovative approaches to provide education outside the school system, for those who are motivated to seek it, in science, math, engineering, and related areas required in the world of work.

Based on computer and multi–media technologies, these projects are designed for independent learning through access to materials and to a network of peers or tutors.

Several initiatives have been launched. One grant enabled a mathematician and video producer to explore the feasibility of using a cable television service for scientists and engineers to discuss their work in a timely, visual manner.

The Foundation is also investigating ways in which telecommunications technology can facilitate the formation of networks of people, separated in distance and time, to learn about technical subjects from knowledgeable experts, and from each other. For example, public libraries and science museums enjoy community roles that suit them to function as network hosts or nodes. They can also provide access from properly equipped homes to technical information and to interactive learning material. These and other similar centers have the potential of addressing a variety of needs, from supplementing classroom learning to offering educational programs for skilled technicians to upgrade their knowledge and capabilities, to providing a profile of scientific and technical careers.

IMMIGRATION

A significant source of technical talent in the United States is immigration. The Foundation's immigration research program is focused on improving the understanding of the nature and impact of individuals entering the United States to study or work in fields of science and engineering. These include permanent residents who are not U.S. citizens, international scholars, visitors, or professional trainees who come to the U.S. for a temporary stay, and foreign students. The volume of such immigration is very substantial, but to date has not been extensively studied.

In 1991, three grants were made to support the development of basic data and analyses of this potentially important phenomenon. The Foundation plans to consider a small number of additional grants in this area.

MINORITIES AND WOMEN IN SCIENCE AND ENGINEERING

The Foundation is supporting efforts to ameliorate the underrepresentation of minorities and women in science and engineering.

One approach involves supporting ***Special Schools of Mathematics and Science,*** mentioned earlier, to recruit and retain minority students. Five of these schools, where standards and aspirations are high, are receiving Sloan support to equip minority students with the knowledge and skills to perform well at leading colleges and universities.

Another approach is aimed at ***Reducing Attrition of Women and Minorities in Science and Technology Majors*** in the early undergraduate years. In 1991, grants were made to support women's programs in the engineering schools of Cornell, Purdue, and the University of Washington. These complement earlier grants focused on retaining minorities in the engineering schools at City College of New York, Stanford, and Georgia Tech. These schools report that programs of summer study, faculty mentoring, group study, and early participation in faculty research are showing evidence of reducing attrition.

Retaining Women in Working Careers in Science and Engineering is another interest which the Foundation is pursuing. The choice by many women to leave technical careers, even after earlier academic success, is cause for concern and the Foundation is supporting research, such as a grant to the Families and Work Institute, to make more effective the efforts of public and private sector employers to reduce this loss. Indeed, all the action programs described above are paralleled by research grants designed to improve understanding of the causes of underrepresentation and to help devise more effective action programs in the future.

EDUCATION AND TRAINING FOR MANUFACTURING

The invigoration of manufacturing as a field for study and practice is a major emphasis of the Foundation's program in technology and management education. Grants include the development of a Ph.D. program at Stanford to address the need for a new generation of professors to teach manufacturing. At the Master's level, both Northwestern University and the Leaders for Manufacturing program at MIT are receiving support to develop a new curriculum in manufacturing for managers and engineers. The Foundation plans to continue support in manufacturing education and is open to new approaches which will strengthen the area.

PUBLIC UNDERSTANDING OF SCIENCE AND TECHNOLOGY

The Foundation is providing funds for two major public television series to enhance understanding and interest in issues related to science and technology: *Made in America*, on industrial competitiveness, which will be broadcast in 1992, and *Great Projects in Engineering*, which is now in production. In addition, Sloan support is assisting the production of NOVA's *First Light* project on the building of the Hale Telescope on Palomar Mountain. The Foundation is also considering several new initiatives to strengthen efforts that expand communication of technical information and issues for the general population.

ECONOMIC GROWTH AND INDUSTRIAL COMPETITIVENESS

The program in ***Economics and Industrial Studies*** is aimed at understanding the basic forces that will maintain and improve a high American ***Standard of Living*** in an increasingly competitive world economy.

ECONOMICS

The Economics Program is focused on the contributions which economic analysis can make to understanding competitiveness. For example, with economic growth and rising standards of living dependent on productivity increases, the Foundation is supporting research to improve the complex techniques involved in accurately assessing productivity change. As part of this effort, William Baumol and Edward Wolff are working with Sloan support on two volumes on long term productivity growth which will be a sequel to their benchmark analysis Productivity and American Leadership: The Long View.

The Foundation is continuing to explore other areas where economic analysis can enhance understanding of U.S. competitiveness.

INDUSTRY STUDIES

In 1990, the Sloan Foundation launched a major program to establish interdisciplinary centers at leading research universities to study U.S. industries. The goal is to support the evolution of an academic community that can provide realistic research and education on American industry. The Foundation's hope is that these efforts will develop into long-term programs that can contribute observations, analysis, and understanding to U.S. companies engaged in these industries.

In this program, the MIT Center for the Study of the Automobile Industry will expand the extensive analysis developed in the International Motor Vehicle Program in the 1980's. Another MIT center is studying the pharmaceutical industry. A new Harvard University Center for Textile and Apparel Research is studying the clothing and textile industries.

Other industry study centers include information processing at Stanford University, semiconductors at the University of California at Berkeley, the carbon steel industry at Carnegie Mellon University and the University of Pittsburgh, and specialty chemicals and engineering plastics in a joint Harvard–MIT project. In addition, a new MIT program on Industrial Performance will draw on results from all the industry studies while undertaking its own full program of comparative research on productivity and industrial performance in the U.S. and six other countries.

COMPETITIVENESS AND THE MANAGEMENT OF TECHNOLOGY

The subjects involved here include manufacturing, the availability and introduction of technology, the management of the product development process, the nature and education of the work force, the outlook of management, the cost and availability of capital, tax incentives, the impact of U.S. liability law on product safety and innovation, trade policy, international economics, the role of government in scientific and technical activities and so forth. All of these issues are part of this program.

A major effort in the area is the Sloan sponsored Consortium on Competitiveness and Cooperation, an interdisciplinary and multi–campus research and graduate training program with industry participation. The Consortium includes Columbia, Stanford, Harvard, MIT, and the University of California at Berkeley. Topics in research and workshops range across a broad field of technology interests—management, details of product design, sociology of technological fields, history of technologies, and market place influences on technology. The Consortium has produced over 20 working papers and several books:

Antitrust, Innovation, and Competitiveness, edited by Thomas Jorde and David Teece (Oxford University Press, December 1991)

Technology and the Wealth of Nations, edited by Nathan Rosenberg, Ralph Landau, and David Mowery (Stanford University Press, 1992)

National Innovation Systems: A Comparative Analysis, edited by Richard R. Nelson (Oxford University Press, 1992).

The Foundation will attempt, from time to time, to contribute to other major issues of our time in a way appropriate to its expertise and size. A special approach to the study and understanding of broadly recognized problems will be a requirement for Foundation support.

The Foundation is pursuing two efforts in this area: one relating to the problem of *Drug Abuse* and the other relating to *Energy and the Environment*. To contribute to the issue of drug abuse, the Foundation is providing support to the RAND Corporation to conduct a study of changes in the legal status of drugs and the impacts and experiences in major European countries.

Two projects were funded in the area of energy and the environment in 1991, one dealing with the public perception of nuclear power and the other with long-term clean-up of radioactive waste at federal reactor sites.

In addition to its four main areas of interest, the Foundation will continue its tradition of a *Civic* program and make one or two grants each year in support of civic projects i.e. projects which benefit the citizens of New York City. Ongoing activities include support of the New York Hall of Science, the Academy of Science, and the Sloan Public Service Awards of the Fund for the City of New York.

The Foundation will continue to be open to especially good proposals outside its primary fields.

Applications can be made at any time for support of activities related to the range of interests indicated above. Grants of $30,000 or less are made throughout the year by the officers of the Foundation. Officer grants enable the Foundation to respond quickly to proposals for many activities, such as workshops, symposia, and conferences, that fall within its program areas and interests, but require only moderate funding (at most $30,000). Officer grants also can be helpful for the preliminary planning and exploratory stages of major projects.

Grants over $30,000 are made by the Trustees who meet five times a year for that purpose. Letters of application are normally sent to the president or an officer of the Foundation and include, in addition to details about the applicant and the proposed project, information as to the cost and duration of the work. Officer grants may not include any overhead charge; for trustee grants, at most fifteen percent of direct project costs can be budgeted for overhead. In the case of new applicants, the tax status of the organization that would administer the grant should be included unless it is a recognized institution of higher education.

The Foundation's activities do not generally extend to religion, the creative or performing arts, medical research or health care, or to the humanities. Grants are not made for endowments or for buildings or equipment, and are made only occasionally for general support or for activities outside the United States.

The Foundation has no deadlines or standard forms. Often a brief letter of inquiry, rather than a fully developed proposal, is an advisable first step for an applicant, conserving his or her time and allowing for a preliminary response as to the possibility of support.

1991 GRANTS AND ACTIVITIES

SCIENCE AND TECHNOLOGY

Science and technology are major interests of the Foundation. Research and doctoral dissertation fellowships account for expenditures of more than $3 million annually. The program also includes trustee and officer grants for the direct support of research, primarily in molecular evolution, and for the indirect support of and understanding of the research process. Support in the area of the research process covers a broad range of topics from visitors' programs in mathematical physics to science and technology infrastructure and policy. Scholarly work in the history of science and technology is another interest which the Foundation pursues. In addition, a substantial number of officer grants support special scientific symposia, workshops, and conferences.

There is generally an emphasis in grants and awards on areas of research in science and technology which are significant but not yet adequately recognized or funded by other sources. The Foundation is open to proposals in new areas within the program.

1991 SLOAN RESEARCH FELLOWSHIPS

Sloan Research Fellowships **$2,700,000**

Initiated in 1955 and by far the oldest among active Foundation programs, the Sloan Research Fellowship Program aims to stimulate fundamental research by young scholars of outstanding promise at a time in their careers when their creative abilities are especially high and when federal or other support may be difficult to secure. Fellowships have gone to more than 2600 scientists at over 180 colleges and universities and have accounted for expenditures of nearly $58 million. Sloan Research Fellows continue to receive numerous prizes and awards in recognition of their major research accomplishments. Sixteen Fellows have received Nobel prizes and twelve have been awarded the prestigious Fields Medal in mathematics.

These yearly awards are now made in five fields: chemistry, economics, mathematics, neuroscience, and physics. Each fellowship is administered by the Fellow's institution and is designed to allow the greatest possible freedom and flexibility in its use. A brochure entitled "Sloan Research Fellowships," available from the Foundation, describes the program in detail.

Candidates for Sloan Research Fellowships are nominated by department chairmen or other senior scientists familiar with their work. Within each discipline, a committee composed of three distinguished scientists reviews all nominations and recommends the final selections. When evaluating nomination forms and supporting documents, committee members are asked to identify those nominees who show the most outstanding promise of making fundamental contributions to new knowledge. During 1991, the Foundation awarded Research Fellowships of $30,000 each, over a two year term, to 89 scholars at 50 institutions. To arrive at the final selections, some 400 nominations were reviewed by the following committees:

Chemistry: Dr. Richard Bersohn, Columbia University; Dr. Harry B. Gray, California Institute of Technology; Dr. Jerrold Meinwald, Cornell University.

Economics: Dr. Rudiger W. Dornbusch, Massachusetts Institute of Technology; Dr. David M. Kreps, Stanford University; Dr. Christopher A. Sims, Yale University.

Mathematics: Dr. Barry Mazur, Harvard University; Dr. Richard B. Melrose, Massachusetts Institute of Technology; Dr. William P. Thurston, University of California at Berkeley.

Neuroscience: Dr. Lily Jan, University of California, San Francisco; Dr. Bruce S. McEwen, The Rockefeller University; Dr. Robert H. Wurtz, National Institutes of Health.

Physics: Dr. Roger Dashen, University of California, San Diego; Dr. Robert C. Dynes, University of California, San Diego; Dr. William Press, Harvard University.

FELLOWSHIP RECIPIENTS

Arizona, University of
Neuroscience: David B. Morton

Boston University
Neuroscience: Lindsay A. Farrer
L. Bruce Pearce
Physics: Bennett B. Goldberg

British Columbia, University of
Neuroscience: Terrance P. Snutch

California Institute of Technology
Neuroscience: Gilles J. Laurent

California, University of, Berkeley
Chemistry: A. Paul Alivasatos
Bruce M. Novak
K. Birgitta Whaley
Economics: David Romer

California, University of, Davis
Mathematics: Abigail Thompson

California, University of, Irvine
Physics: Clare Yu

California, University of, Los Angeles
Chemistry: Robert W. Armstrong
Mathematics: Geoffrey Mess

California, University of, Santa Barbara
Physics: Jean M. Carlson
Mark Sherwin

California, University of, Santa Cruz
Physics: Lars E. Hernquist

Carnegie Mellon University
Physics: Michael Widom

Chicago, University of
Economics: In-Koo Cho
Mathematics: Gui-Qiang Chen

Colorado, University of
Physics: John C. Price

Columbia University
Chemistry: Gerard F.R. Parkin
Economics: Ricardo Caballero
Mathematics: Huai-Dong Cao
Kieran G. O'Grady
Physics: Kimyeong Lee
R. Michael Rich

Cornell University
Mathematics: Bernd Sturmfels
Eva Tardos

Cornell University Medical College
Neuroscience: Michael Caudy

Harvard University
Chemistry: Peter Chen
Gregory L. Verdine
Mathematics: Maciej Zworski

Illinois, University of, Chicago
Mathematics: Jeremy T. Teitelbaum

Illinois, University of, Urbana-Champaign
Chemistry: Andrew J. Gellman
Patricia B. Shapley
Mathematics: Aimo Hinkkanen
Physics: Douglas H. Beck
Tony M. Liss

Indiana University
Chemistry: Mark D. Hollingsworth
Physics: John P. Carini

Iowa State University
Chemistry: Nenad M. Kostic

Massachusetts Institute of Technology
Chemistry: Peter T. Lansbury
Economics: Nancy Lin Rose
Mathematics: Ezra Getzler

Michigan State University
Chemistry: Mercouri G. Kanatzidis
Economics: Jeffrey M. Wooldridge

Michigan, University of
Chemistry: James E. Penner-Hahn
Economics: Matthew D. Shapiro

New York University
Mathematics: Zhouping Xin
Horng-Tzer Yau

North Carolina, University of
Neuroscience: Brian Popko
Physics: Charles R. Evans

Northwestern University
Chemistry: Manfred M. Kappes
Thomas V. O'Halloran

Notre Dame, University of
Chemistry: David J. Tannor

Ohio State University
Physics: Kristen Sellgren

Oregon Health Sciences University
Neuroscience: Richard B. Simerly

Oregon State University
Physics: Janet Tate

Pennsylvania, University of
Physics: Arjun G. Yodh

Princeton University
Economics: Laurence Ball
Mathematics: Carlos T. Simpson
Physics: Igor Klebanov

Rice University
Mathematics: Michael Wolf

Rochester, University of
Chemistry: Thomas R. Rizzo

Rutgers University
Mathematics: Olivier Mathieu
Physics: Michael R. Douglas

Salk Institute for Biological Studies
Neuroscience: Charles M. Gray

Scripps Biomedical Research Institute
Chemistry: Donald Hilvert

Southern California, University of
Mathematics: Sheldon Kamienny
Physics: Nelson E. Bickers

Stanford University
Mathematics: Rafe Mazzeo
Neuroscience: Susan K. McConnell

State University of New York, Buffalo
Chemistry: James F. Garvey

State University of New York, Stony Brook
Mathematics: Mikhail Lyubich
Gang Tian
Physics: Jainendra Jain

Swarthmore College
Neuroscience: Kathleen K. Siwicki

Texas, University of, Austin
Physics: Daniel J. Heinzen

Toronto, University of
Chemistry: Mark Lautens
Neuroscience: Martin R. Ralph

Tufts University
Neuroscience: Dale D. Hunter
Barry A. Trimmer

Utah, University of
Chemistry: Thomas G. Richmond
Neuroscience: David Jonah Grunwald

Virginia, University of
Physics: Alan T. Dorsey

Washington, University of
Chemistry: Michael H. Gelb
Neuroscience: Mark S. Cooper

Wisconsin, University of, Madison
Physics: Thad G. Walker

1991 DOCTORAL DISSERTATION FELLOWSHIPS

Doctoral Dissertation Fellowships **$1,050,000**

The Sloan Dissertation Program, established in 1984, is designed to assist doctoral candidates in two fields of traditional interest to the Foundation: economics and mathematics. Completing the doctoral research and writing a dissertation in these fields are tasks performed with difficulty alongside a candidate's teaching duties and other obligations. The Sloan awards allow Fellows to concentrate on finishing their doctoral work.

Fellowships have been received by 390 graduate students and have accounted for expenditures of over $7 million. In 1991, awards covering full tuition plus a stipend of $13,500 were made to 25 doctoral candidates in each field. Nominations were solicited from the chairmen of leading graduate departments of economics and mathematics. They were reviewed, and final selections made, by the following committees:

Economics: Dr. Alan Auerbach, University of Pennsylvania; Dr. Bengt Holmstrom, Yale University; Dr. Edward Leamer, University of California, Los Angeles.

Mathematics: Dr. Richard W. Beals, Yale University; Dr. William Fulton, University of Chicago; Dr. Allen Hatcher, Cornell University

FELLOWSHIP RECIPIENTS

California Institute of Technology
Economics: Robert J. Cull
Mathematics: Ramin Naimi

California, University of, Berkeley
Economics: Jushan Bai
Helga Hessenius

California, University of, Los Angeles
Mathematics: Geng Xu

Carnegie Mellon University
Economics: Jhinyoung Shin

Chicago, University of
Economics: Edward L. Glaeser
Hedi Diego Kallal
Erzo G. J. Luttmer
Mathematics: Stavros Garoufalidis
Albert J. Goodman
Reid Charles Huntsinger

City University of New York
Mathematics: Adam Epstein

Columbia University
Economics: Adi Brender
Donald Davis
Mathematics: George Pappas

Cornell University
Mathematics: Susan M. Hermiller
Alyson A. Reeves

Harvard University
Economics: Francesca Cornelli
Jinyoung Hahn
Oved Yosha
Mathematics: Karen Chandler
Jeffrey S. Rosenthal

Indiana University
Mathematics: Igor Kukavica

Johns Hopkins University
Mathematics: Takuji Kashiwabara

Maryland, University of
Mathematics: Frederick H. Wilhelm

Massachusetts Institute of Technology
Economics: John Joseph Beaulieu
Glenn D. Ellison
Mathematics: Eric K. Babson
Richard R. Kerswell
Esteban G. Tabak

Michigan, University of
Economics: Robert Wood

Minnesota, University of
Mathematics: Ramanujachary Kumanduri

New York University
Economics: Antonio M. Merlo

Northwestern University
Economics: Geert Bekaert
Anand Swamy
Mathematics: Rachel A. Kuske

Pennsylvania, University of
Mathematics: Tobias Colding

Princeton University
Economics: Michael A. Boozer
John McLaren
Mathematics: Shinichi Mochizuki

Purdue University
Mathematics: Irena Sifrar Swanson

Rochester, University of
Economics: Sang-Won Lee

Stanford University
Economics: Hilary Williamson Hoynes
Christina Shannon
Mathematics: Yng-Ing Lee
Tatiana Toro

State University of New York, Stony Brook
Mathematics: Lisa M. Traynor

Yale University
Economics: Tetsushi Honda
Anne Beeson Royalty

Beginning in the late sixties, the Sloan Foundation focused its direct support of science upon a single field identified as one experiencing a burst of intellectual ferment or creativity, but as yet unable to generate sufficient research resources. The first such focused program was in the neurosciences and the second, in cognitive science. Since 1986, the program has concentrated on advancing molecular studies of evolution as a field offering the prospect of revolutionary insights into the evolutionary origins of the earth's animal and plant kingdoms.

Several approaches have been pursued to enhance research capabilities in the field. The Foundation sponsors two highly competitive fellowship programs, one postdoctoral, the other sabbatical, for biological scientists seeking to develop the scientific capacities needed to undertake molecular studies of evolution. In addition, grants have been made for two series of short courses: one at the Marine Biological Laboratory at Woods Hole, aimed principally at young evolutionary biologists, the other at the UCLA Molecular Biology Institute, aimed principally at young molecular biologists. Nearly 300 participants have now benefitted from these extensive courses. Grants have also supported workshops and symposia directed toward the scientific issues of molecular evolution.

As this program nears completion in 1993, the Foundation and its advisors are considering new candidate areas where Sloan funding could have a substantive impact on enhancing the development of a significant, emerging scientific field or intersection of fields.

During 1991, the following distinguished advisory committee has assisted the Foundation in all aspects of this program:

Michael T. Clegg, Professor of Genetics, University of California, Riverside; **Russell F. Doolittle,** Professor of Biology and Chemistry, University of California, San Diego; **Morris Goodman,** Professor of Anatomy and Molecular Biology and Genetics, Wayne State University; **Leroy Hood,** Professor of Chemical Biology, California Institute of Technology; **James A. Lake,** Professor of Molecular Biology in Biology, University of California, Los Angeles; **Philip J. Regal,** Professor of Ecology, University of Minnesota.

Postdoctoral Fellowships in Molecular Evolution **$825,000**

In 1991, the fifth year of this competitive Fellowship program, applications again greatly exceeded the number of available awards. Each award includes $25,000 per year for stipend and benefits of the postdoctoral Fellow, $10,000 per year to the host laboratory for the Fellow's research expenses, and up to 15 percent in overhead. Grants will be made in 1992.

Fellow: Katherine A. Arbanasin, Department of Chemistry, University of California, San Diego • *Host Institution and Senior Scientist:* Stanford University, Department of Chemistry, John H. Griffin

Fellow: Wendy J. Bailey, Department of Molecular Biology and Genetics, Wayne State University • *Host Institution and Senior Scientist:* Yale University, Department of Biology, Frank H. Ruddle

Fellow: Michael P. Cummings, Department of Organismic and Evolutionary Biology, Harvard University • *Host Institution and Senior Scientist:* University of California, Berkeley, Department of Integrative Biology, Montgomery Slatkin

Fellow: Ronald W. DeBry, Department of Chemistry, Florida State University • *Host Institution and Senior Scientist:* Florida State University, Department of Biological Sciences, Lawrence G. Abele

Fellow: Scott V. Edwards, Department of Zoology, University of California, Berkeley • *Host Institution and Senior Scientist:* University of Florida, Department of Pathology and Laboratory Medicine, Edward K. Wakeland

Fellow: Lisa M. Nagy, Department of Molecular Biology and Genetics, University of Wisconsin–Madison • *Host Institution and Senior Scientist:* University of Wisconsin–Madison, Department of Molecular Biology and Genetics, Sean B. Carroll

Fellow: Gavin J.P. Naylor, Department of Vertebrate Paleontology, American Museum of Natural History • *Host Institution and Senior Scientist:* University of Michigan, Department of Biology, Wesley M. Brown

Fellow: Linda A. Raubeson, Department of Ecology and Evolutionary Biology, University of Connecticut • *Host Institution and Senior Scientist:* Mount Holyoke College, Department of Biological Sciences, Diana B. Stein

Fellow: Jeffrey W. Shultz, Department of Biological Sciences, University of Cincinnati • *Host Institution and Senior Scientist:* University of Cincinnati, Department of Biological Sciences, David P. Mindell

Fellow: Alexei I. Slesarev, Institute of Molecular Genetics, USSR Academy of Sciences • *Host Institution and Senior Scientist:* University of California, Los Angeles, Department of Biology, James A. Lake

Sabbatical Awards Program in Molecular Evolution **$200,000**

This competitive program is intended for established scientists interested in expanding their research knowledge and activities into molecular studies of evolution. Foundation support is supplemental to that provided under the terms of normal university sabbatical or research leave programs. The following awards were made during 1991, the third round in the program. Grants will be made in 1992–1993.

Fellow: John C. Avise, Department of Genetics, University of Georgia • *Host Institution and Laboratory Director:* Stanford University, Hopkins Marine Station and Department of Biological Sciences, Dennis A. Powers

Fellow: Mark W. Courtney, Division of Biotic Systems and Resources, National Science Foundation • *Host Institution and Laboratory Director:* University of Southwestern Louisiana, Department of Biology, Joseph E. Niegel

Fellow: Martin E. Feder, Department of Organismal Biology and Anatomy and The Committee on Evolutionary Biology, University of Chicago • *Host Institution and Laboratory Director:* University of Chicago, Department of Molecular Genetics and Cell Biology, Susan L. Lindquist

Fellow: Gerald F. Shields, Institute of Arctic Biology, University of Alaska Fairbanks • *Host Institution and Laboratory Director:* University of Utah, Department of Human Genetics, Ryk H. Ward

Fellow: Jack W. Sites, Jr., Department of Zoology, Brigham Young University • *Host Institution and Laboratory Director:* Texas A&M University, Department of Animal Science, Scott K. Davis

Fellow: James F.A. Traniello, Department of Biology, Boston University • *Host Institution and Laboratory Director:* Boston University, Department of Biology, Scott M. Williams

Fellow: Edward N. Trifonov, Department of Polymer Research, Weizmann Institute of Science (Israel) • *Host Institution and Laboratory Director:* Linus Pauling Institute of Science and Medicine, Emile Zuckerkandl

Fellow: Marcy K. Uyenoyama, Department of Zoology, Duke University • *Host Institution and Laboratory Director:* Pennsylvania State University, Department of Biology, Stephen W. Schaeffer

OFFICER GRANTS

The Pennsylvania State University **$30,000**
University Park, Pennsylvania 16802

Partial support for a 1992 international conference on molecular evolution. (Project Director: Dr. Masatoshi Nei, Director, Institute of Molecular Evolutionary Genetics and Distinguished Professor of Biology; Grant period: August 1, 1991–July 31, 1992.)

Wayne State University **$7,000**
Detroit, Michigan 48202

Support for a workshop on molecular evolution. (Project Director: Dr. Morris Goodman, Professor, Department of Anatomy and Cell Biology; Grant period: August 1, 1991–July 31, 1992.)

Yale University **$30,000**
New Haven, Connecticut 06520

To support the opportunistic collection of DNA samples reflecting human genetic diversity. (Project Director: Dr. Kenneth K. Kidd, Professor of Human Genetics, Psychiatry and Biology; Grant period: July 1, 1991–June 30, 1993.)

MATHEMATICS

OFFICER GRANTS

American Institute of Physics **$30,000**
Woodbury, New York 11797–2999

Support for a Soviet–American Conference on Chaos to be held July 1991. (Project Director: Kenneth W. Ford, Executive Director and CEO; Grant period: February 5, 1991–December 31, 1991.)

American Mathematical Society **$25,000**
Providence, Rhode Island 02940

To partially support a Strategic Planning Task Force of the American Mathematical Society. (Project Director: Dr. William H. Jaco, American Mathematical Society; Grant period: May 1, 1991–April 30, 1992.)

Mathematical Sciences Research Institute **$30,000**
Berkeley, California 94720

For partial support of two workshops on mathematical physics. (Project Director: Irving Kaplansky, Executive Director; Grant period: April 1, 1991–March 31, 1993.)

Princeton University **$25,000**
Princeton, New Jersey 08544–4219

Support for the work of John W. Tukey. (Project Director: John W. Tukey, Research Statistician; Grant period: October 30, 1991–October 31, 1993.)

Society for Industrial and Applied Mathematics **$23,320**
Philadelphia, Pennsylvania 19104–2688

Support for symposia and lectures on manufacturing and design on the second International Conference on Industrial and Applied Mathematics. (Project Director: Dr. I. Edward Block, Executive Director; Grant period: April 15, 1991–April 15, 1992.)

Stanford University **$30,000**
Stanford, California 94305-2060

Partial sponsorship of a meeting on the Theoretical Aspects of Reasoning about Knowledge (TARK). (Project Director: Professor Yoav Shoham, Computer Science Robotic Laboratory, Stanford University; Grant period: December 1, 1991–December 31, 1992.)

Stony Brook Foundation **$30,000**
State University of New York at Stony Brook
Stony Brook, New York 11794-2550

Partial funding of a symposium on Topological Methods in Modern Mathematics. (Project Director: Dr. Anthony V. Phillips, Professor of Mathematics, SUNY; Grant period: June 1, 1991–October 31, 1991.)

University of Minnesota **$30,000**
Minneapolis, Minnesota 55455

Support for a special summer session on mathematical modeling for graduate students. (Project Directors: Professor Avner Friedman, Director, Institute for Mathematics and its Applications and Willard Miller, Jr., Professor and Associate Director; Grant period: December 1, 1991–November 30, 1992.)

OFFICER GRANTS

Columbia University **$5,500**
New York, New York 10027

To prepare a catalog and bibliography of the writings of Professor I.I. Rabi. (Project Director: Mr. Ronald J. Grele, Director, Oral History Research Office, Columbia University, Butler Library; Grant period: November 13, 1991–December 31, 1992.)

IEEE Foundation, Inc. **$27,700**
New York, New York 10017

To fund a conference on Technological Competitiveness in the Electrical and Electronics Industries: Historical and Contemporary Perspectives. (Project Director: Dr. William Aspray, Director, Center for the History of Electrical Engineering, Rutgers University; Grant period: July 15, 1991–July 15, 1992.)

Los Rios Community College District **$30,000**
Sacramento, California 95825

Support for a biography of Lise Meitner. (Project Director: Dr. Ruth Sime, Professor of Chemistry; Grant period: July 1, 1991–December 31, 1992.)

Massachusetts Institute of Technology **$27,380**
Cambridge, Massachusetts 02139

Partial support for Professor Thomas Hughes to spend Spring 1992 semester at MIT. (Project Director: Kenneth Keniston, Director, Program in Science, Technology and Society; Grant period: January 1, 1992–December 31, 1992.)

Niels Bohr Archive **$25,000**
DK–2100 Copenhagen, Denmark

Support for the expansion of the Library's book collection. (Project Director: Finn Aaserud, Acting Director, Niels Bohr Archive; Grant period: January 1, 1991–January 31, 1992.)

Rensselaer Polytechnic Institute **$30,000**
Troy, New York 12180–3590

Partial support for a book on industrial research. (Project Director: Herbert I. Fusfeld, Chairman Advisory Board, School of Management; Grant period: July 1, 1991–June 30, 1993.)

The Rockefeller University **$5,000**
New York, New York 10021–6399

Final support for the completion of a biography of Archibald Garrod by Alexander Bearn. (Project Director: Dr. Alexander Bearn, The Rockefeller University; Grant period: March 6, 1991–December 31, 1991.)

The Rockefeller University **$25,000**
New York, New York 10021–6399

Support for Dr. Abraham Pais's writings on the history of science. (Project Director: Abraham Pais, Department of Physics; Grant period: November 4, 1991–October 31, 1993.)

Stanford University **$30,000**
Stanford, California 94305

Support for a Workshop on History of Technology for Engineering Students. (Project Director: Professor Robert E. McGinn, Professor of Values, Technology, Science, and Society and Industrial Engineering; Grant period: December 16, 1991–December 31, 1992.)

Universities Research Association, Inc. **$30,000**
Washington, D.C. 20036

Partial support for the third international symposium on the history of particle physics. (Project Director: Michael Riordan, Assistant to the President, URA, Inc.; Grant period: October 1, 1991–October 31, 1992.)

OFFICER GRANTS

Keystone Center $25,000
Keystone, CO 80435

Support for a "Scientist to Scientist" colloquium. (Project Director: Mr. Robert W. Craig, President, Keystone Center; Grant period: May 21, 1991–April 30, 1992.)

Santa Fe Institute $12,000
Santa Fe, New Mexico 87501

Support of a Workshop on Computation in the Social Sciences. (Project Director: Professor John Miller; Grant period: August 1, 1991–October 31, 1992.)

Santa Fe Institute $30,000
Santa Fe, New Mexico 87501

Support of a workshop on Adaptive Computation. (Project Director: Dr. Edward A. Knapp, Director; Grant period: November 1, 1991–October 31, 1992.)

TRUSTEE GRANT

Massachusetts Institute of Technology $210,000
Cambridge, Massachusetts 02139

This program of research on energy and environmental policy addresses three specific subjects: 1) Critique of U.S. Energy policy, 2) The Prospects for Nuclear Power in the U.S. and 3) Global Warming. The first subject involves a detailed appraisal of U.S. energy policy, which is considered essential by many people. That appraisal should come from an individual or a few specialists who undertake the task as important public policy analysis and not on behalf of some special interest. The goal of this project is to improve understanding of the forces that are preventing the U.S. government from adopting a stable energy policy, as well as the costs and risks that are borne as a consequence of not having an adequate, sensible, and stable policy.

The project on the prospects for nuclear power in the U.S. will study the reasons for the standstill in commercial development for the past decade, as well as the reasons to consider for its continued development. The third project on global warming will focus on the implications of concern about CO_2 emissions from fuels which are selected to meet the energy needs of industry and utilities. Various proposals are being put forward, e.g. a carbon tax, that needs to be viewed from the perspective of the impact on energy costs and supply. Such policy proposals require analysis and commentary from independent sources. (Project Director: John M. Deutch, Karl Taylor Compton Professor, Department of Chemistry, MIT; Grant period: February 15, 1991–February 28, 1994.)

The Alfred P. Sloan Foundation will sponsor a series of books intended to broaden public understanding of the 20th century's critical technologies. The book series will narrate the development of specific technologies considering the circumstances of their emergence, their early development and use, their expanding application and their eventual full impact practically, socially and culturally.

The subjects include the invention of the transistor, the history of computers, the development of the hydrogen bomb, commercializing space, the problems and prospects of nuclear power, the influence of the jet engine on commercial aviation, the technological revolution in agriculture, the history of commercial radio, civilian satellites, the achievement of public health, the impact of birth-control technology, the story of radar, gene technology, and the dieselization of railroads. More will be added. The Series will also include biographies. Two have been commissioned, one of scientist-engineer-businessman, Edwin Land, the inventor of the Polaroid camera, and the other of the pioneer efficiency expert, Frederick Winslow Taylor. Unlike a previous Series of memoirs by scientists written with Sloan Foundation sponsorship, most of the books in the new Series will be the work of professional authors. The list of grantees announced in early 1992 and their subjects are the following:

William Aspray, director of the IEEE Center for the History of Electrical Engineering, and Martin Campbell-Kelly, computer scientist at the University of Warwick: a history of the computer.

Robert Buderi, technology editor, BusinessWeek: the story of radar.

John Cairns, M.D., former director of the Cold Spring Harbor Laboratory of Quantitative Biology: a history of public health.

Craig Canine, farmer, free-lance writer: 20th century American agriculture.

Susan J. Douglas, associate professor of Media and American Studies, Hampshire College: the history of commercial radio in America.

Helen Gavaghan, science journalist: a history of civilian space satellites.

Stephen S. Hall, writer and author: immunotherapy.

Thomas A. Heppenheimer, aerospace engineer and science journalist: commercial jet aviation.

Lillian Hoddeson, physicist and historian, and Michael Riordan, physicist and author: the invention of the transistor.

Robert Kanigel, writer, author: biography of Frederick Winslow Taylor and the cult of efficiency.

Bettyann Kevles, writer, lecturer, Humanities Faculty, Art Center College of Design: seeing inside the body from X-rays to MRI.

Charles C. Mann, journalist and author: birth-control technology.

Victor McElheny, director of the Knight Science Journalism Fellowships, MIT: biography of Edwin Land.

Henry Petroski, professor of civil engineering, Duke University: technology and culture in the history of communications.

Robert Pool, mathematician and science journalist: nuclear power past, present and future.

Mark Reutter, free-lance writer: the dieselization of American railroads.

Richard Rhodes, writer and historian: the development of the hydrogen bomb.

EDUCATION IN SCIENCE, TECHNOLOGY, AND MANAGEMENT

The Foundation's program in this traditional area of support reflects a broad scope of interests. Grants in science and engineering education encompass a variety of important issues, such as: understanding how and why people choose or do not choose to enter professions in science and technology and the reasons for continuing or leaving those professions, training a future scientific and technical elite, analyzing and initiating programs to address the underrepresentation of women and minorities in science and engineering, and developing educational programs and materials.

In technology and management education, the Foundation places special emphasis on vital fields such as manufacturing. A principal focus is curriculum development at the graduate level which will increase expertise and career interest in manufacturing among graduate students in engineering and management. Programs which strengthen the participation of women and minorities in management and engineering is another major goal in this area.

The Foundation is also exploring innovative approaches for education outside the classroom or school system. The effort is aimed at independent learning in science and technology as a supplement to classroom materials and as an avenue for exploring new interests. One focus is on education, using computer and multi–media technologies, for students motivated to educate themselves. Another focus is on the use and development of science and technology centers and museums for highly motivated students.

Enhancing public understanding and interest in science and technology is another area which the Foundation is pursuing. Sloan grants are supporting two major public television series: Made in America, on industrial competitiveness, and Great Projects in Engineering, which is now in production. Sloan funds are also assisting the production of NOVA's First Light project on the building of the Hale Telescope on Palomar mountain. The Foundation is considering several other initiatives to expand communication of information on technical projects and issues for the general population.

SPECIAL SECONDARY SCHOOLS, TRUSTEE GRANTS

California State University **$250,000**
Carson, California 90747

The California Academy of Mathematics and Science, a specialized high school, is new. Its first freshman (9th grade) class of 125 students entered in September 1990. It will add an additional grade in each year until a steady state of 500 students is reached. Unlike other members of the National Consortium of Specialized Secondary Schools of Mathematics, Science, and Technology, the California Academy is predominantly minority. Sloan support will strengthen the school at this crucial point in its development, and increase its chance for support from both the public and private sectors. The funds will be used for instructional enrichment, specifically, summer classes, instructional materials, co–ordination of industry internships, and student participation in regional and national conferences. The goal is to improve the quality of mathematics and science instruction so that graduates can compete for admission to high quality college programs in science and mathematics. (Project Director: Ms. Kathy Clark, Principal, California Academy of Mathematics and Science; Grant period: November 1, 1991–October 31, 1994.)

Mississippi High School for Mathematics and Science **$252,000**
Columbus, Mississippi 39701

This grant supports a program of prize awards to outstanding high school graduates in science and mathematics who will be chosen by the National Consortium of Specialized Schools of Mathematics, Science, and Technology. By awarding a $2500 prize to each of 20 graduating seniors, the Foundation hopes to encourage excellence in academic achievement, and provide an example of support which will be emulated by local industries, since funding for the awards is only for the first four years. The winners will be chosen by a panel of faculty from consortium members, with no school to receive more than one prize in any single year. Achievement, and not need, will be the main criterion. (Project Director: Johnny Franklin, Principal; Grant period: November 1, 1991–October 31, 1995.)

Thomas Jefferson High School for Science and Technology **$250,000**
Alexandria, Virginia 22312

This specialized high school, located in Alexandria, Virginia, is recognized as one of the best of its kind in the country, ranking with counterpart schools in North Carolina, Illinois, and Mississippi. This year it produced more National Merit semi-finalists than any other school in the nation. Minority enrollment at the school is currently only 5 percent. Sloan funds will be used to increase the number of minority students through a program for promising seventh and eighth graders, consisting of after-hours instruction in the school's laboratories and classrooms, field trips to businesses and industries for the students and their parents, and a six-week summer program. (Project Director: Geoffrey Jones, Principal; Grant period: November 1, 1991–October 31, 1994.)

Cornell University **$52,319**
Ithaca, New York 14853

A continuing supply of Ph.D.s is a matter of keen interest in academic and other professional spheres of American life. In recent years there has been some lengthening of the time-to-Ph.D. degree. The time may depend on positions available in the fields, funding for graduate studies and other factors. While in some fields, it remains at four years or even less, in others it has stretched to more than ten years. This study will cover seven disciplines at a single university for which the appropriate data are available. The study will allow entry of the entire time path of financial support—year by year—and will therefore measure influence of type of support and timing of support. Similarly, sequential changes in the labor market and predictions of the future market during the course of graduate study can be entered. Other data that is now available and will be used include gender, citizenship, marital status, dependents, GRE scores, undergraduate institution, and post-degree plans. Several

of these variables allow for testing completing probabilities dependence on undergraduate "quality". (Project Directors: Professor Ronald Ehrenberg, Irving M. Ives Professor of Industrial and Labor Relations and Economics; Grant period: May 1, 1991–April 30, 1992.)

Families and Work Institute **$195,000**
New York, New York 10001

Women engineers and scientists employed in the private sector have been leaving the work force at a significantly higher rate than their male counterparts. This is true even for women who are well established in their careers. This study will examine why this is so, and point the way to changes that would improve retention. In nine firms across the pharmaceutical, automotive, and oil industries, R & D and Human Resources managers will be interviewed regarding their experience in recruiting and promoting women scientists and engineers. Also, in each of the nine firms, four focus groups will be formed to identify problems encountered by their members. (Project Director: Catherine Morrison, Vice President; Grant period: November 1, 1991–December 31, 1992.)

The University of Chicago **$393,270**
Chicago, Illinois 60637

A review of the fields of vocational and career development, counseling and guidance, done with the help of leaders in these fields, has shown that although there have been a number of theories developed over the past forty years, and some testing of those theories, there has been very little empirical examination of how the choice of an occupation actually develops in the secondary school years. This research will include a systematic set of semi-structured personal interviews with students in urban, suburban, and rural school systems; a review of national longitudinal surveys to extract information on the development of occupational knowledge and the process of selection, and an examination of current theoretical work for its bearing on this empirical study. (Project Director: Dr. Barbara Schneider, Ogburn Stouffer Center, University of Chicago; Grant period: July 1, 1991–October 31, 1992.)

University of Colorado Foundation **$240,000**
Boulder, Colorado 80306

This grant provides funds for researchers at the University of Colorado to extend novel initial work they have completed on determining why science and engineering students switch to other majors. The initial studies, which generated interesting hypotheses, were done on a small Sloan grant, at Colorado universities and colleges. Work under this project will examine these hypotheses at universities of different kinds and caliber in other regions of the country. The proposed research will again be done by ethnographic methods. Among the preliminary hypotheses established in the first phase to be further examined are:

- Switchers and non-switchers are not different in their experiences nor in their abilities.
- The chief problems faced by both groups were with the quality of the academic environments—poor teaching, faculty unapproachability, lack of assistance.
- Some often cited problems, such as class size, poor equipment, foreign faculty or teaching assistants were never mentioned as reasons for switching. Minority students' reasons for switching (or not switching) were the same as their non-minority counterparts.
- There were important differences between minority groups. Women differed from men in that they were more critical of the quality of teaching and were more strongly affected by early low grades.

(Project Director: Dr. Elaine Seymour, Co-Project Director, University of Colorado at Boulder; Grant period: July 1, 1991–October 31, 1993.)

ENTRY AND RETENTION, OFFICER GRANTS

Commission on Professionals in Science and Technology **$22,000**
Washington, D.C. 20005

A conference on predicting shortages of science/engineering professionals. (Project Director: Betty M. Vetter, Executive Director; Grant period: May 1, 1991–September 30, 1991.)

The Research Foundation of State University of New York **$27,977**
Albany, New York 12201

Support for a study on "Occupational Departure of Employees in the Natural Sciences and Engineering". (Project Director: Anne E. Preston, Assistant Professor, W. Averall Harriman School for Management and Policy, SUNY, Stony Brook; Grant period: June 1, 1991–September 30, 1992.)

WOMEN AND MINORITIES, TRUSTEE GRANTS

Cornell University **$190,000**
Ithaca, New York 14853

Purdue University **$204,000**
West Lafayette, Indiana 47007

University of Washington **$198,000**
Seattle, Washington 98195

The past decade has seen a leveling-off, at about fifteen percent, of women studying engineering. The available remedies that can be tried are numerous and vary substantially in the amount of time and money required before an upturn might be seen.

Significant gains may be made in a few years by spending modest sums in support of undergraduate engineering programs that have both of the following characteristics: 1) they are recognized as being of high academic quality, so that someone earning their degrees will have an initial advantage at the start of an engineering career, as well as the training for long–term high performance; 2) they have well established efforts to increase the enrollment of women and to reduce their rate of attrition. The three programs supported here represent these characteristics. Sloan funds will pay for support groups and summer employment assistance for freshmen, where attrition takes its highest toll, seminars and courses for women in their early undergraduate years, and similar kinds of assistance. (Project Directors: Dean William B. Streett, College of Engineering, Cornell University; Dean Henry T. Yang, School of Engineering, Purdue University; Dean J. Ray Bowen, College of Engineering, University of Washington; Grant period: November 1, 1991–October 31, 1994.)

Wellesley College **$250,000**
Wellesley, Massachusetts 02181

Wellesley College will conduct a two–year study of personal and structural factors that facilitate or deter women's participation in scientific fields. The study is expected to shed light on women students' choice of science as a college major, women students' success in completing scientific training, and women's career experience in scientific vocations.

The project will employ several methodologies: surveys of Wellesley graduates who pursued careers in science and others who shifted majors as undergraduates or left later; focus group discussion with current undergraduates; comparative data analysis with projects at MIT and Spelman dealing primarily with males and minorities. (Project Directors: Paula M. Rayman, Associate Professor of Sociology and Research Associate, Center for Research on Women, and Nancy Kolodny, Professor and Chairman, Department of Chemistry; Grant period: April 15, 1991–March 31, 1993.)

WOMEN AND MINORITIES, OFFICER GRANTS

National Academy of Sciences **$30,000**
Washington, DC 20418

In support of a Conference (November 4–5, 1991) on Women in Science and Engineering. (Project Director: Phillip M. Smith, Executive Officer; Grant period: October 1, 1991–December 31, 1991.)

RESEARCH UNIVERSITIES: THE SYSTEM OF EDUCATION AND RESEARCH, TRUSTEE GRANT

National Research Council **$100,000**
Washington Avenue, D.C. 20418

This grant provides partial support to extend and bring up to date the now decade–old assessment of research–doctorate programs in United States universities. The existing assessment of Ph.D programs in the physical sciences, life sciences, social and behavioral sciences, humanities and engineering was published in 1982 as five volumes (An Assessment of Research–Doctorate Programs in the United States, L.V. Jones, G. Lindzey and P. Coggeshall, editors, Washington, D.C., National Academy Press). These reports are the principal data resource for assessing the quality of graduate programs by discipline, including self–assessments within institutions and fields. The 1982 assessments are now out of date, given rapid changes in both disciplines and institutions. This proposed project will not only replicate the earlier study, but also enhance and extend it. Changes in program quality ratings will be examined and analyzed; quality perceptions will be related to program size, number and age of faculty, and faculty publication records; and quality assessments will be obtained from industrial employers. A 12–member committee, assisted by three specialized panels, will conduct this work over a three–year period. (Project Director: Dr. Alan Fechter, Executive Director, Office of Scientific and Engineering Personnel (NRC); Grant period: April 1, 1991–March 31, 1994.)

RESEARCH UNIVERSITIES: THE SYSTEM OF EDUCATION AND RESEARCH, OFFICER GRANT

Columbia University **$30,000**
New York, New York 10027

Partial support for a project on "current threats to the continuing excellence of America's best universities." (Project Director: Dr. Jonathan R. Cole, Provost; Grant period: October 1, 1991–September 30, 1993.)

IMMIGRATION, TRUSTEE GRANTS

Center for Immigration Studies **$39,652**
Washington, D.C. 20036

This grant supports a study of the foreign–born population of the United States who qualify as professionals by education, training or experience. It will be based principally upon special tabulations on data gathered in the 1990 Census, tabulations that will otherwise not be undertaken on this rich source of information. In addition to Census data, the study will draw upon other potential sources of relevant data, such as the Immigration and Naturalization Service, the National Center for Education Statistics, the National Association of Foreign Student Affairs, the Institute of International Education, and the Visa Office of the Department of State.

The data will provide a unique resource for analysis by the principal investigators and by other researchers. Analytic questions to be pursued include: what share of specified occupations by locale are currently occupied by foreign–born professionals; how do the life and work circumstances of foreign–born professionals compare to those of native–born professionals in comparable fields and locations; and to what extent have foreign–born professionals of differing national origins tended to concentrate in certain occupational fields and/or places of settlement, along with identification of any changes in such patterns. (Project Director: Dr. Leon F. Bouvier; Grant period: July 1, 1991–December 31, 1992.)

Population Reference Bureau, Inc. **$93,944**
Washington, DC 20009

This grant supports a study of the impacts of foreign–born scientists and engineers upon American economic and educational institutions. It will be based upon numerous direct interviews with expert informants, including: foreign–born scientists and engineers themselves, educators, employers, union officials, "gatekeepers" such as university admissions officers, native–born scientists and engineers, and appropriate professional and trade associations. The project will complement the quantitative analyses of other grants in this program area. (Project Director: Dr. David S. North, Senior Associate; Grant period: November 1, 1991–December 31, 1992.)

University of California, San Diego **$80,263**
La Jolla, California 92093

Sloan funding in this grant will support research by Dr. George Borjas on the economic consequences of immigration to the United States by highly–skilled workers in scientific and technical fields. The numbers of such workers, many of whom initially enter as foreign students and then convert their status to permanent resident after graduation, have grown quite large, and now represent significant proportions of the total labor force in some fields such as education in engineering and some sciences. However, very little analysis has been undertaken of this phenomenon, and equally limited assessments have been conducted of its positive and negative impacts upon U.S. educational institutions and industrial firms.

The project will focus on the numbers, institutions, levels and disciplinary concentrations of foreign students in the U.S., in an attempt to understand the elements that have driven the large increase in foreign student presence in some fields; an assessment of competing hypotheses as to the impacts of foreign students upon the choices of institutions and fields made by native–born students; and an analysis of the U.S. labor market experience of foreign–born professionals (relative to those of natives) in the 1970s and 1980s.

CURRICULUM AND MATERIALS, OFFICER GRANTS

Rensselaer Polytechnic Institute **$20,000**
Troy, New York 12180–3590

To partially support the visit of an eminent Russian researcher and educator. (Project Director: Julian D. Cole, Professor of Applied Mathematics, Rensselaer Polytechnic Institute; Grant period: September 1, 1991–September 30, 1992.)

The Mathematical Association of America **$29,500**
Washington, D.C. 20036

Support for the preparation and distribution of translations of mathematics entrance examination for Japanese colleges and universities. (Project Director: Don Albers, Professor of Mathematics, Menlo College; Grant period: January 1, 1991–December 31, 1991.)

TECHNOLOGY AND MANAGEMENT EDUCATION

MANUFACTURING, TRUSTEE GRANTS

Rensselaer Polytechnic Institute **$218,900**
Troy, New York 12180–3590

Under this grant Rensselaer will initiate team industrial projects as a special version of the senior engineering capstone work. The plan is unique in two respects: it centrally involves graduate students as team leaders; it seeks to systematically organize projects with industrial companies. The Rensselaer plan will also request a company technical person to have an active supervisory role in each project. Beginning in 1990, the Foundation has provided grants to develop graduate level educational programs in engineering and management that draw closer to real industrial issues. This effort seeks to do this at the undergraduate level. (Project Director: Herbert H. Richtol, Dean of the Undergraduate College; Grant period: March 1, 1991–December 31, 1993.)

Stanford University **$3,000,000**
Stanford, California 94305–2060

In recognition of the need to educate more U.S. engineering and management students for work in manufacturing, and in special recognition of the scarcity of university professors to do the teaching, Stanford proposes to embark on a ten year program. The program aims at producing high quality Ph.D.s, with some prior experience in manufacturing, who will take up new positions at leading engineering and business schools. The Foundation will help to initiate the first five year phase. The program is characterized by being small (five per year over a ten year period) but extremely selective. To attract engineers or managers who have already exhibited capability in manufacturing companies, substantial stipend, full tuition, thesis–research funding, and a career–starting grant at completion will be offered. The program will require the development of a set of special courses and the close supervision of senior faculty. (Project Director: Professor W. C. Reynolds, Chairman, Mechanical Engineering Department, Stanford University; Grant period: March 1, 1991–December 31, 1994.)

MANUFACTURING, OFFICER GRANT

Rensselaer Polytechnic Institute **$30,000**
Troy, New York 12180-3590

Partial support for the development of manufacturing and technology curriculum material in core management fields. (Project Director: Robert G. Hawkins, Dean, School of Management; Grant period: May 15, 1991–May 15, 1992.)

MINORITIES AND WOMEN, OFFICER GRANT

American Women's Economic Development Corp. **$30,000**
New York, New York 10022

To expand women's business development training to Los Angeles and Washington, D.C. (Project Director: Rosalind E. Paaswell, Chief Executive Officer, AWED; Grant period: August 1, 1991–October 31, 1992.)

EDUCATION OUTSIDE THE CLASSROOM

TRUSTEE GRANT

The Franklin Institute **$178,000**
Philadelphia, Pennsylvania 19103

The Franklin Institute, one of the oldest and most renowned science museums, will initiate a program for the Philadelphia metropolitan area similar to the New York Junior Academy. The New York Junior Academy, now 26 years old, is a membership organization of high school students, grades 8–12, interested in science and technology. The students, who pay nominal membership dues of $10 per year, run the Junior Academy themselves, via an elected managing board assisted by the education director of the New York Academy of Sciences. Members of the managing board organize frequent lectures and seminars by prominent scientists and engineers; a career/college guidance program; a summer opportunities program in science and engineering; field trips to research sites such as Bell Labs and nature conservancies; and occasional social events. The Junior Academy provides a "peer group" in which interest in science and technology is strongly supported, countering the negative peer pressure that interested students often experience in their own high school.

Under this grant, the Franklin Institute will begin to transform and expand itself into a Junior Academy; it has elected its own officers, and will launch an active program, including: a monthly lecture series; a newsletter; field trips to research sites; college and career guidance; social events; overnight "camp–ins" in the Museum with science workshops; use of Museum labs for members; science projects; and mentoring relationships with local senior scientists. The membership goal for the first year is 300 students. (Project Director: Minda Borun, Director, Museum Program, Franklin Institute Science Museum; Grant period: February 15, 1991–February 28, 1994.)

OFFICER GRANTS

Boston University **$28,770**
Boston, Massachusetts 02215

Evaluation of the attractiveness of Interactive Compressed Video in delivering engineering education to the workplace, and dissemination of the results. (Project Director: Peter Z. Bulkeley, Professor and Chairman, Department of Manufacturing Engineering; Grant period: September 1, 1991–June 30, 1992.)

Massachusetts Corporation for Educational Telecommunications **$29,600**
Cambridge, Massachusetts 03139–4135

For a two-day conference on Interactivity and Distance Learning. (Project Director: Cardie Texter, Director of Development and Sponsored Programs; Grant period: November 30, 1991–May 31, 1992.)

New York Academy of Sciences **$20,287**
New York, New York 10021

Support for a conference on Junior Academies of Science. (Project Director: Dr. Talbert B. Spence, Director of Educational Program; Grant period: April 1, 1991–September 30, 1991.)

Technical Education Research Centers, Inc. **$25,000**
Cambridge, Massachusetts 02140

Evaluate the Environmental Network Pilot Project. (Project Directors: June Foster and William Spitzer—TERC; Grant period: August 5, 1991–December 31, 1991.)

TRUSTEE GRANTS

Harvard University **$300,000**
Cambridge, Massachusetts 02138

For five years (1987–1992) the Foundation has been providing support to the Harvard School of Public Health for three journalists to be in residence each year taking courses and doing research. This is a final grant to support the Fellowship for two more years, during which time Harvard expects to be able to raise endowment funding to make the program a permanent fixture at the School of Public Health.

This program is the third of its kind which Sloan has helped launch. In 1975 the Foundation initiated a fellowship program for business and economics journalists at Princeton University. Over a period of six years Sloan granted $1.3 million which supported forty-eight reporters from daily newspapers across the country to study for a full year at Princeton. Most of the alumni are still practicing journalists and many have moved up to big city newspapers or national magazines.

In 1982 the Foundation helped found M.I.T.'s Vannevar Bush Fellowship Program in Technology and Science Journalism. Over six years Sloan granted $1 million to the Bush Fellowship; and, toward the end of that time, assisted the Director in his efforts to raise endowment funds to institutionalize the Fellowship on a permanent basis. That effort succeeded. The program continues at M.I.T. as the Knight Fellowship Program in Science Journalism.

The Fellowship at Harvard's School of Public Health seeks a similar future. More than economics or science, reporting about health issues commands widespread public attention. Good, accurate, informed journalism is even more important in this context of public attitudes. A recent Louis Harris study said: "If people understand a problem and what they can do about it, if information and guidance is widely available, many will make healthy changes in personal conduct." The Harvard program addresses that situation. (Project Director: Jay A. Winsten, Director, Center for Health Communications; Grant period: June 1, 1992–June 30, 1994.)

WGBH Educational Foundation **$150,000**
Boston, Massachusetts 02134

This grant from the Foundation will partially support the making of a documentary film which will tell the story of the building of the Hale Telescope on Palomar Mountain in southern California. The Hale Telescope, with a two-hundred inch Pyrex mirror, is one of the masterworks of depression engineering. The story begins in 1934 when George Hale chose a fern meadow as the site on Palomar Mountain. Work crews blasted and dug a circle of holes in the meadow. Caltech students hauled rocks out of the holes using wheelbarrows. The dome, designed by committee, is almost exactly the size of the Pantheon in Rome.

Some of the engineers that built the Hale are still alive. They will help tell the story on film. Archival footage will also be used. Caltech has uncovered a rare film, thought to be lost, that shows in detail the making of the Hale's mirror–blank at Corning. Byron Hill, the master engineer who later became observatory superintendent, has contributed the only surviving copy of a ten-minute piece of film that shows the mirror being pulled to the top of Palomar Mountain. These and other materials will be combined to create a visual narrative of an extraordinary feat of engineering. (Project Director: Kathy White and Robin Bates, Producers, WGBH; Grant period: June 18, 1991–December 31, 1992.)

OFFICER GRANTS

The Computer Museum **$30,000**
Boston, Massachusetts 02210

To support a preliminary running of the Turing Test. (Project Director: Dr. Oliver B.R. Strimpel; Grant period: September 1, 1991–August 31, 1992.)

National Video Resources, Inc. **$15,620**
New York, New York 10012

Assessment of the videocassette market in science and technology. (Project Director: Gretchen Dykstra, Project Director, National Video Resources, Inc.; Grant period: February 1, 1991–October 31, 1991.)

New York University **$24,816**
New York, New York 10011

Preparation of a new edition of Controversy: The Politics of Technical Decisions, edited by Dorothy Nelkin. (Project Director: Professor Dorothy Nelkin, Department of Sociology; Grant period: February 15, 1991–June 30, 1992.)

Rensselaer Polytechnic Institute **$7,000**
Troy, New York 12180–3590

Continuation of Rensselaer Polytechnic Institute's seminars for journalists on science and technology policy issues. (Project Director: Herbert I. Fusfeld, Chairman, Advisory Board, School of Management; Grant period: July 1, 1991–August 31, 1992.)

Research Foundation of The City University of New York $29,900
New York, New York 10003

Planning grant for a Science and Engineering Television Network. (Project Director: Gary Welz, Adjunct Lecturer in Mathematics; Grant period: August 5, 1991–November 1, 1991.)

Scientists' Institute for Public Information $30,000
New York, New York 10017

Support for a Conference on Science and TV News. (Project Director: Alan McGowan, President; Grant period: March 6, 1991–February 28, 1992.)

Share Our Strength (SOS) $10,000
Washington, D.C. 20005

Support for an anthology of science stories. (Project Director: Bill Shore, Executive Director; Grant period: September 1, 1991–November 30, 1992.)

Whitehead Institute for Biomedical Research $25,000
Cambridge, Massachusetts 02142

Support for a public seminar series on the social, ethical, and environmental consequences of the molecular biology revolution. (Project Directors: Dr. Eric Lander, Member, Whitehead Institute and Professor of Biology, MIT; Dr. Gerald R. Fink, Director, Whitehead Institute and American Cancer Society Professor of Genetics; Grant period: September 1, 1991–August 31, 1993.)

ECONOMIC GROWTH AND INDUSTRIAL COMPETITIVENESS

The goal of this program is to deepen understanding of the basic forces that will maintain and improve a high American standard of living in an increasingly competitive global economy. The program spans a broad range of areas which affect the ability of U.S. industry to compete in world markets: manufacturing, the availability and introduction of technology, management of the product development process, the nature and education of the work force, the outlook of management, the cost and availability of capital, tax incentives, the impact of U.S. liability law on product safety and innovation, trade policy, international economics, and so forth. In addition, grants in the area of economics are focused on the contributions which economic analysis can make to issues relating to competitiveness such as productivity.

In 1990, the Sloan Foundation launched a major program to establish interdisciplinary centers at leading research universities to study U.S. industries. The objective is to support the evolution of an academic community, involving scholars in engineering, management, and economics, that can provide realistic research and education for American industry. The Foundation's hope is that these efforts will develop into long term programs that can contribute observations, analysis, and understanding to U.S. companies engaged in these industries.

By the end of 1991, the Foundation had allocated $15.8 million for eight industry studies programs. At MIT, the Center for the Study of the Automobile industry will expand the extensive analysis developed in the International Motor Vehicle Program in the 1980's. Another MIT center is studying the pharmaceutical industry. A new Harvard University Center for Textile and Apparel Research is studying the clothing and textile industries.

Other industry study centers include information processing at Stanford University, semiconductors at the University of California at Berkeley, the carbon steel industry at Carnegie Mellon University and the University of Pittsburgh, and specialty chemicals and engineering plastics in a joint Harvard–MIT project. In addition, a new MIT program on Industrial Performance will draw on results from all the industry studies while undertaking its own full program of comparative research on productivity and industrial performance in the U.S. and six other countries.

TRUSTEE GRANTS

Harvard University **$260,000**
Cambridge, Massachusetts 02138

Process materials industries are an important part of any modern economy. The U.S. chemical industry still makes a positive contribution to the trade balance. Product development has been relatively little studied, especially from the point of view and by the methods of this project. The plan is to work with five companies each in the U.S., Japan, and Europe which make similar products (e.g., engineering plastics, agricultural chemicals, specialty chemicals) and to deal with a number of product projects in each company. The researchers will analyze product development for each project and will measure development times, numbers of engineers, investments in the development process, success or failure of the product and other characteristics.

The purpose is to compare by product, from company to company and country to country. This effort is designed to enhance understanding of differences in product and process engineering itself, engineering management, business strategy related to product development, and the relation between product and process development and customer requirements. The research will produce needed understanding of an important area. Articles and a book will be produced along with case studies and other course material. (Project Director: Kim B. Clark, Harvard University, Graduate School of Business Administration; Grant period: July 1, 1991–October 31, 1993.)

Massachusetts Institute of Technology **$2,527,640**
Cambridge, Massachusetts 02139

With this grant, the MIT Schools of Engineering, Management, and Science will establish an industry study program of the pharmaceutical industry. Emphasis in the program, in its initial years, will be on manufacturing, industry structure, and regulation. Finance and technology management and other topics will also be studied. Comparative studies for the U.S., Japan, and Europe will be an important aspect of these studies. In manufacturing, for example, product development of a drug leads to

clinical evaluation which may take several years. When approval to market does arrive, the originally planned manufacturing technology may have been superseded by better methods. New approaches to rapid product development that have inherently flexible manufacturability are needed, some of which have now appeared in other industrial sectors. The degree to which companies have embarked on this change will be observed and the development process itself will be studied.

The program at MIT will draw from work already underway in the Biotechnology Process Engineering Center (BPEC) (an NSF Engineering Research Center), the Center for Management of Technology, the Leaders in Manufacturing and other groups. The BPEC has an industry consortium of 65 companies that will also serve as an initial basis for industrial interaction for the industry study program. Participating members of the Sloan School have established relationships with Merck and other leading companies. Drawing from these sources, an industry advisory panel will be formed to work closely with academic participants. (Project Director: Charles L. Cooney, Director, Department of Chemical Engineering, MIT: Grant period: March 1, 1991–December 31, 1994.)

Massachusetts Institute of Technology **$3,232,056**
Cambridge, Massachusetts 02139

MIT will establish a new program to study productivity and industrial performance with this support. The program will: 1) create an ongoing research and educational enterprise at MIT, reaching faculty and students that will bring American industrial issues to the forefront; 2) conduct research in worldwide industrial performance (productivity, quality, timeliness, flexibility, human resource uses and management, technology development, governmental roles, and macroeconomic issues); and 3) develop new elements in MIT's educational offerings that will reflect this industrial focus.

Key elements of the proposed program include: the development of a community of industrial scholars at MIT; research projects on industrial performance issues that cut across individual industries; new research on productivity measures; new courses for

graduate and undergraduate programs; and the formation of best practices councils for particular industries. (Project Director: Professor Richard K. Lester, Director, Program on Industrial Performance; Grant period April 15, 1991–December 31, 1994.)

MPC Corporation **$1,900,000**
Pittsburgh, Pennsylvania 14213–3890

This Sloan grant will enable project directors at Carnegie–Mellon and the University of Pittsburgh to create a center for the study of the steel industry. The initial direction is to study, for the carbon steel industry, the factors that influence worldwide competitiveness. The center is to be a long–term establishment that will continuously monitor the steel industry, moving over time from one sector of that industry to another.

Consistent with the Foundation's emerging conception of industry studies, this plan will bring faculty with knowledge of the industry together with others who will learn the industry. It will place graduate students from a number of disciplines squarely into industry issues. It will be informed by technical and business people from both U.S. and foreign companies. And it offers the potential for a continuing focus on the steel industry over a long period of time. The center will concentrate on four key areas of study: ***management***, including strategy, human resource policies, finance, marketing, and the management of manufacturing; ***manufacturing technology and research*** including productivity and quality, new technology and new products, and research and development; ***energy and environment***; and ***government policies***. In each of these areas and sub–areas, research directions have been initially established. Country and specific company comparisons will form the basis for much of the work in all of the areas. (Project Director: Roger Ahlbrandt, Program Manager, Professor and Dean, Katz School of Business, University of Pittsburgh; Grant period: March 1, 1991–December 31, 1994.)

Stanford University **$3,038,261**
Stanford, California 94305–2060

The Graduate School of Business, School of Engineering and The Institute for International Studies of Stanford will establish a center for the study of the computer industry with this support. They will study computer hardware and software of all types, networks and data communications, and marketing and servicing of all of these products. Faculty participating in the center's studies will be drawn from electrical and industrial engineering and computer science, operations research, finance and strategy management, economics, political science, law, anthropology, and public administration. The center will study four main topics: design and manufacturing; company organization, operations, and strategy; evolution of firms and structure of the industry; and international issues. The first task of the research groups will be a series of field explorations with a large number of companies. Seminars, workshops, conferences, and new courses will couple the research to the educational environment at Stanford.

The Stanford center will have an Industrial Advisory Committee to be composed of computer industry leaders in the U.S., Europe, and Japan. (Project Director: Professor Daniel Okimoto, Northeast Asia–U.S. Forum on International Policy; Grant period: July 1, 1991–November 30, 1994.)

University of California, Berkeley **$1,448,147**
Berkeley, California 94720

The Schools of Engineering and Business of the University of California at Berkeley will form a center for the study of semiconductor manufacturing under this grant. As with the other industry studies, the center seeks to develop a community of academic scholars and students, working with industry leaders to become thoroughly knowledgeable about this industry. Berkeley electrical engineers, computer scientists, and industrial engineers already have detailed knowledge of some topics, as do the social scientists and business school faculty. The center, and its broad connections to the

technologies and business of companies of the industry, will bring key people together, learning about the full scope of the semiconductor industry.

The research program at Berkeley will address competitiveness issues through these elements: comparative studies of the world's best semiconductor manufacturing plants; technical research projects aimed at directly improving key manufacturing processes; an examination of business systems and policies of the industry; and financial analyses. In addition, these research activities will help promote new curricula, new courses, workshops and seminar activities and a professional education component for the industry itself. (Project Director: Professor David A. Hodges, Dean of Engineering; Grant period: April 15, 1991–December 31, 1994.)

OFFICER GRANT

National Academy of Sciences $30,000
Washington, D.C. 20418

Support for a series of articles by leaders from business and industry to be published in ISSUES. (Project Director: Mary R. Koppal, Publisher, ISSUES; Grant period: March 25, 1991–March 31, 1992.)

TRUSTEE GRANTS

The Brookings Institution $250,000
Washington, D.C. 20036–2188

The Brookings Institution is focusing its attention on the broadly shared concern about the productivity and competitiveness of the U.S. economy. Economic policy–making and private economic decision–making can be helped by researchers who are willing to take on real world issues and to collect or develop sources of data that provide genuinely new information.

Under this grant, they will devote a series of special issues of the journal Brookings Papers on Economic Activity: Microeconomics Issues (Micro–BPEA) to competitiveness issues such as manufacturing's role in overall productivity, rapidly changing computer technology's impact on service sector productivity, factors determining differences in productivity in plants within an industry, impact of product liability on innovation, international comparisons of fringe benefits costs, and impact on competitiveness of worker safety and environmental regulation. (Project Director: Henry J. Aaron, Director, Economic Studies Program; Grant period: October 8, 1991–December 31, 1993.)

National Academy of Sciences $750,000
Washington, D.C. 20418

The Sloan Foundation is providing partial support for the National Academies of Sciences and Engineering and the Institute of Medicine to create a new standing Board on Science, Technology and Economic Policy (BSTEP) of the National Research Council. The purpose of the Board is to analyze, understand, and report on the relationship between economic and technological issues and the nation's industrial structure.

BSTEP will stand as one of the few independent boards of the Academies. Its first chairman will be Michael Spence, a recognized microeconomist and now dean of the Stanford Graduate School of Business. Members of the Board represent a

distinguished group of corporate business and technical leaders, management and financial experts, academic economists and engineers, and people with governmental policy experience.

BSTEP's combination of economists and technologists will help to extend the range of the national advisory functions provided by the Academies to those economic policy-making centers such as the Council of Economic Advisors, the Domestic Policy Council, The Departments of Treasury and Commerce, the Federal Reserve and the Office of the Trade Representative which increasingly depend on technological understanding. (Project Director: Dr. Stephen A. Merrill, Executive Director, NAS, National Research Council; Grant period: July 1, 1991–October 31, 1994.)

National Bureau of Economic Research, Inc. **$450,000**
Cambridge, Massachusetts 02138

With this support, the National Bureau of Economic Research will continue the work it began under a 1987 Sloan grant on improving the quality of the national output measurement. Researchers involved in the project believe that production measurement techniques in industries with rapid technological change, such as microcomputers and pharmaceuticals, have not accurately assessed the productivity record of the U.S. economy in recent decades. They plan a serious attack on this problem over the next three years. The availability of new detailed data sources from selected industries will allow them to develop and implement a new methodological approach to these issues. The work may result in a revision of the existing measures in productivity and living standards and help to evaluate the social value of specific innovations. Industrial productivity is the principal determinant of standard of living and, therefore, improving its measurement is essential. (Project Director: Zvi Griliches, Professor of Economics, Harvard University; Grant period: June 18, 1991–June 30, 1994.)

OFFICER GRANT

University of Maryland **$19,300**
College Park, Maryland 20742

Support for a program to expand the study of earnings and income differentials. (Project Director: Professor Frank Levy, School of Public Affairs, University of Maryland; Grant period: July 1, 1991–June 30, 1992.)

OFFICER GRANTS

Boston University $30,000
Boston, Massachusetts 02215

Support for the dissemination of the results of a conference on "New Product Speed to Market: Strategies for Action." (Project Director: Professor Stephen Rosenthal, Boston University, School of Management; Grant period: February 15, 1991–December 31, 1991.)

Massachusetts Institute of Technology $30,000
Cambridge, Massachusetts 02139

MIT conference on Curriculum Development in Manufacturing. (Project Director: Professor Charles H. Fine, Sloan School of Management; Grant period: May 1, 1991–November 30, 1991.)

University of California, Los Angeles $29,000
Los Angeles, California 90024

Partial support of a conference on Manufacturing. (Project Director: Wellford W. Wilms, Assistant Dean for Student Affairs, UCLA, Graduate School of Education; Grant period: September 1, 1991–August 31, 1992.)

OFFICER GRANTS

Massachusetts Institute of Technology $30,000
Cambridge, Massachusetts 02139

Support for a conference on the impact of international immigration on the security and internal stability of states. (Project Director: Dr. Myron Weiner, Director, Center for International Studies; Grant period: March 1, 1991–February 29, 1992.)

University of Washington $30,000
Seattle, Washington 98195

Support for a new program in product liability, productivity and safety. (Project Director: Dr. Harold Lurie, Associate Director, Center for Law, Science and Technology, School of Law, University of Washington; Grant period: October 1, 1991–June 30, 1992.)

TRUSTEE GRANTS

American Enterprise Institute for Public Policy Research **$200,000**
Washington, D.C. 20036

The Foundation is providing partial support to the American Enterprise Institute for two years of a research program entitled: Technology and Trade in the Age of Global Competition. The project will analyze the contribution of technology to U.S. economic growth, the implications for the United States and other major trading nations of the convergence of trade policy and innovation policy, and the role of "global" or globalizing corporations in national economies and in international competition. The research results will range from short, policy briefs to longer, analytic papers, monographs and multi-authored volumes. The Institute will undertake an extensive outreach effort to disseminate the analyses and the results of the research to key U.S. policymakers and the international policy community, to business executives, and to interested public and academic observers.

This activity provides an important academic complement to the studies which Sloan is supporting at the industry level. In the case of AEI, the focus is more at policy-oriented macroeconomic issues which provide the context in which industries and firms operate. Both perspectives are important to understanding competitiveness and U.S. performance. (Project Director: Claude Barfield, Director, Science and Technology Policy Studies; Grant period: April 2, 1991–March 31, 1993.)

Institute for International Economics **$162,000**
Washington, D.C. 20036

The Institute for International Economics will conduct research under this grant that will provide a detailed quantitative assessment of U.S. policies that deliberately seek to limit U.S. sales abroad. Such policies are motivated by security or foreign policy reasons (e.g. COCOM export controls and sanctions against South Africa and Iraq) and by domestic policy objectives that may impair U.S export competitiveness

(e.g. health, safety, and environmental regulations). This task will build on the work of the National Academy of Sciences (1987) for export controls.

The proposed study will make two important contributions to the current debate on U.S. international economic competitiveness. First, it will focus attention on a hitherto largely neglected but potentially very significant set of domestic impediments to U.S. exports. Second, it will provide the first reasonably comprehensive and comparable quantitative assessment of the potential magnitude of all domestic export disincentives.

The study aims to help clarify the policy discussion of self-inflicted export disincentives by first cataloging alleged disincentives and then by assessing quantitative estimates of these disincentives.

The results of the project will be published as a short book aimed at a non-technical audience of policymakers, the business, labor and financial communities, and scholars. (Project Director: J. David Richardson, Visiting Fellow, Institute for International Economics; Grant period: April 15, 1991–June 30, 1992.)

OFFICER GRANT

Massachusetts Institute of Technology **$25,000**
Cambridge, Massachusetts 02139

Support for a conference on "National vs. International Roles of the Research University." (Project Director: Eugene B. Skolnikoff, Professor of Political Science, MIT; Grant period: December 13, 1991–December 31, 1992.)

The Foundation will attempt to contribute to the major issues of our time, but in a way appropriate to its expertise and size. Usually this requires a special approach so that a meaningful contribution can be made to issues and problems that are widely recognized. The Foundation will pursue work in those areas where such an approach can be developed that will enhance understanding of complex issues. In 1991, two projects were funded in this program, one dealing with the public perception of nuclear power and the other with long-term clean-up of radioactive waste at federal reactor sites.

TRUSTEE GRANTS

Decision Science Research Institute, Inc. **$748,441**
Eugene, Oregon 97401

Experiences such as Shoreham and many other reactor programs show that public fear of nuclear power and its political translation into government regulation may be the most powerful restraint on nuclear energy in the U.S. Other countries have similar public and political responses. France and, perhaps Japan, may treat the matter differently.

To ask why nuclear energy evokes special fears may seem naive. However, surprisingly, the underlying reasons have not been thoroughly understood. There are hypotheses that range from atavistic human fears to phobias to individual rational assessment. The connection to nuclear weapons is often cited. Paul Slovic and his colleagues at Decision Research propose to conduct a series of integrated empirical studies to improve our understanding.

The work will involve representative sample psychometric surveys of the U.S. and France. It will inquire into perceptions of risks and benefits in terms of scales that Slovic has developed over the past fifteen years. It will test the connections people make to dependence on oil, the greenhouse problem, pollution and health effects of mining and burning coal, nuclear weapons proliferation, radioactive wastes, and other matters. It will also test theories that public reaction comes from deep-lying fearful images. It will test the degree to which public trust or lack of trust in government and management has affected attitudes toward nuclear energy. (Project Director: Paul Slovic, President; Grant period: July 1, 1991–October 31, 1994.)

Resources for the Future **$85,000**
Washington, D.C. 20036

The Department of Energy is planning a major cleanup of nuclear and other hazardous wastes at defense nuclear facilities that it estimates will cost around $150 billion. Are the benefits of this cleanup worth the costs? **Resources for the Future** proposes to tackle this question by taking a preliminary look at the potential applicability of benefit-cost analysis in this area. The purposes of the project are to scope the problem, to address some difficult conceptual issues in the evaluation of benefits and costs, and to assess the types of information and models needed to conduct the analysis.

Since the DOE environmental restoration program is in its infancy, there may be much to be gained from an efficiency point of view by making benefit-cost analysis a part of the program. This approach could help in determining the types of data to be collected and the types of descriptive and analytical models to be constructed. More importantly, the resulting information could help the decision-making process on when and how much cleanup activity should be conducted at a particular site. (Project Directors: Alan Kneese and Alan Krupnick, Senior Fellows – RFF; Grant period: October 8, 1991–December 31, 1992.)

OFFICER GRANTS

Massachusetts Institute of Technology **$12,000**
Cambridge, Massachusetts 02139

Support for a conference on global warming. (Project Director: John M. Deutch, Institute Professor; Grant period: December 9, 1991–December 31, 1992.)

University of Miami **$15,000**
Coral Gables, Florida 33124–5540

Support for planning committee of the 15th Annual International Forum on Energy. (Project Director: Behram N. Kursunoglu, Director, Center for Theoretical Studies; Grant period: January 1, 1991–December 31, 1991.)

SPECIAL PROJECTS

OFFICER GRANT

The Business Enterprise Trust **$30,000**
Stanford, California 94305

Partial support of The Business Enterprise Trust's program of awards to business leaders who have demonstrated a commitment to society as well as to the success of their businesses. (Project Director: James E. Burke, Chairman, The Business Enterprise Trust; Grant period: July 2, 1991–July 31, 1992.)

CIVIC PROJECTS

OFFICER GRANTS

Connecticut Public Broadcasting, Inc. **$30,000**
Hartford, Connecticut 06106–0240

Funding for a PBS documentary called Who Will Teach for America? (Project Director: R. Thatcher Drew, President, Drew/Fairchild, Inc.; Grant period: August 1, 1991–September 15, 1991.)

Research Foundation of the City University of New York **$30,000**
New York, New York 10003

To study the feasibility of eliminating highway toll plaza congestion. (Project Director: Mitsuru Saito, Assistant Professor, Institute for Transportation System, City University of New York; Grant period: June 1, 1991–January 31, 1992.)

ADDITIONAL GRANTS

OFFICER GRANTS

Council on Foundations, Inc. **$24,700**
Washington, D.C. 20036–5168

General support (Membership dues). (Project Director: James A. Joseph, President; Grant period: January 1, 1991–December 31, 1991.)

Independent Sector **$7,400**
Washington, D.C. 20036

General support (Membership dues). (Project Director: Jeanne Bohlen, Vice President, Membership and Development; Grant period: January 1, 1991–December 31, 1991.)

New York Regional Association of Grantmakers **$7,125**
New York, New York 10018

General support (Membership dues). (Project Director: Barbara Bryan, Executive Director; Grant period: January 1, 1991–December 31, 1991.)

1991 FINANCIAL REVIEW

FINANCIAL REVIEW

The financial statements and schedules of the Foundation, which have been audited by Ernst & Young, independent auditors, appear on pages 91 to 99 They include the balance sheet, statements of income, expenses and changes in fund balance and of changes in financial position, and schedules of management and investment expenses and of investments.

Investment and other income for 1991 was $35,124,586, a decrease of $4,251,499 from $39,376,085 in 1990. After the deduction of investment expenses and provision for Federal excise tax from investment and other income, net investment income was $32,232,276 in 1991 as compared with $36,251,064 for the prior year. Investment expenses during 1991 totaled $1,935,310 of which $1,409,269 represented investment counsel fees. Provision for Federal excise tax amounted to $857,000. The total of these deductions from income in 1991 was $2,792,310 versus $3,125,021 in 1990.

The total of grants and appropriations authorized, net of grant refunds, and management expenses during 1991 was $32,786,039. This sum was $453,763, greater than 1991 net investment income. Of this total, grants and appropriations authorized amounted to $30,205,367 while management expenses were $2,808,716. Since the Foundation's inception in 1934, the cumulative excess of grants and expenses over the Foundation's income has amounted to $13,075,270.

Grant and appropriation payments in 1991 were $28,626,395 compared with $21,190,975 the prior year. Together with management expenses, investment expenses, Federal excise taxes paid and other charges, the total of cash expenditures net of grant refunds in 1991 was $35,019,668 while in 1990 the amount was $26,903,566.

Grants and appropriations authorized and payments made during the year ended December 31, 1991 are summarized on the following table:

Grants and appropriations unpaid at December 31, 1990	**$27,557,602**
Authorized during 1991	30,205,367
	57,762,969
Payments during 1991	28,626,395
Grants and appropriations unpaid at December 31, 1991	**$29,136,574**

The market value of the Foundation's total assets was $727,641,989 at December 31, 1991 including investments valued at $726,524,177 as compared with total assets of $612,221,359 at December 31, 1990.

Report of Ernst & Young
Independent Auditors

Board of Trustees
Alfred P. Sloan Foundation

We have audited the accompanying balance sheet of the Alfred P. Sloan Foundation as of December 31, 1991 and 1990, and the related statements of income, expenses and changes in fund balance and changes in financial position for the years then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. 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 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 Alfred P. Sloan Foundation at December 31, 1991 and 1990, and the results of its operations and changes in its fund balance and financial position for the years then ended in conformity with generally accepted accounting principles.

Our audits were conducted for the purpose of forming an opinion on the basic financial statements taken as a whole. The accompanying other financial information of management and investment expenses for the years ended December 31, 1991 and 1990 and investments at December 31, 1991 is presented for purposes of additional

analysis and is not a required part of the basic financial statements. Such other financial information has been subjected to the auditing procedures applied in our audits of the basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

Ernst + Young

New York, New York
January 24, 1992

Assets	1991	1990
INVESTMENTS:		
Fixed income:		
Government and agency	$134,596,349	$113,700,974
Corporate and other	173,263,732	150,053,581
	307,860,081	263,754,555
Equity:		
General Motors Corporation	17,244,708	32,447,710
Other	283,294,403	248,647,457
	300,539,111	281,095,167
Other:	21,799,082	21,072,147
Total investments (market value: $726,524,177 in 1991 and $610,815,353 in 1990)	630,198,274	565,921,869
INTEREST PURCHASED	1,040,159	1,354,350
CASH	77,653	51,656
Total	$631,316,086	$567,327,875

Liabilities and Fund Balance

GRANTS AND APPROPRIATIONS UNPAID	$ 29,136,574	$ 27,557,602
OTHER	4,631,446	133,032
FUND BALANCE	597,548,066	539,637,241
Total	$631,316,086	$567,327,875

See accompanying notes to financial statements.

STATEMENT OF INCOME, EXPENSES AND CHANGES IN FUND BALANCE

For the years ended December 31, 1991 and 1990	1991	1990
INVESTMENT INCOME:		
Dividends	$ 12,118,898	$ 12,877,000
Interest	23,000,500	26,496,268
Other	5,188	2,817
	35,124,586	39,376,085
LESS:		
Investment expenses	1,935,310	1,734,621
Provision for Federal excise tax	857,000	1,390,400
	2,792,310	3,125,021
Net investment income	32,332,276	36,251,064
Grants and management expenses:		
Grants and appropriations authorized (net of grants refunds of $228,044 in 1991 and $137,299 in 1990)	29,977,323	27,961,854
Management expenses	2,808,716	2,702,241
Total	32,786,039	30,664,095
EXCESS OF INCOME OVER EXPENSES (EXPENSES OVER INCOME)	(453,763)	5,586,969
NET GAIN ON DISPOSALS OF SECURITIES	58,364,588	31,334,853
NET CHANGE IN FUND BALANCE FOR YEAR	57,910,825	36,921,822
FUND BALANCE AT BEGINNING OF YEAR	539,637,241	502,715,419
FUND BALANCE AT END OF YEAR	$597,548,066	$539,637,241

See accompanying notes to financial statements.

STATEMENT OF CHANGES IN FINANCIAL POSITION

For the years ended December 31, 1991 and 1990	1991	1990
SOURCE OF FUNDS:		
Investment income	$35,124,586	$39,376,085
Net gain on disposals of securities	58,364,588	31,334,853
Other	5,518,705	49,886
	99,007,879	70,760,824
APPLICATION OF FUNDS:		
Grant and appropriation payments (net of grant refunds of $228,044 in 1991 and $137,299 in 1990)	28,398,351	21,053,676
Management expenses	2,808,716	2,702,241
Investment expenses	1,935,310	1,734,621
Federal excise taxes and other	1,877,291	1,413,028
	35,019,668	26,903,566
INCREASE (DECREASE) IN FUNDS CONSISTING OF:		
Cost of investments	64,276,405	42,950,408
Interest purchased	(314,191)	957,244
Cash balances	25,997	(33,985)
Other		(16,409)
NET INCREASE	$63,988,211	$43,857,258

See accompanying notes to financial statements.

1. ORGANIZATION

The Alfred P. Sloan Foundation is a nonprofit charitable corporation existing under the laws of the State of Delaware and is classified as a private foundation as defined in the Internal Revenue Code. As such, the Foundation is exempt from Federal income taxes, but is subject to a Federal excise tax on net investment income.

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation

The accompanying financial statements have been prepared substantially on the accrual basis of accounting, and, accordingly, reflect all significant assets and liabilities. Investment income and investment and management expenses are recorded on the cash basis, the effect of which on the accompanying financial statements is not materially different from the accrual basis.

Accounting for Investments

Investments purchased are carried at cost. Investments received by gift or bequest are recorded at market value at date of such gift or bequest. Gains or losses on disposal of investments are determined generally on a first-in, first-out basis, but in certain instances the specific identification basis is used. Net gain or loss on disposals of securities is applied to the principal section of the fund balance.

Grants, Appropriations and Federal Excise Tax

Grants and appropriations are accrued at the time authorized by the Trustees and Federal excise tax is accrued in the year to which it relates.

3. RETIREMENT PLAN

The Foundation has a defined contribution retirement plan covering substantially all employees under arrangements with Teachers Insurance and Annuity Association of America and College Retirement Equities Fund which provide for the purchase of annuities for employees. Retirement plan expense was $191,397 and $187,841 for 1991 and 1990, respectively.

4. LEASE

The Foundation's lease for its office space expires December 31, 1998. The lease contains an escalation clause which provides for rental increases resulting from increases in real estate taxes and certain other operating expenses. Under the lease, rent expense amounted to $629,483 and $584,291 in 1991 and 1990, respectively. At December 31, 1991, base rent commitments aggregate approximately $2,828,000 and are payable at approximately $404,000 annually.

5. FUND BALANCE

Fund balance, at year end, is comprised of the following:	**1991**	**1990**
Principal	$610,623,336	$552,258,748
Income—cumulative excess of grants and expenses over income from inception of the Foundation	(13,075,270)	(12,621,507)
Fund balance	$597,548,066	$539,637,241

6. OTHER LIABILITIES

The Foundation uses financial futures in its investment strategy. As of December 31, 1991 the Foundation had outstanding S&P 500 Index and U.S. Treasury futures contracts totalling approximately $78,623,000 which represent the gross contract market values. This amount, however, may differ from the Foundation's future cash requirements as the Foundation may close out futures positions prior to settlement and thus be subject only to the change in value of the futures contracts. The Foundation is subject to the market risk associated with changes in value of the futures contracts. The net appreciation in the market value as of December 31, 1991 of the outstanding futures contracts, amounting to approximately $5.5 million, has been deferred and included in "other liabilities" until such time as the related contracts expire or are closed out.

SCHEDULE OF MANAGEMENT AND INVESTMENT EXPENSES

For the years ended December 31, 1991 and 1990	1991	1990
Management Expenses		
Salaries and employee benefits:		
Salaries	$1,414,162	$1,382,811
Employees' retirement plan and other benefits	439,507	414,660
Total	1,853,669	1,797,471
Rent	629,483	584,291
Program expenses	399,917	335,272
Office expenses and service	342,470	391,465
Reports and publications	51,590	23,671
Professional fees	57,628	64,968
Total management expenses	3,334,757	3,197,138
Less management expenses applicable to investments	526,041	494,897
Management expenses applicable to grant making	$2,808,716	$2,702,241
Investment Expenses		
Investment counsel fees	$1,409,269	$1,239,724
Management expenses applicable to investments	526,041	494,897
Total investment expenses	$1,935,310	$1,734,621

SCHEDULE OF INVESTMENTS

As of December 31, 1991	Market		
	Cost	Amount	Percent of Total Investments
FIXED INCOME			
Government and Agency	$134,596,349	$146,083,201	20.1%
Corporate and other	173,263,732	181,566,388	25.0%
Total fixed income	307,860,081	327,649,589	45.1%
Equity			
General Motors Corporation	17,244,708	18,480,000	2.5%
Other	283,294,403	358,170,368	49.3%
Total Equity	300,539,111	376,650,368	51.8%
Other	21,799,082	22,224,220	3.1%
Total Investments	$630,198,274	$726,524,177	100.0%

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1992 ANNUAL REPORT

ALFRED P. SLOAN FOUNDATION

Alfred P. Sloan, Jr.
1875–1966

LIFE OF ALFRED P. SLOAN, JR.

Alfred Pritchard Sloan, Jr., was born in New Haven, Connecticut, May 23, 1875, the first of five children of Alfred Pritchard Sloan, Sr., and Katherine Mead Sloan. His father, a machinist by training, was then a partner in a small company importing coffee and tea. In 1885 the family moved to Brooklyn, where it was particularly active in the Methodist Church. (Young Alfred's maternal grandfather was a Methodist minister.) Alfred, Jr., excelled as a student both in the public schools and at Brooklyn Polytechnic Institute where he completed the college–preparatory course. After some delay in being admitted to the Massachusetts Institute of Technology (which considered him too young when he first applied), he matriculated in 1892 and took a degree in electrical engineering in three years as the youngest member of his graduating class.

Mr. Sloan began his working career as a draftsman in a small machine shop, the Hyatt Roller Bearing Company of Newark, New Jersey. At his urging, Hyatt was soon producing new antifriction bearings for automobiles. In 1898 he married Irene Jackson of Roxbury, Massachusetts. The next year, at age 24, he became the president of Hyatt, where he supervised all aspects of the company's business. Hyatt bearings became a standard in the automobile industry, and the company grew rapidly under his leadership. In 1916 the Hyatt Roller Bearing Company, together with a number of other manufacturers of automobile accessories, merged with the United Motors Corporation, of which Mr. Sloan became President. Two years later that company became part of the General Motors Corporation (itself established in 1908 as the General Motors Company), and Mr. Sloan was named Vice President in Charge of Accessories and a member of the Executive Committee.

He was elected President of General Motors in 1923, succeeding Pierre S. du Pont, who said of him on that occasion: "The greater part of the successful development of the Corporation's operations and the building of a strong manufacturing and sales organization is due to Mr. Sloan. His election to the presidency is a natural and well–merited recognition of his untiring and able efforts and successful achievement." Mr. Sloan had developed by then his system of disciplined, professional management that provided for decentralized operations with coordinated centralized policy control. Applying it to General Motors, he set the Corporation on its

course of industrial leadership. The next 23 years, with Mr. Sloan as Chief Executive Officer, were years of enormous expansion for the Corporation and of a steady increase in its share of the automobile market.

In 1937 Mr. Sloan was elected Chairman of the Board of General Motors. He continued as Chief Executive Officer until 1946. When he resigned from the chairmanship in 1956, the General Motors Board said of him: "The Board of Directors has acceded to Mr. Sloan's wish to retire as Chairman. He has served the Corporation long and magnificently. His analysis and grasp of the problems of corporate management, his great vision and rare good judgement, laid the solid foundation which has made possible the growth and progress of General Motors over the years." Mr. Sloan was then named Honorary Chairman of the Board, a title he retained until his death on February 17, 1966. For many years he had devoted the largest share of his time and energy to philanthropic activities, both as a private donor to many causes and organizations and through the Alfred P. Sloan Foundation, which he established in 1934.

Mr. Sloan, as a realist as well as a humanist and philanthropist, looked upon the Foundation as an extension of his own life and work. Although he recognized the inevitability of change that might dictate a different course, he expected that the Foundation would "continue as an operating facility indefinitely into the future...to represent my accomplishments in this life." His accomplishments during his lifetime were of the highest order, and in themselves provide the most dramatic and lasting tribute to his extraordinary talent. Through the Foundation, his accomplishments have been extended and expanded.

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COMMITTEES OF THE BOARD OF TRUSTEES

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Howard W. Johnson, Chairman

Stephen L. Brown
Ralph E. Gomory
Frank Press
Harold T. Shapiro

Investment Committee

Stephen L. Brown, Chairman

S. Parker Gilbert
Ralph E. Gomory
Howard W. Johnson
Harold T. Shapiro

Audit Committee

Lewis T. Preston, Chairman

Stephen L. Brown
Cathleen S. Morawetz

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Stewart F. Campbell
Financial Vice President and Secretary

Arthur L. Singer, Jr.
Vice President

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Program Officer

Maureen Gassman
Assistant Secretary

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Controller

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Program Officer

Harry Weiner
Program Consultant

1992 GENERAL INFORMATION

INTRODUCTION

"In managerial technique I emphasize the necessity of the scientific approach; this affects men, tools and methods. Many associate the word scientific with physics. But it means a constant search for the facts —the true actualities— and their intelligent, unprejudiced analysis. Spend any proper amount of money to get the facts. Only by increased knowledge can we progress, perhaps I had better say survive."

—Alfred P. Sloan, Jr.

The Alfred P. Sloan Foundation, a philanthropic non-profit institution, was established by Alfred P. Sloan, Jr. in 1934. During the past year, the Sloan Foundation has made grants of $34 million. The total assets at the end of 1992 were $776 million.

PROGRAMS AND INTERESTS

The main interests and programs of the Foundation are concentrated primarily in four areas:

- Science and Technology
- Economic Growth, Industrial Competitiveness, and Standard of Living
- Education in Science, Technology, and Management
- Selected National Issues

This section provides a brief description of the Foundation's evolving program in each of these areas.

FELLOWSHIPS

Sloan Research and Dissertation Fellowships are a significant part of this program ($3,876,000 in 1992). The ***Sloan Research Fellowships*** are given in chemistry, physics, mathematics, the neurosciences and economics. These are competitive grants, given to young faculty members with high research potential on the recommendation of department chairmen and other senior scientists. In 1993, eight fellowships in computer science will be added to the program. Information on these fellowships, and the ***Sloan Dissertation Fellowships*** in mathematics and economics, may be obtained by separate inquiry to the Foundation.

DIRECT SUPPORT OF RESEARCH

Major government agencies such as NSF and NIH dominate the direct support of research, operating on a scale far beyond that of a private foundation. To be useful here, the Sloan Foundation seeks areas that are or have the potential to become significant, but have not received sufficient attention. They may be newly emerging topics or subjects that do not fit into a disciplinary or program orientation of one or another of the government science agencies.

One current area for such support is ***Molecular Evolution.*** Over the past six years this program has included postdoctoral awards, sabbatical awards, short courses, and workshops and symposia. During this period, the integration of molecular and evolutionary perspectives and techniques have progressed and the field is widely perceived to have become an exciting area of science. With the goals of the program largely realized, the Foundation's support in 1992 moved into a new phase. The sabbatical program was ended, the postdoctoral program phased out, and emphasis shifted to support of newly independent scientists.

Another area for direct support of research is a major ***Sky Survey Project.*** In 1992, the Foundation approved an initial grant of $3 million, of a planned total of $8 million, for the Sloan Digital Sky Survey. The survey will cover almost all of the northern skies, and will produce three-dimensional position and spectrographic information for a million galaxies and one hundred thousand quasars.

Several other areas of science are being considered as candidates for funding programs.

INDIRECT SUPPORT OF RESEARCH

Indirect support and understanding of the research process is another continuing area of the Foundation's interest. One example is a grant made in 1990 for four years of support to the American Association for the Advancement of Science for a new Executive Branch Program to bring industrial expertise to the ***White House Office of Science and Technology Policy.*** In 1992 the Foundation made another grant in support of a Technology Fellows Program operated by the Institute of Electrical and Electronic Engineers (IEEE), to provide engineers with extensive industrial experience to the ***Technology Administration of the Department of Commerce.***

The Foundation is also interested in learning more about the working of the university science and engineering system. Support in this area was initiated in 1992 with a grant to William F. Massey at Stanford University to work on a university-based model of the ***production of Ph.D.'s in scientific and engineering fields.*** The Foundation is considering other efforts in this area.

During 1992, the Foundation began a program of selective grants aimed at helping to preserve those ***sectors of science in the former Soviet Union*** that represented leading components of the worldwide scientific enterprise. The focus is on three such fields: physics, mathematics, and astronomy. The Foundation's support has been given to American scientific societies in these fields, all of which have initiated direct efforts to preserve the quality core of their cognate fields in Russia and other former Soviet republics.

The Foundation also continues to fund, through officers' grants, special purpose conferences and workshops in mathematics, physics and other fields.

HISTORY OF SCIENCE AND TECHNOLOGY

Another aspect of the Foundation's science program is the support of the History of Science and Technology. During 1992 several Foundation-supported projects culmi-

nated in ***book publications:*** biographies of John von Neumann by Norman Macrae, Leo Szilard by William Lanouette, and Jerrold Zacharias by Jack Goldstein. These books are products of the Foundation's program of biographies and autobiographies of many of the twentieth century's leading scientists.

Also during 1992, funding was provided to create a ***new American history textbook.*** The purpose is to write a text which will give proper emphasis to the role that science and technology have played throughout the history of the United States. A task force headed by Roe Smith of MIT is now engaged in this three year undertaking.

Work also continued during the year on the Foundation's ***three long term efforts.*** These are the editing of the papers of Albert Einstein, of Thomas Edison, and the correspondence of Charles Darwin.

ECONOMIC GROWTH, INDUSTRIAL COMPETITIVENESS, AND STANDARD OF LIVING

The goal of this program is to contribute to the understanding of the basic forces that will maintain and enhance a high American standard of living in an increasingly competitive world economy.

ECONOMICS

The economics program is focused on the contributions which economic analysis can make to understanding competitiveness. For example, with economic growth and a rising standard of living dependent on ***productivity*** increases, the Foundation is supporting research to improve the complex techniques involved in accurately assessing productivity change. As part of this effort, a Sloan grant supported the work of William Baumol and Edward Wolff which resulted in their benchmark analysis, Productivity and American Leadership: the Long View. This book examined major parts of the long-term historical record of growth and development in America and other countries. As a sequel, two additional volumes were completed in 1992: William Baumol's Entrepreneurship, Management, and the Structure of Payoffs and Competitiveness, Convergence, and International Specialization by Edward Wolff and David Dollar.

Two other economic studies supported by the Foundation were completed in 1992. Sizing Up U.S. Export Disincentives by J. David Richardson provides a detailed quantitative assessment of U.S. policies that deliberately seek to limit U.S. sales abroad for security or foreign policy reasons, or for other reasons that serve important domestic policy objectives but may inadvertently impair U.S. export competitiveness, such as health, safety, and environmental regulations. The second study, Reciprocity and Retaliation: Does Tough U.S. Trade Policy Work? by Thomas Bayard, explores the efficacy of United States threats of retaliation to liberalize foreign barriers to U.S. goods.

During 1992 the Foundation initiated support in the area of ***human resource management*** to gain a better understanding of human resource practices involving employee participation and the link to profitability and productivity. Three grants were made in 1992: (1) a study at Carnegie Mellon University which will utilize data gathered in two

earlier surveys of small and medium sized metal-working firms to investigate the relationship between human resource innovations and a firm's economic performance; (2) a parallel effort at the University of Southern California using data from two other surveys covering about 1,000 large firms in both the manufacturing and service sectors; and (3) supplementary support for the industry center study on semiconductors at the University of California at Berkeley to expand and deepen the human resource dimension of its research.

The Foundation is considering other projects in this area which will help to build a community of scholars in the human resource field.

Research in corporate economic history is another interest of the Foundation. In the past, Sloan grants have supported several scholars' work in this area, including Alfred Chandler's research, which led to his Pulitzer Prize-winning book The Visible Hand. During 1992, the Foundation began exploring a new area focused on the ***role of the corporation*** in America.

As part of this effort, grants were made to the Business Enterprise Trust to support its program of research and awards to illuminate exemplary corporate behavior and to Boston University to support research by James Post in business policy.

In 1993 the Foundation will be considering projects on such topics as: (1) different forms of capitalism which are evolving in other countries, and (2) the fundamental question: to whom and for what is the corporation responsible? Is the corporation responsible to shareholders alone? To employees? To customers? To the country?

INDUSTRY STUDIES

In 1990, the Sloan Foundation launched a major program to establish interdisciplinary centers at leading research universities to study U.S. industries. The goal is to support the evolution of an academic community that can provide realistic research and education on American industry. This includes: (1) deepening the expertise among faculty members on the central issues of a particular industry; (2) initiating a new realm of studies for graduate students; and, (3) over time, providing useful observations and insights to American companies.

In this program, the ***MIT Center for the Study of the Automobile Industry*** is expanding the initial assembly plant survey developed in the International Motor Vehicle Program in the 1980's. In addition to this work, the Center is working on a detailed comparison of product development methods and their relationship to the success or failure of the products. Other important studies include an intensive examination and measurement of supplier relations, the development of materials design and costing procedures, and examination of the impact environmental requirements will have on automobile material content and design.

The automobile studies have resulted in more than a dozen graduate students working in this area as well as new course material on product development, human resource management, supplier management, and materials design. The Machine That Changed the World, which was the product of initial study, has been adopted as a course reading requirement in dozens of engineering and business schools.

At the ***Center for the Study of the Semiconductor Industry at the University of California at Berkeley,*** a study of 25 plants is underway which examines a set of technical and business performance measurements and practices, including differences in productivity, production methods and quality as well as in work organization and personnel management practices. This work has served to bring together faculty and graduate students across several disciplines into a useful working group. The effort has also stimulated several doctoral studies. In addition, new courses on accounting for manufacturing, data collection and analysis for line control and others have been introduced.

The study of the ***carbon steel mill industry*** by faculty and graduate students at ***Carnegie Mellon University*** and the ***University of Pittsburgh*** is also underway. Thirty steel mills have been visited to gain data for an econometric measure of human resource management. At the same time, a more detailed set of case studies of human resource practices for entire steel processing lines is being gathered. These human

resource studies are being conducted in parallel with a technology study in which modern technology is measured in terms of product quality and production efficiency.

Other industry study centers include ***information processing at Stanford University, pharmaceuticals at MIT, specialty chemicals and engineering plastics*** in a ***joint Harvard-MIT*** project, and ***textiles and apparel at Harvard University.*** Work at these centers is progressing similarly. The newest of the industry studies is the ***Financial Services Center at Wharton*** where work has just begun on two major issues: productivity and its relation to technology and risk adjusted performance measures. In addition, the ***Center for Industrial Performance at MIT*** will draw on the results from all the industry studies while undertaking its own full program of comparative research on productivity and industrial performance in the U.S. and six other countries.

EDUCATION AND TRAINING FOR MANUFACTURING

The Foundation's program in this area involves training from high school apprenticeships to Ph.D.s in manufacturing.

At the graduate level, in the entering class of the ***Stanford Ph.D. program,*** individuals with industrial or business experience are now working towards careers as manufacturing professors. In the spring of 1992, new courses developed as part of the program were presented which stimulated interest in these topics in both business and industrial engineering students.

A new ***master's level program*** at Cornell was added in 1992 to those already funded at MIT, Northwestern, and New York Polytechnic. The Cornell program will involve the engineering and business schools and will also have a full human resource component from the Industrial Labor Relations school.

At the ***community college level,*** the Foundation made a grant to Regional Technology Systems to support The Consortium for Manufacturing Competitiveness which consists of fourteen community colleges, one in each of fourteen southeastern states. The major functions that will be supported are specialized training in new technology,

production methods, and management in addition to direct technology demonstration and transfer, all for small manufacturing companies.

The possibility of forming ***apprenticeships*** in American high schools, modeled after the European apprenticeship system, is another area the Foundation is exploring. The Pennsylvania Youth Apprenticeship Program (PYAP), for which the Foundation is the lead sponsor, has completed two years of an effort to find out how apprenticeships can fit into the U.S. educational system. Twelve students have finished a first year, their junior year in high school, working at six metalworking factories for half of the school week and taking full credit in specially prepared academic subjects for the other half. They will go on to their senior year. The program is now expanding and in the fall of 1993, one hundred new juniors will start working at eighty companies.

The Foundation is also considering a possible role in supporting projects aimed at ***the training of people who are already at work*** in combination with current grants in the program which are focused only on individuals entering the workforce.

COMPETITIVENESS STUDIES

The ***Consortium on Competitiveness and Cooperation*** has completed the work of its initial three year grant. This combined effort of faculty and students from Stanford University, the University of California at Berkeley, Columbia University, Harvard University and MIT has developed into a national central core for efforts in the management and use of technology in companies and across industries. The academics involved have achieved a more realistic perspective for their work from direct contact with a large number of industrial corporations. They have developed a more coherent view of the connections between the strategic handling of technology by firms and the micro- and macro-economic environments which surround firms and industries. The consortium has served to provide an enhanced focus on competitiveness issues for the faculty members involved, its graduate students, and the business and engineering schools at its universities.

The products of the Consortium's effort include nine books, over 100 papers and arti-

cles, a new journal, numerous workshops and conferences, and new Ph.D's. The Foundation provided additional support for this project in 1992.

Other topics of interest in this area cover a broad field including (1) ***the impact of U.S. liability laws on economic performance,*** and (2) ***the U.S. private investment system,*** the relationship of major investors such as pension and mutual investors to the long-term, patient fostering of company positions.

The Foundation is also providing funds for selected programs in ***manufacturing technology*** itself. A small project at Cornell University is aimed at forming a sound theoretical framework for tolerancing, without which computer driven mechanical part-making will flounder. In a study at the University of Wisconsin, extensions of experimental design methodology for manufactured products are being derived mathematically in closer proximity to their actual design use in companies.

In other efforts, a Sloan grant will support a study at Carnegie Mellon of the effectiveness of ***Japanese transplant production methods and human resource management*** as compared with American counterpart companies. The Foundation is also supporting a National Academy of Engineering program on ***small manufacturing company*** absorption and use of technology in products and processes. In addition, the Foundation is continuing to provide funds for the Board of Science, Technology, and Economic Policy of the National Research Council to pursue its work in examining the relationship between ***economic and technical policy matters.***

EDUCATION IN SCIENCE, TECHNOLOGY, AND MANAGEMENT

Current programs build upon this area of long-standing interest to the Sloan Foundation. Strengthening education and interest in scientific and engineering fields has many dimensions. Enhancing ***scientific and technical literacy*** among college students not majoring in science and engineering is one aspect. Another key area is ***career choice:*** how and why people choose (or do not choose) to enter fields in science and technology. Among those who pursue these fields, the question of ***retention*** becomes critical. There is also the need to address the ***interests of highly motivated students,*** both through active involvement with technical facilities as well as through opportunities for ***independent learning outside the classroom*** using computer technologies. Other important issues involve examining the role of ***immigration*** as a significant source of talent, and supporting efforts to ameliorate the ***underrepresentation of women and minorities in science and engineering.*** Related to and influencing all of this is the ***public perception and understanding of science and technology.***

SCIENTIFIC AND TECHNICAL LITERACY

The Sloan program in the ***New Liberal Arts (NLA),*** whose funding was concluded in 1990, was an effort to inject an appreciation of technology into the curriculum of non-technologists. A comprehensive appraisal of the program, its materials, and impacts is now underway to provide perspective on other possibilities for enhancing technical literacy.

CAREER CHOICE

The objective in this area is to understand how American students develop interest in science and engineering and then proceed toward careers in those fields. A pilot study conducted by the University of Chicago with Sloan funds has yielded important observations and information on how career and work ideas develop for all students. As a sequel to this effort, the Foundation is providing support for a five-year longitudinal study of ten junior and senior high school systems across the U.S. that encompass economic, social, and ethnic diversity.

RETENTION

The Foundation is supporting research to deepen understanding of the factors influencing the supply of graduates trained in science and technology. One aspect of

supply is the retention of science and engineering undergraduates in those fields. The first Sloan funded study of retention—those who switch out of science and engineering studies and those who remain—at four Colorado colleges and universities has continued to attract wide attention. The early hypotheses generated in that work, that "weeding out" was harshly removing students of high caliber, that engineering and science faculty alienated students by their approach to teaching, have resulted in a great deal of discussion. The work has stimulated a study at Berkeley which confirms the Colorado findings that there were not significant differences in scores and grades between those who switched and those who stayed. The Foundation has funded a second phase grant to the researchers, Elaine Seymour and Nancy Hewitt, to test their first results and methods at three large universities in other parts of the country.

The same kind of retention issues have been studied with a Sloan grant in a project conducted by Dartmouth on its own students and those at Yale, Brown, and Cornell. The initial findings again show that students who stay in science and engineering and those who leave for other majors felt that science is not taught as well as the social sciences and humanities. For these eastern schools, the main reason for leaving was a positive attraction to another field. Those who switched did report that they found science hard and, in fact, their high school records showed, contrary to the Colorado and Berkeley results, that they were less well prepared. This study finds that women who did stay in science and engineering felt less secure about their studies, were more depressed about their academic progress and, in general, seemed to have less self-esteem than men in the same classes even though their grades were as good as the men's grades.

In addition to these efforts, the Foundation is also supporting a study at Purdue that seeks to understand what succeeds in motivating undergraduates in American engineering schools to go on for graduate work, especially U.S. born students. Data received from 215 engineering departments are currently being analyzed.

HIGHLY MOTIVATED STUDENTS

The Foundation is encouraging the development of ***active peer group*** societies of high school students interested in science and engineering. The principal goals are to support and to assist secondary school students with such interests, while counteracting the powerful peer pressures that operate against pursuing activities in science and technology.

During 1992, the Foundation supported a second experiment by a science and technology museum — the Carnegie Science Center in Pittsburgh — to establish such a student organization. The first effort which was supported at the Franklin Institute, known as "The Student Academy of the Franklin Institute Science Museum", has a program now underway. Two Student Academy meetings are held each month, one a general meeting, the other organized by interest in four different areas: the environment, bioscience, astronomy, and computers. Current efforts are being devoted to building memberships of the Student Academy and to developing a computer bulletin board for members.

Another approach which the Foundation is pursuing is to work with special secondary schools, where the objective is to educate high performing students at an advanced level. The Foundation is funding a prize of $2500, given by The National Consortium of Specialized Schools of Mathematics, Science, and Technology, to the twenty outstanding graduating high school seniors from among the 35 schools in the consortium. The first set of prizes was awarded in June 1992. The aim of this effort is both to recognize academic achievement and to help the schools raise money for long term support of the awards from local industries.

LEARNING OUTSIDE THE CLASSROOM

The Foundation is supporting innovative approaches to provide education outside the school system, for those who are motivated to seek it, in science, math, engineering, and related areas required in the world of work. These approaches are based on the use of computers, coupled with modern telecommunications networks, which can qualitatively and quantitatively advance this type of education.

The quality of learning is likely to improve, for example, through interactivity and visualization made possible by computers. Quantitatively, learning can extend to a large

number of people who cannot attend formal classes for practical reasons owing to conflicts with professional or personal obligations. In addition, productivity gains may be possible if the use of networked computers allows students to progress at their own natural pace, rather than at the average pace of a group.

During 1992, as a first step toward understanding how learners might take advantage of computer networks, the Foundation commissioned a survey of educational services presently available at home via computer modem and phone lines. This study indicated that the number of services is large, but an unsophisticated user faces many problems: an uncongenial and inconsistent variety of protocols and interface conventions excludes all but the most determined novices; conferences and discussion groups often suffer from a low substance-to-noise ratio; the many large data bases are of value only to the skilled researcher with a clear purpose; the variety of online courses in technical subjects is limited; and courses typically consist of a numbing sequence of text lectures. These difficulties suggest that this may be an area where the Foundation might be able to serve a useful role.

Two Sloan grants have also been made for experimental curriculum development for learning at a distance. One grant to Patrick Suppes of Stanford supports an experiment in computer-assisted, networked home instruction in mathematics for community college students. The other grant to the New School for Social Research supports the development of a core undergraduate curriculum in science and mathematics to be delivered entirely by telecommunications.

The Foundation plans to consider additional efforts in distance learning, such as the use of computer networks that permit both on-campus and off-campus students to seek the assistance of tutors or peers to help with homework or with special projects.

IMMIGRATION

A significant source of technical talent in the United States is immigration. Individuals enter the U.S. to study or work in fields of science and engineering. They include permanent residents who are not U.S. citizens, international scholars, visitors, or professional trainees who come to the U.S. for a temporary stay, and foreign students. The volume of such immigration is very substantial, but to date the nature and impacts have not been extensively studied.

During 1992, the Foundation launched a new program to support research in this area. The focus is on the impact on the U.S. economy and workforce of the immigration of scientists and engineers to the United States. Proposals will be funded in three areas: (1) assessments of the contributions of foreign-born scientists and engineers vs. concerns about U.S. dependency on these professionals for economically-strategic skills; (2) the growing demand from U.S. educational institutions for foreign-born faculty and teaching assistants in some fields of science and technology vs. concerns about the impacts of such concentrations upon career choice among U.S. nationals; and (3) the role of foreign-born scientists and engineers in providing needed skills not otherwise available in the U.S. workforce vs. concerns that U.S. born scientists and engineers are facing increasingly discouraging employment and funding prospects.

MINORITIES AND WOMEN IN SCIENCE AND ENGINEERING

The Foundation is supporting efforts to ameliorate the underrepresentation of minorities and women in science and engineering. Three types of grants characterize this program: ***inspirational measures, research on the nature of the problem, and measures of direct intervention.***

One example of the ***inspirational approach*** addressing the area of women in science is a major grant to WGBH in Boston to produce a series of six one-hour television documentaries, each one featuring a different woman scientist. In addition, Ruth Cowan of the State University of New York at Stony Brook has received a grant to write a book of oral histories of women engineers. The products of these grants are intended to inspire girls and young women to consider pursuing careers in science or engineering.

Research grants in the program include many issues related to the work of Hewitt and Seymour at the University of Colorado discussed above in the section on Retention. Other earlier grants include a two-year study of factors that influence women to pursue undergraduate studies and careers in science which is being conducted by the Center for Research on Women at Wellesley College. The Families and Work Institute

is examining the experience of women scientists and engineers in industry with Sloan support. And a grant to Professor Anne Preston at the State University of New York at Stony Brook is funding a study on the departure of women from science and engineering occupations. Her preliminary findings indicate that the factors causing women to exit from science and engineering careers are, in order of priority, family considerations, absence of mentoring relationships, a mismatch between personal interests and the realities of a science or engineering career, and the perception that a different standard is applied to women.

Intervention grants for minorities in mathematics, science, engineering and management careers reflect several different approaches. Five special high schools of mathematics and science in California, Illinois, Mississippi, North Carolina, and Virginia received grants in 1990 and 1991. Four of these are engaged in creating a feeder network of highly talented and motivated minority students to increase the enrollment of such students in their school. One is focused on improving the quality of science and mathematics education in selected schools with a high percentage of minority students.

Another aspect of the intervention program is an effort to ***increase minority enrollments*** and retention rates at three engineering schools, City College of CUNY, Georgia Tech, and Stanford, and two management schools, Northwestern and UCLA. The impact of these grants, made in 1990, is indicating that the intervention program is making a difference.

At City College, for example, performance is better for students participating in the "laboratory" mode calculus classes supported by the Sloan grant than for students enrolled in conventional classes. The difference in performance has been so striking that City College is considering employing the laboratory mode universally for its introductory calculus class.

The Foundation has also provided support to Arizona State in 1990 for Project 1000, an effort to increase the number of Hispanic students in mathematics, science and engineering around the country. The degree of success is evident in the following numbers of Hispanic students applying and admitted to graduate school through

Project 1000: prior to the Sloan grant, 16 applied and were admitted; in 1991, 54 applied and 40 were admitted; in 1992, 83 applied and 75 are estimated to have been admitted. In addition, Professor Gary Keller of Arizona State, the founder and director of Project 1000, was given a Charles A. Dana Award for Pioneering Achievement in Health and Education in October 1992.

During 1992, a $600,000 grant was made to the Committee on Institutional Cooperation, a consortium of midwestern universities and historically black colleges, to increase the number of minority science and engineering students at the post-secondary level.

Intervention efforts focused on women currently consist of a grant made in 1990 to the Association for Women in Science (AWIS) for mentoring programs at colleges and universities across the country and grants made in 1991 to three engineering schools, Cornell, Purdue, and the University of Washington, to increase their recruitment and retention of women. The AWIS Mentoring Project has involved approximately 2000 graduate and undergraduate students at 160 institutions through the activities of 33 local chapters. It is also preparing two publications on the subject of mentoring. Intervention measures at the engineering schools are currently being implemented.

In 1993, the Foundation plans to strengthen the research and inspirational components of the program. The research approach will include selected conferences to review current knowledge about recruitment and retention of women and minorities in science and engineering as a guide for future endeavors.

Inspirational measures will be augmented with the presentation of a television series on Women in Science and another being considered on minority scientists and engineers which are part of the Foundation's program "Public Understanding of Science and Technology" (see below).

PUBLIC UNDERSTANDING OF SCIENCE AND TECHNOLOGY

The four part television series on ***industrial competitiveness,*** Made in America?, produced with a major grant from the Foundation, was broadcast in 1992. Each hour

focused on a single manufacturing industry and provided viewers with an unprecedented opportunity to see inside factories and to gain some feel for production processes. The series was well received with favorable reviews and a large audience.

Two new major television documentary series were funded in 1992 which will be broadcast in late 1993 and early 1994. One is a six-part series on ***women in science.*** Each hour will focus on the life of an individual woman scientist—her work, her circumstances, her mentors, her colleagues, and her assessment of the rewards and costs of a successful scientific career. One goal is to provide girls and young women with clear evidence that, despite the difficulties, careers in science have been successfully pursued by many women, leading to important scientific advances and rewarding lives. As a sequel to this project, a series on ***minority scientists and engineers*** is now being planned.

The second series funded in 1992, Challenge to America produced by Hedrick Smith, will be a four-hour series on the economic, political, cultural, and social characteristics of Germany, Japan, and the United States and their impact on ***competitiveness in the global economy.***

During 1992, the commissioning of the ***Technology Book Series*** was nearly completed with 23 books now in preparation. The series will tell the stories of some of the major technologies of the twentieth century in an effort to broaden understanding of the great technical events of our time and their role in our society. It will focus on the development of specific technologies, in a broad range of fields, narrated by eminent professional writers.

The Foundation is also supporting a new ***technology reporting effort by National Public Radio*** (NPR). The NPR effort has produced reports for the national news programs Morning Edition and All Things Considered. Examples include an extended story on manufacturing, with special reference to the pivotal and highly-competitive computer-controlled machine tool industry, and a piece on Sematech, the government-industry partnership aimed at improving the machines used in the semiconductor industry.

The Foundation will attempt to contribute to other major issues of our time in a way appropriate to its expertise and size. A special approach to the study and understanding of broadly recognized problems will be a requirement for Foundation support. Several efforts are currently underway in this area.

DRUG ABUSE

In 1990 the Foundation made a $1 million grant to the RAND Corporation for a three year study to ***analyze the variety of experiences with changes in the legal status of drugs*** in twentieth century industrial societies. The project is nearing completion. Several conferences have been held, considerable data have been collected, and books and papers are now available. "Would Legalization Open the Floodgates?" by Rob MacCoun is a major analytic piece which appeared in Psychological Review (1992). It examines the available evidence on the effects of removing criminal prohibitions and presents a framework for cross-national research. "Lessons From the Smoking Experience" by Tom Schelling was published in Science. European and American Drug Policies: Comparative Studies edited by Peter Reuter and Mathea Falco has been accepted by Cambridge University Press. And "What Harms Do Reduction Policies Reduce? The Case of Heroin" by MacCoun, Reuter, and Kahan is an analysis of the differences in the health, crime, and work indicators connected with heroin addiction in countries with different drug policies. This was the major paper for the 3rd International Harm Reduction Conference in Melbourne in March 1992.

The principal finding of the project to date is that there is little evidence that drug policy has had much impact on drug abuse. Rather, the study indicates that a key aspect of this issue is the extent and severity of crime related to addiction. Harm reduction approaches (eg. treatment, rehabilitation, government dispensing) in some countries have succeeded in greatly increasing the share of addicts in contact with social service systems. These addicts tend to be less criminally active.

ENERGY AND THE ENVIRONMENT

Also in 1990, the Foundation made a grant to the Woods Hole Oceanographic Institution for planning a project "Optimal Growth Strategies for Waste Management: The Ocean

Option". During 1992, most of the work on this project was completed. The effort involved gathering together some of the world's foremost ocean scientists to review both the potential risks and the potential advantages of ***deep ocean waste disposal.*** They identified the waste streams for which deep ocean disposal shows the greatest promise and the most likely pathways for environmental impacts. In addition, the project designed the basic features of an industrial-scale at-sea experiment for assessing deep ocean disposal options.

The results were presented to a group of environmentalists who were generally opposed to such a plan. However, the discussions resulted in some agreement that there was value in determining the scale of economic benefits. The final phase of the project involves completion of a detailed assessment of the economic aspects, and an analysis of regulatory issues.

Another project is underway with Sloan funding which examines the ***public perception of nuclear power***. The work involves psychometric surveys of the perceptions of risks and benefits associated with nuclear energy in the United States and France. Among a large set of other questions, the survey will examine trust, gender effects, knowledge, decision-making processes and world views as measures of beliefs, attitudes, and reactions.

A Sloan grant to Resources for the Future to carry out a feasibility study of ***cost/benefit analysis applied to the nuclear facilities clean-up*** program is nearing completion and a final report is expected in early 1993.

In addition to its four main areas of funding, the Foundation will continue its tradition of a *Civic* program for projects aimed at benefitting the New York area. Ongoing activities include support of the New York Hall of Science, and the Sloan Public Service Awards of the Fund for the City of New York. Two new efforts were launched in 1992: one to assist the New York Public Library in establishing a Science, Industry, and Business Library, and one aimed at understanding specialized manufacturing in New York City. The Foundation will also continue to be open to especially good proposals outside its primary fields.

HOW TO APPLY FOR A GRANT

Applications can be made at any time for support of activities related to the range of interests indicated above. Grants of $30,000 or less are made throughout the year by officers of the Foundation. Officer grants enable the Foundation to respond quickly to proposals for many activities, such as workshops, symposia, and conferences, that fall within its program areas and interests, but require only moderate funding (at most $30,000). Officer grants can also be helpful for the preliminary planning and exploratory stages of major projects.

Grants over $30,000 are made by the Trustees who meet four times a year for that purpose. Letters of application are normally sent to the president or an officer of the Foundation and include, in addition to details about the applicant and the proposed project, information on the cost and duration of the work. Officer grants may not include any overhead charge; for trustee grants, at most fifteen percent of direct project costs can be budgeted for overhead. In the case of new applicants, the proof of tax-exempt status of the organization that would administer the grant should be included unless it is a recognized institution of higher education.

The Foundation's activities do not generally extend to religion, the creative or performing arts, medical research or health care, or to the humanities. Grants are not made for endowments or for buildings or equipment, and are made only occasionally for general support or for activities outside the United States.

The Foundation has no deadlines or standard forms. Often a brief letter of inquiry, rather than a fully developed proposal, is an advisable first step for an applicant, conserving his or her time and allowing for a preliminary response regarding the possibility of support.

1992 GRANTS AND ACTIVITIES

SCIENCE AND TECHNOLOGY

Science and technology are major interests of the Foundation. Research and Doctoral Dissertation Fellowships account for expenditures of more than $3 million annually. In addition, trustee and officer grants for the direct support of research are part of this program. A major initiative in 1992 was a grant for the Sloan Digital Sky Survey, which will cover almost all of the northern skies, and will produce three-dimensional position and spectrographic information for a million galaxies and one hundred thousand quasars.

A particular emphasis in the direct support of research is concentration on a selected area where Sloan funding can have a substantive impact on enhancing the development of a significant field, or intersection of fields, which are newly emerging, but as yet are not able to generate sufficient research resources. The Sloan Foundation began this effort in the late sixties, and since that time, has supported focused programs in the neurosciences, in cognitive science, and over the past six years, in molecular studies of evolution. With the goals of the molecular evolution program largely realized, funding in 1993 will move into a new phase of research grants for young scientists just beginning their careers. A Sloan grant will also aid in the creation of a scientific society, the Society for Molecular Biology and Evolution. The Foundation is currently considering other areas of science as candidates for concentrated funding.

The program also includes trustee and officer grants for the indirect support of and understanding of the research process. Support in this area covers a broad range of topics, from programs of selective grants to aid science in the former Soviet Union to science and technology infrastructure and policy. Scholarly work in the history of science and technology is another interest which the Foundation pursues. In addition, a substantial number of officer grants support special scientific symposia, workshops, and conferences.

There is generally an emphasis in grants and awards on areas of research in science and technology which are significant but not yet adequately recognized or funded by other sources. The Foundation is open to proposals in new areas within the program.

1992 SLOAN RESEARCH FELLOWSHIPS

Sloan Research Fellowships **$2,700,000**

Initiated in 1955 and by far the oldest among active Foundation programs, the Sloan Research Fellowship Program aims to stimulate fundamental research by young scholars of outstanding promise at a time in their careers when their creative abilities are especially high and when federal or other support may be difficult to secure. Fellowships have gone to more that 2700 scientists at over 180 colleges and universities and have accounted for expenditures of over $60 million. Sloan Research Fellows continue to receive numerous prizes and awards in recognition of their major research accomplishments. Seventeen Fellows have received Nobel prizes and twelve have been awarded the prestigious Fields Medal in mathematics.

These yearly awards are now made in five fields: chemistry, economics, mathematics, neuroscience, and physics. In 1993, a sixth field—computer science—will be added. Each fellowship is administered by the Fellow's institution and is designed to allow the greatest possible freedom and flexibility in its use. A brochure entitled "Sloan Research Fellowships," available from the Foundation, describes the program in detail.

Candidates for Sloan Research Fellowships are nominated by department chairmen or other senior scientists familiar with their work. Within each discipline, a committee composed of three distinguished scientists reviews all nominations and recommends the final selections. When evaluating nomination forms and supporting documents, committee members are asked to identify those nominees who show the most outstanding promise of making fundamental contributions to new knowledge. During 1992, the Foundation awarded Research Fellowships of $30,000 each, over a two year term, to 90 scholars at 54 institutions. To arrive at the final selection, some 400 nominations were reviewed by the following committees:

Chemistry: Dr. Richard Bersohn, Columbia University; Dr. Samuel Danishefsky, Yale University; Dr. Harry B. Gray, California Institute of Technology.

Economics: Dr. Rudiger W. Dornbusch, Massachusetts Institute of Technology; Dr. Jose Scheinkman, The University of Chicago; Dr. Christopher A. Sims, Yale University.

Mathematics: Dr. Spencer J. Bloch, The University of Chicago; Dr. Richard B. Melrose, Massachusetts Institute of Technology; Dr. William P. Thurston, University of California, Berkeley.

Neuroscience: Dr. Lily Jan, University of California, San Francisco; Dr. Bruce S. McEwen, The Rockefeller University; Dr. Robert H. Wurtz, National Institutes of Health.

Physics: Dr. Roger Dashen, University of California, San Diego; Dr. Robert C. Dynes, University of California, San Diego; Dr. Saul Teukolsky, Cornell University.

FELLOWSHIP RECIPIENTS

Alabama, University of, Birmingham
Neuroscience: John Allen Jellies

Arizona, University of
Mathematics: Bruce J. Bayly

Auburn University
Chemistry: David M. Stanbury

Baylor University
Neuroscience: Mark S. Perin

Boston University
Neuroscience: Paolo Gaudiano

Brown University
Mathematics: Nicolaos Kapouleas

California Institute of Technology
Mathematics: Gian Michele Graf
Physics: Peter B. Weichman

California, University of, Berkeley
Mathematics: Nicolai Reshetikhin
Physics: James Graham
Paul L. McEuen

California, University of, Los Angeles
Mathematics: Thomas Mountford
Physics: Hong-Wen Jiang

California, University of, San Diego
Chemistry: Daniel F. Harvey
Jay S. Siegel
Neuroscience: Ethan Bier
Jerold J. M. Chun

California, University of, Santa Barbara
Chemistry: Alison Butler
Glenn H. Fredrickson
Alec M. Wodtke

Chicago, University of
Chemistry: Laurie J. Butler
Physics: Heinrich M. Jaeger
Rene A. Ong

Colorado, University of
Neuroscience: Edward M. Callaway

Columbia University
Chemistry: Brian E. Bent
Mathematics: Xiao-Song Lin

Cornell University
Physics: Andre LeClair

Dartmouth College
Physics: Joel D. Blum

Delaware, University of
Chemistry: Klaus H. Theopold

Duke University
Neuroscience: Anthony-Samuel LaMantia

Florida, University of
Physics: Christopher J. Stanton

Georgia, University of
Mathematics: Andrew James Granville

Harvard University
Neuroscience: Linda Buck
Physics: Christopher S. Kochanek

Houston, University of
Chemistry: David M. Hoffman
Neuroscience: Dale Allen

Illinois, University of, Urbana-Champaign
Chemistry: Eric N. Jacobsen
Steven C. Zimmerman

Institute for Advanced Study
Physics: Erik P. Verlinde

Iowa, University of
Neuroscience: Roberto Malinow
Physics: Lawrence A. Molnar

Louisiana State University
Neuroscience: Pamela J. Hornby

Maryland, University of
Chemistry: Rinaldo Poli
Mathematics: Manoussos G. Grillakis
Jain-Shu Li
Physics: Frederick C. Wellstood

Massachusetts Institute of Technology
Economics: Andrew W. Lo
Mathematics: Sheldon Chang
Physics: Leonid Levitov
Lisa J. Randall

Massachusetts, University of
Neuroscience: Vivian Budnik

McGill University
Neuroscience: Kathryn M. Murphy

Michigan State University
Chemistry: Kim R. Dunbar
Physics: Martin Berz

Michigan, University of
Chemistry: Paul Knochel
Economics: Robert B. Barsky
Mathematics: Juha M. Heinonen

Minnesota, University of
Chemistry: Scott D. Rychnovsky

Montreal, University of
Neuroscience: Marc Klein

Mount Sinai School of Medicine
Neuroscience: Nancy Levin

Northwestern University
Economics: Itzhak Gilboa
Physics: Lee Samuel Finn

Ohio State University
Chemistry: James A. Cowan
Mathematics: Randall Dougherty
Physics: Richard John Furnstahl

Oklahoma, University of
Mathematics: Igor Reider

Pennsylvania State University
Mathematics: Nigel David Higson

Pennsylvania, University of
Chemistry: David W. Christianson
Gregory A. Voth
Economics: Francis X. Diebold

Princeton University
Chemistry: Daniel E. Kahne
Economics: Alan B. Krueger
Mathematics: Zheng-Xu He
Physics: Raymond E. Goldstein

Rochester, University of
Chemistry: Joshua L. Goodman
Economics: James A. Kahn

Rutgers University
Chemistry: Alan S. Goldman

Simon Fraser University
Physics: John L. Bechhoefer

Southern California, University of
Mathematics: Alan Nadel

Stanford University
Physics: Roger William Romani

State University of New York, Stony Brook
Mathematics: Christopher Bishop
Neuroscience: Joseph R. Fetcho

Texas, University of, Austin
Chemistry: Mark Alan Berg
Physics: Mark G. Raizen

Tulane University
Mathematics: Lisa J. Fauci

Washington State University
Physics: Margaret M. Murnane

Washington, University of
Mathematics: Ethan S. Devinatz

Wesleyan University
Mathematics: Donna Marie Testerman

Wisconsin, University of
Economics: James Andreoni

Yale University
Economics: Lin Zhou

1992 DOCTORAL DISSERTATION FELLOWSHIPS

Doctoral Dissertation Fellowships **$1,225,000**

The Sloan Dissertation Program, established in 1984, is designed to assist doctoral candidates in two fields of traditional interest to the Foundation: economics and mathematics. Completing the doctoral research and writing a dissertation in these fields are tasks performed with difficulty alongside a candidate's teaching duties and other obligations. The Sloan awards allow Fellows to concentrate on finishing their doctoral work.

Fellowships have been received by 440 graduate students and have accounted for expenditures of over $8 million. In 1992, awards covering full tuition plus a stipend of $14,000 were made to 25 doctoral candidates in each field. Nominations were solicited from the chairmen of leading graduate departments of economics and mathematics. They were reviewed, and final selections made, by the following committees:

Economics: Dr. Peter A. Diamond, Massachusetts Institute of Technology; Dr. Edward E. Leamer, University of California, Los Angeles; Dr. Sherwin Rosen, University of Chicago.

Mathematics: Dr. Richard W. Beals, Yale University; Dr. William Fulton, University of Chicago; Dr. Allen Hatcher, Cornell University.

FELLOWSHIP RECIPIENTS

Brown University
Economics: Hyoungsoo Zang
Mathematics: Yan Guo

California Institute of Technology
Economics: Kay-yut Chen
Mathematics: Wensheng Wang
Jude Socrates

California, University of, Berkeley
Economics: Rachel Ellen Kranton
Joel J. Schrag

California, University of, Los Angeles
Mathematics: Eric Brussel

California, University of, San Diego
Economics: Farshid Vahid-Araghi
Mathematics: Zhenghan Wang

Chicago, University of
Economics: Matthew E. Kahn
Phillip Strahan
Mathematics: Stephen Fredrick Siegel

Columbia University
Economics: Arik Mark Levinson
Lalith Munasinghe
Mathematics: Theodore Stanford

Cornell University
Economics: Mark Yuying An
Mathematics: Brian C. Hall

Duke University
Economics: Alison Watts

Harvard University
Economics: Elliott Berman
Mathematics: Yael Karshon
Michael Finkelberg
Lucia Caporaso

Illinois, University of, Urbana-Champaign
Mathematics: Karin L. Johnsgard

Maryland, University of
Mathematics: Bernhard Leeb

Massachusetts Institute of Technology
Economics: Jonathan E. Jacobson
William Francis Miracky
Mathematics: Peter J. Schmid

Michigan, University of
Economics: J. Michael Orszag
Maria M. Cancian
Mathematics: Karen E. Smith

Minnesota, University of
Economics: Jae-Young Kim
Mathematics: Raymond Spencer

New York University
Mathematics: Thomas Kriecherbauer
Yoshihiro Tonegawa
Yury Grabovsky

Northwestern University
Economics: Jeffrey Robert Campbell
Joyce Lynn Burnette
Jonas D. M. Fisher

Princeton University
Economics: Masaki Aoyagi
Mathematics: Alex Eskin

Rutgers University
Mathematics: Jeong Han Kim

Stanford University
Economics: Andres Rodriguez
Suzanne J. Cooper
Mathematics: Martin Betz

Yale University
Economics: Yuichi Kitamura
Paul Anthony Cashin
Mathematics: Fusun Akman
William A. Cherry
John E. Fischer, Jr.

MOLECULAR EVOLUTION

Over the past six years, the Foundation has supported studies in molecular evolution to enhance research capabilities in this emerging field of science. Molecular approaches developed in the program have advanced understanding of evolutionary processes, while evolutionary insights have entered into the mainstream of molecular biology. For example, we now have knowledge about evolutionary mechanisms never contemplated by Darwin or Mendel at the molecular level of transposable elements (so-called "jumping genes"). Meanwhile, analysis of DNA information has transformed our understanding of the evolutionary history of primates and of thousands of species of birds. Finally, molecular biologists are increasingly using evolutionary knowledge to focus their research efforts on regions of the genome identifiable as critical to the organism's survival because the information in these regions has been "conserved" over millions of years of evolution. Insights drawn from molecular evolution have also begun to be incorporated into biotechnology, as the potential of evolutionary approaches toward the development of new pharmaceuticals and biologicals is explored.

With the goals of the program largely realized, funding in 1993 will move into a new phase of research grants for young scientists just embarking on their careers. The Foundation is also supporting the establishment of a new scientific society, the Society for Molecular Biology and Evolution, as another appropriate next step.

During 1993, the Foundation and its advisors will consider new candidate areas where Sloan funding can have a substantive impact on aiding the development of a significant, emerging scientific field or intersection of fields.

Throughout 1992, the following advisory committee assisted the Foundation in all aspects of the program: **Michael T. Clegg,** University of California, Riverside; **Russell F. Doolittle,** University of California, San Diego; **Morris Goodman,** Wayne State University; **Leroy Hood,** University of Washington; **James A. Lake,** University of California, Los Angeles; **Philip J. Regal,** University of Minnesota.

POSTDOCTORAL FELLOWSHIPS

Postdoctoral Fellowships in Molecular Evolution **$825,000**

In 1992, the sixth year of this competitive Fellowship program, applications again greatly exceeded the number of available awards. Each award includes $25,000 per year for stipend and benefits of the postdoctoral Fellow, $10,000 per year to the host laboratory for the Fellow's research expenses, and up to 15 percent in overhead. Grants will be made in 1993.

Fellow: Ronald M. Adkins, Wildlife and Fisheries, Texas A&M University • *Host Institution and Senior Scientist:* University of Michigan, Museum of Zoology, Priscilla K. Tucker

Fellow: Judith X. Becerra, Department of Ecology and Evolutionary Biology, University of Arizona • *Host Institution and Senior Scientists:* University of Colorado, Department of Environmental, Population, and Organismic Biology, Richard Olmstead and Brian Farrell

Fellow: Stanton Braude, Department of Biology, University of Missouri • *Host Institution and Senior Scientist:* Washington University, Department Of Biology, Alan Templeton

Fellow: Keith A. Crandall, Department of Biology, Washington University • *Host Institution and Senior Scientists:* University of Texas, Department of Zoology, James J. Bull and David M. Hillis

Fellow: Robert E. Hickson, Molecular Genetics Unit, Massey University (New Zealand) • *Host Institution and Senior Scientist:* University of Hawaii, Department of Genetics and Molecular Biology, Rebecca L. Cann

Fellow: Daniel E. Martinez, Department of Ecology and Evolution, State University of New York at Stony Brook • *Host Institution and Senior Scientists:* University of California, Irvine, Developmental Biology Center, Hans R. Bode and Robert E. Steele

Fellow: Michael D. Purugganan, Department of Botany, University of Georgia • *Host Institution and Senior Scientists:* University of California, San Diego, Department of Biology, Robert J. Schmidt and Martin F. Yanofsky

Fellow: Richard W. Roberts, Department Of Chemistry, Yale University • *Host Institution and Senior Scientist:* Massachusetts General Hospital, Department of Molecular Biology, Jack W. Szostak

Fellow: Hong Yang, Department of Geology and Geological Engineering, University of Idaho • *Host Institution and Senior Scientist:* Wayne State University, Department of Biological Sciences, Edward M. Golenberg

Fellow: Giuseppe C. Zuccarello, Department of Plant Biology, University of California, Berkeley, • *Host Institution and Senior Scientist:* University of California, Santa Cruz, Division of Natural Sciences, Lynda J. Goff

MOLECULAR EVOLUTION, TRUSTEE GRANTS

Pennsylvania State University **$60,000**
University Park, Pennsylvania 16802

The Foundation is providing start-up support for the new Society for Molecular Biology and Evolution. As currently planned, this new society will take over governance of the already-existing scientific journal Molecular Biology and Evolution, published by the University of Chicago Press. The creation of this society, devoted to molecular evolution, and under the leadership of highly respected scientists, represents an important step forward for the field. (Project Director: Dr. Linda Maxson, Professor and Head, Department of Biology (Penn State) and Secretary Treasurer, Society for Molecular Biology and Evolution; Grant period: January 1, 1993–December 31, 1997.)

The Rockefeller University **$100,000**
New York, New York 10021

This grant provides support for research on mutation and expert systems in science being conducted by Dr. Joshua Lederberg, the 1958 Nobel laureate in biology. The project has two foci: experimental assessment of the degree to which the environment may influence the rate of mutation in a gene, and the development of improved computer-based expert systems for molecular biology research. (Project Director: Dr. Joshua Lederberg, University Professor and President Emeritus; Grant period: March 1, 1992–August 31, 1993.)

MOLECULAR EVOLUTION, OFFICER GRANTS

Columbia University **$9,000**
New York, New York 10027

Support for a seminar series in molecular evolution. (Project Directors: Dr. Robert Pollack, Professor, Department of Biology and Dr. Donald Melnick, Professor, Department of Anthropology; Grant period: July 1, 1992–June 30, 1995.)

Gordon Research Conferences **$8,141**
Kingston, Rhode Island 02881

Partial support for the 1992 Gordon Research Conference on Theoretical and Mathematical Biology. (Project Directors: Dr. Steven H. Strogatz, Assistant Professor of Applied Mathematics, Massachusetts Institute of Technology and Dr. Leah Edelstein Keshet, Associate Professor, University of British Columbia; Grant period: January 1, 1992–December 31, 1992.)

Society for the Study of Evolution **$3,000**
Madison, Wisconsin 53706

Support for a scientific symposium on molecular evolution. (Project Director: Mr. Donald Waller, Executive Vice President; Grant period: June 1, 1992–November 30, 1992.)

Society of General Physiologists, Inc. **$22,390**
Woods Hole, Massachusetts 02543

Support for a conference on "Molecular Evolution of Physiological Processes." (Project Director: Dr. Douglas M. Fambrough, Professor of Biology, The Johns Hopkins University; Grant period: December 1, 1992–November 30, 1993.)

Vanderbilt University **$2,950**
Nashville, Tennessee 37340

Support for a symposium entitled "Molecular evolution of development and gene expression." (Project Director: Douglas R. Cavener, Associate Professor of Molecular Biology; Grant period: February 1, 1992–September 30, 1992.)

University of Pennsylvania **$17,726**
Philadelphia, Pennsylvania 19104

Support for molecular analysis of ancient corpses discovered in the Taklamakan desert of China. (Project Directors: Dr. Victor H. Mair, Professor of Chinese, University of Pennsylvania and Dr. Luigi Cavalli-Sforza, Professor of Genetics, Stanford University, School of Medicine; Grant period: January 1, 1993–December 31, 1993.)

University of Texas Health Science Center at Houston **$11,439**
Houston, Texas 77225

Support for a graduate-student level text on molecular evolution. (Project Director: Dr. Wen-Hsiung Li, Professor, Genetics Center; Grant period: November 1, 1992–April 30, 1994.)

DIGITAL SKY SURVEY, TRUSTEE GRANT

Astrophysical Research Consortium **$3,000,000**
Seattle, Washington 98185

This grant provides partial support for the Astrophysical Research Consortium to undertake a digital sky survey, consisting of detailed optical imaging and spectrographic measurements of most of the extra-galactic northern sky. About 100,000 galaxies and 10,000 quasars will be located and red-shift measured, thereby increasing detailed knowledge by a factor of ten. The participating institutions will be Princeton University, the University of Chicago, the Institute for Advanced Study and the Fermi Laboratory.

The scientific goals of the project are: (1) to produce a ten-fold increase in knowledge about quasars–their locations, history, structure and, by using quasars as "searchlights" (because they are so distant and so bright), to learn from them about galaxy structure and to study gravitational lensing; (2) to produce data on enough galaxies and clusters of galaxies so that statistical analysis may be done on the evolution of structure; (3) to understand more about other major structures of the universe (e.g. dark space, walls); (4) to serve as a long-lasting map of a large portion of the sky; and (5) to present a very grand opportunity for the kind of serendipitous discoveries that occur in this kind of large observational project.

The project will be conducted over a ten year period and will involve support from NSF, NASA, the Navel Observatory, the Fermi Laboratory, and the participating Universities. (Project Director: Dr. Donald G. York, Director, Apache Point Observatory; Grant period: February 18, 1992–December 31, 1993.)

OFFICER GRANTS

Princeton University **$5,000**
Princeton, New Jersey 08544

Additional support for the work of John W. Tukey. (Project Director: John W. Tukey, Research Statistician; Grant period: December 7, 1992–January 31, 1994.)

Rensselaer Polytechnic Institute **$27,470**
Troy, New York 12180

For a workshop on Perturbation Methods in Physical Mathematics. (Project Director: Joseph E. Flaherty, Professor; Grant period: October 15, 1992–November 1, 1993.)

TRUSTEE GRANTS

Massachusetts Institute of Technology **$208,752**
Cambridge, Massachusetts 02139

The United States is often referred to as a "technological society," yet our general history textbooks tend to place the implication of technological change and development on the periphery of the nation's experience. This grant provides support to MIT to write a college-level American history textbook that will integrate developments in science, engineering, and technology into the mainstream of American history as an integral component in defining the American experience. A team of five scholars will carry out the project, led by MIT's Merritt Roe Smith, a historian of technology. The intent is to indicate how attention to technological factors in the American experience can enrich our understanding of the past and better relate it to the present. (Project Director: Merritt Roe Smith, Professor of History of Technology; Grant period: June 16, 1992–May 31, 1994.)

The Research Foundation of State University of New York **$185,171**
Stony Brook, New York 11794

Very few women choose to become engineers. There were fewer women engineers in the United States in 1986 than there were women in any other scientific profession. In that year, 45% of the country's psychologists were women; 30% of its computer specialists; 15% of its physicians; 14% of its physicists; and only 4% of its engineers.

Women who decide to become engineers are often courageous people; they have the courage to defy a powerful stereotype. With this grant, Professor Ruth Cowan of SUNY, Stony Brook will write a book, an oral history based on interviews, in which their courage can be displayed and celebrated. The book, it is hoped, will inspire more young women in secondary schools and colleges to scale the barriers, with pride in their predecessors' achievements, and with enthusiasm for the work that engineers do.

Professor Cowan and her associates plan to conduct between 70 and 75 extensive interviews. In the interviews and the resultant volume, they will work to achieve a temporal, geographical, and disciplinary cross-section of American women who are engineers. They will interview women who have retired as well as women who are just starting their careers. They will seek out women who have worked in the major subdivisions of engineering, women who work in industry, women who work for themselves, women who are engineering educators, women who moved from engineering into management, and women who have made their careers in engineering research. They also plan to interview women from each of the major geographical areas of the country and each of the major demographic communities. And they plan to interview women with many different life patterns. (Project Director: Ruth Schwartz Cowan, Professor of History, State University of New York; Grant period: June 16, 1992–June 30, 1995.)

Rutgers University Foundation **$250,000**
New Brunswick, New Jersey 08903

In its review of Volume One of the Papers of Thomas A. Edison, the New York Times wrote: "It is a sign of the times that editions are now appearing of the personal papers of the supreme architects of our scientific and material world, Einstein and Edison. As we think we know Einstein, we think we know Edison. What we think is likely to be part truth, part myth. If material progress could be symbolized by one man, that man has to be Edison; his trademark, institutionalized innovation, has given our age its distinctive historical trait: rapid, ceaseless, technological change. The older heroic writing about Edison purveys the partial myth of the self-made man. There have since been books of solid scholarship about him, but we have only begun to learn what was most significant. From Edison's personal papers we can begin to answer the question of how Edison achieved what he did, and that answer bears on the larger question of what made our civilization and what shapes its future possibilities."

The Sloan Foundation has provided $400,000 to the Edison Papers Project. Volume One which received the American Association of Publishers award as the "outstanding scholarly book of 1989", and Volume Two have been completed. This

grant supports work on Volumes Three and Four, which will cover the important inventive years of 1877-86. (Project Director: Reese V. Jenkins, Director and Editor, Thomas A. Edison Papers, Rutgers University; Grant period: February 4, 1992–January 31, 1995.)

HISTORY OF SCIENCE AND TECHNOLOGY, OFFICER GRANTS

Brandeis University **$30,000**
Waltham, Massachusetts 02254

Support for a biography of Hans A. Bethe. (Project Director: Dr. Silvan Schweber, Historian of Physics, Department of Physics; Grant period: January 28, 1992–December 31, 1994.)

The Brookings Institution **$3,000**
Washington, DC 20036

Support for picture rights for the biography of Leo Szilard by William Lanouette. (Project Director: William Lanouette, Writer; Grant period: July 27, 1992–January 31, 1993.)

Carnegie-Mellon University **$20,800**
Pittsburgh, Pennsylvania 15213

Support for a feasibility study for a history of the RAND Corporation. (Project Director: Mr. Gustave H. Shubert, Senior Fellow and Corporate Advisor, The RAND Corporation; Grant period: September 1, 1992–March 31, 1993.)

Massachusetts Institute of Technology **$10,000**
Cambridge, Massachusetts 02139

Support for the first phase of a new American history textbook. (Project Director: Merritt Roe Smith, Metcalfe Professor of Engineering and the Liberal Arts, MIT; Grant period: February 4, 1992–December 31, 1992.)

University of California, Berkeley **$10,000**
Berkeley, California 94720

Support for an oral history by Dr. Charles Townes. (Project Director: Dr. Charles Townes, Professor Emeritus, Department of Physics; Grant period: March 31, 1992–December 31, 1993.)

SCIENCE AND TECHNOLOGY INFRASTRUCTURE

TRUSTEE GRANTS

American Astronomical Society $70,000
Washington, DC 20009

American Mathematical Society $70,000
Providence, Rhode Island 02940

American Physical Society $70,000
New York, New York 10017

The collapse of the Soviet Union has brought with it important consequences for the future of world science especially in a few key disciplines. For many years, the Soviet Union produced some of the world's most outstanding intellects in physics, mathematics, and astronomy. The poor state of the economies of the former Soviet republics has produced significant losses of financial support for these and other sciences, with the livelihoods of younger scientists the most threatened.

There is considerable concern on the part of the U.S. scientific community, which sees itself as part of a world-wide scientific effort, about these developments. Through these grants, the Sloan Foundation is providing help for the efforts of American scientists to preserve the quality core of those fields of Soviet science that are of central importance to world science. These grants, when matched by each society, will provide awards to outstanding mathematicians, physicists, and astronomers in the former Soviet Union. (Project Directors: Dr. Stanley E. Woosley, Professor of Astronomy and Astrophysics, Chair AAS-FSU Committee, American Astronomical Society; Grant period: November 1, 1992–October 31, 1994; Dr. Michael Artin, President, American Mathematical Society; Grant period: January 1, 1993–December 31, 1993; Dr. Irving A. Lerch, Director of International Scientific Affairs, American Physical Society; Grant period: July 1, 1992–June 30, 1993.)

SCIENCE AND TECHNOLOGY INFRASTRUCTURE, OFFICER GRANTS

American Academy of Arts and Sciences $4,790
Cambridge, Massachusetts 02138

Support for a meeting to consider efforts to assist scientists and academics in the Former Soviet Union. (Project Director: Dr. Walter Rosenblith, Convener, Academy Ad Hoc Committee on Aid to FSU Academics; Grant period: October 1, 1992–March 31, 1993.)

American Mathematical Society $30,000
Providence, Rhode Island 02940

To provide matching funds to assist mathematicians in the Republics of the former Soviet Union. (Project Director: Dr. Michael Artin, President; Grant Period: August 1, 1992–July 31, 1993.)

American Physical Society $30,000
New York, New York 10017

To provide matching funds to assist physicists in the republics of the former Soviet Union. (Project Director: Dr. Irving A. Lerch, Director of International Scientific Affairs; Grant period: June 1, 1992–May 31, 1993.)

The Keystone Center $25,000
Keystone, Colorado 80435

Support for the 1992 Scientist to Scientist summer colloquium. (Project Director: Mr. Robert W. Craig, President; Grant period: June 3, 1992–June 30, 1993.)

Massachusetts Institute of Technology **$29,979**
Cambridge, Massachusetts 02139

Support to collect and preserve an archive of recent dramatic changes in science in the former Soviet Union. (Project Director Dr. Loren R. Graham, Professor of the History of Science; Grant period: December 1, 1992–November 30, 1993.)

Santa Fe Institute **$30,000**
Santa Fe, New Mexico 87501

Support to fund a study of the applicability of the genetic algorithm. (Project Director: Professor Stephanie Forrest, Department of Computer Science, University of New Mexico; Grant Period: November 30, 1992–November 30, 1994.)

The University of Chicago **$20,000**
Chicago, Illinois 60637

Support for organizing a high energy cosmic ray experiment. (Project Director: James W. Cronin, Professor of Physics, University of Chicago, The Enrico Fermi Institute; Grant period: October 15, 1992–October 15, 1993.)

University of Pennsylvania **$5,000**
Philadelphia, Pennsylvania 15260

Support for travel of American science and technology historians to a '93 conference in Berlin. (Project Director: Professor Thomas P. Hughes, Professor of History and Sociology of Science; Grant period: September 28, 1992–December 31, 1993.)

TRUSTEE GRANTS

IEEE Foundation, Inc. **$70,000**
New York, New York 10017

In 1991, the Institute of Electrical and Electronic Engineers (IEEE) initiated an experimental fellowship program in cooperation with the Technology Administration of the U.S. Department of Commerce. The goal was to complement the capacities of this governmental agency with electrical and electronic engineers who have deep understanding of the product development process in key industries.

The first two Fellows have made important contributions toward this effort. For example, one Fellow succeeded in creating an industry/government working group in the crucial area of optoelectronics, with special reference to the technologies involved in flat-panel displays. The other Fellow has been working toward the formation of a similar consortium on automotive technology. This grant will continue support for the program. (Project Director: Mr. Charles A. Eldon, Vice Chairman, IEEE-USA, US Competitiveness Committee; Grant period: November 1, 1992–October 31, 1993.)

Sigma Xi, The Scientific Research Society **$60,000**
Research Triangle Park, North Carolina 27709

In 1989 the Foundation made a grant of $75,000 in partial support of the National Academy of Sciences Panel on Scientific Responsibility and the Conduct of Research. That Panel has nearly completed its work and its report will be issued in the near future. It will contain a set of principles to guide the responsible conduct of science, including both the roles and responsibilities of scientists as individuals, and also those of research institutions including government agencies, universities, scientific journals and professional societies.

Sigma Xi, The Scientific Research Society, is planning a large-scale Forum on ethics and science to address the conclusions and recommendations of the NAS Panel and promote their dissemination and implementation in the scientific research commu-

nity. A distinguished Steering Committee which includes the presidents of The National Academy of Sciences and The National Academy of Engineering and the Study Director of the NAS Panel has agreed to take responsibility for shaping the Forum. (Project Director: Mr. John F. Ahearne, Executive Director; Grant period: April 7, 1992–December 31, 1993.)

SCIENCE AND TECHNOLOGY POLICY, OFFICER GRANT

Rensselaer Polytechnic Institute **$8,000**
Troy, New York 12180

Support to continue Breakfast Seminars on Science and Technology Policy. (Project Director: Herbert I. Fusfeld, Chairman, Advisory Board, School of Management (RPI); Grant period: October 1, 1992–September 30, 1993.)

ECONOMIC GROWTH, INDUSTRIAL COMPETITIVENESS, AND STANDARD OF LIVING

The goal of this program is to deepen understanding of the basic forces that will maintain and improve a high American standard of living in an increasingly competitive global economy. The program spans a broad range of areas which affect the ability of U.S. industry to compete in world markets: the vitality of manufacturing industries, the availability and introduction of technology, management of the product development process, training and education for manufacturing, human resource management, the cost and availability of capital, tax incentives, the impact of U.S. liability law on product safety and innovation, trade policy, international economics, and so forth.

In 1990, The Sloan Foundation launched a major effort within this program to establish interdisciplinary centers at leading research universities to study U.S. industries. The objective is to support the evolution of an academic community involving scholars in engineering, management, and economics that can provide realistic research and education on American manufacturing industries. The Foundation's hope is that these efforts will develop into long term programs that can contribute observation, analysis, and understanding to U.S. companies engaged in these industries.

The interdisciplinary centers include automobiles (MIT), pharmaceuticals (MIT), textiles and apparel (Harvard), information processing (Stanford), semiconductors (University of California at Berkeley), carbon steel (Carnegie Mellon and the University of Pittsburgh), specialty chemicals (Harvard and MIT) and financial services (Wharton). An MIT program on Industrial Performance will draw on the results from all the industry studies while undertaking its own full program of comparative research on productivity and industrial performance in the U.S. and six other countries. In addition to the interdisciplinary centers, the Foundation is also providing support for other selected projects that can enhance our understanding of U.S. industries.

The economics component of this program is focused on the contribution which economic analysis can make to understanding competitiveness. For example, with economic growth and a rising standard of living dependent on productivity increases, the Foundation is supporting research to improve the techniques

involved in assessing productivity change. Other studies in this area include human resource management and an examination of the role of the corporation.

Education and training for manufacturing is another area of emphasis within this program. The Foundation is providing support for education that will increase expertise and career interest in manufacturing from the high school apprenticeship level, to the community college level, to the master's degree level, and to the Ph.D. level with individuals preparing to become manufacturing professors.

TRUSTEE GRANTS

University of California, Los Angeles **$298,800**
Los Angeles, California 90024

Among the key issues for competitive industrial production is the organization and management of human resources. The ability of companies to make the best use of their employees and for employees to appreciate their work, and constructively contribute to this productivity, is at least as much of the competitive challenge as are technology, production efficiency, capital investments, etc. One way of approaching this human resource component is to view a production facility and its business management through the eyes of people doing the work—the manufacturing operators, their supervisors, engineers, union representatives, and manufacturing and general business managers.

With Sloan support, Professor Wellford Wilms of UCLA will study the process by which a major manufacturing company, Toyota, transfers its production system to a selected group of suppliers. He will work with each of the suppliers, in their production, engineering, and business offices, to observe, through the people, how the changes in company behavior are seen by the employees, how they react to them, and separately, to measure the production and business gains (or losses) that result. The suppliers range from large organizations such as Johnson Controls and LOF Glass to small companies.

This research will provide a view of organizational and human resource change at the same time that it shows how a major lean production manufacturer works with its suppliers. The work will add a new research approach and will bring complementary knowledge to the ongoing MIT studies of the automobile industry also supported by the Foundation. (Project Director: Wellford W. Wilms, Research Director, Graduate School of Education, California Worksite Research Committee; Grant period: July 1, 1992–December 31, 1994.)

University of Pennsylvania **$3,361,760**
Philadelphia, Pennsylvania 19104

The Wharton School of the University of Pennsylvania will establish a center for the study of the financial services industry with this funding. As in the other industry centers in the Foundation's program, Wharton intends to focus attention of its faculty and students on a broad range of issues across the industry.

The financial services industry plays a role in the nation's economy through its share of GNP and large employment and an even more powerful competitive role through the quality of its support of other manufacturing and service industries. Among the initial projects that will be studied are the appropriate use of technology in increasing productivity for this industry, the measurement of firm performance on a risk-adjusted basis, and the strengths and weaknesses of accounting and financial data in measuring firm performance across the insurance, banking and other sub-sectors of the industry. Additional topics that will engage different faculty teams include the appropriate restructuring of work and the integration of functions in large multi-service corporations (as in the combination of banking and insurance in Germany) at the same time that provision of efficient specialized services creates new firms (e.g., specialized mortgage insurers and, separately, mortgage services).

The Center's research is designed to produce objective understanding of important issues and facets of the industry and its sub-sectors, with participating faculty from many fields. Through specially convened seminars, workshops and conferences, work will be presented to the companies which are involved. In turn, through field-work discussions and company response sessions, the accuracy and applicability will be tested. Journal article preparation and book writing will convey the new recognitions and understanding to a larger audience. The research groups at Wharton will meet frequently so that, although the program is broad, the study teams will not work narrowly. (Project Director: Professor Richard Herring, Director of Financial Institutions Center, Wharton; Grant period: July 1, 1992–December 31, 1995.)

TRAINING AND EDUCATION, TRUSTEE GRANTS

Cornell University **$558,900**
Ithaca, New York 14853

With this grant, Cornell University will add a core of manufacturing courses to master's level programs in engineering, industrial and labor relations, and business administration. The degrees to be granted, for example, will be a Master's in Mechanical Engineering with the Manufacturing Option. The first phase of this program is in engineering. A unique aspect of this program is that the course offerings for all three fields will be jointly developed by teams of faculty from each school.

The proposed developments are part of an overall approach to manufacturing at Cornell which includes a manufacturing engineering productivity research program and offerings in manufacturing management. These activities work closely with advisory groups from industrial corporations. In some of the course offerings that have begun, experienced industrial manufacturing managers share teaching responsibilities. (Project Director: Professor Albert R. George, Co-Director, Cornell University, COMEPP; Grant period: May 1, 1992–August 31, 1995.)

MANTEC **$200,000**
York, Pennsylvania 17401

In October, 1990, the Foundation provided a grant to support the initial two years of a program to design, develop, and demonstrate an adaptation of the kind of apprenticeship system that appears to produce skilled workers in Germany, Holland, Denmark and many other countries. At present, just over one hundred 11th grade students and a dozen 12th graders are enrolled in such a program in six locations in Pennsylvania–York, Lancaster, Williamsport, Pittsburgh and two in the Philadelphia area. The students will learn from a newly prepared curriculum from specially trained teachers in selected locations arranged by their district. They will work in one of eighty metalworking companies, mentored by workers who have agreed on a set of skills and work environment requirements to be taught. In each of the six loca-

tions, an advisory group of company and local educators, plus parents, will monitor the program. This grant provides additional support to facilitate the implementation of this new mode of education. (Project Director: Mrs. Jean Wolfe, State Director, Pennsylvania Youth Apprenticeship Program, c/o MANTEC, Inc.; Grant period: January 1, 1993–June 30, 1994.)

Regional Technology Strategies, Inc. **$642,700**
Chapel Hill, North Carolina 27516

The Consortium for Manufacturing Competitiveness (CMC) is a group of fourteen community colleges in fourteen southeastern states. They were initially chosen by each state to represent a particular region in which small and medium sized manufacturing enterprises were in need of skilled new technicians, special training for employees, and technical advice. Regional Technology Strategies (RTS) is a private organization, closely allied to the Southern Growth Policies Board of the Southern Governor's Association. It has led the CMC, through its initial activities, and introduced a number of important concepts, including small company networks, and European models of small company technological learning. RTS has helped the CMC toward useful interchange on specialized courses, faculty exchanges, and technical consulting across the area.

Funding from the Foundation will support the RTS and CMC colleges in continuing their training and outreach activities to local businesses through innovative approaches. A selection committee composed of southeastern small manufacturers, national community college authorities, and university professors has been created. Other funding will be used to establish stronger ties to counterpart European technical colleges that have already been successful in this kind of enterprise. (Project Director: Dr. Stuart Rosenfield, President, RTS; Grant period: May 1, 1992–August 31, 1994.)

Rensselaer Polytechnic Institute **$75,000**
Troy, New York 12180

Case studies that use interactive multimedia technology engage students by including the sights and sounds of the people and processes involved in the case and by providing decision points where students can try out different courses of action. Multimedia materials have been developed for courses in the sciences, languages and the humanities; but little use has been made of multimedia in engineering and management education.

This grant will enable Susan Sanderson and colleagues in the Schools of Management, Science and Engineering at Rensselaer Polytechnic Institute to produce and evaluate a prototype interactive multimedia case study of the Sony Walkman. It will bring together innovative research and teaching material in design, manufacturing, and total quality management developed at Rensselaer and will be useable in undergraduate and graduate engineering and management courses. In addition to the fully produced Walkman prototype, initial planning and design will be conducted on two additional case studies, of the Motorola pager and the Mazda Miata.

The work will be guided by an advisory committee of engineering and management faculty from Stanford, Carnegie-Mellon, Cornell, Harvard, M.I.T., and Tokyo University. The Walkman case study will be tested in three courses at RPI and one at Cornell. (Project Director: Susan Walsh Sanderson, Associate Professor, Rensselaer Polytechnic Institute; Grant period: April 15, 1992–December 15, 1992.)

TRAINING AND EDUCATION, OFFICER GRANTS

Southport Institute for Policy Analysis **$30,000**
Washington, DC 20002

Support to promote workplace education in small firms. (Project Director: Dr. Forrest P. Chisman, President; Grant period: July 1, 1992–December 31, 1992.)

Stanford University **$30,000**
Stanford, California 94305

Support of a conference on graduate education in manufacturing. (Project Director: Charles H. Fine, Professor, M.I.T., Director, Leaders in Manufacturing Program; Grant period: May 1, 1992–April 30, 1993.)

MANUFACTURING AND TECHNOLOGY, TRUSTEE GRANTS

National Academy of Engineering Fund **$350,000**
Washington, DC 20418

The National Academy of Engineering has been involved in the technological aspects of competitiveness issues over the past several years, including manufacturing, global trade, intellectual property, and time horizons. Virtually all of these studies have dealt with large and leading companies. With support from this grant, the Academy will turn its attention to small manufacturing companies.

The NAE's study will involve product and process innovation in small, technology-based firms. It will focus on five industries, with the intention of identifying required capabilities and resources and the best practices that help small companies introduce, manage, and produce with new technology. Five industry specific workshops will be convened with representatives from 30-40 companies. Discussions with these

company representatives, plus presentations from them and from commissioned papers, will bring forth best practices regarding introduction and management of technologies in product development and manufacturing. The workshops will be held in several locations, chosen to best serve small manufacturers. (Project Director: Mr. Bruce R. Guile, National Academy of Engineering Fund; Grant period: January 1, 1993–June 30, 1995.)

University of Wisconsin, Madison **$405,217**
Madison, Wisconsin 53706

Reducing the amount of experimentation required in designing a product or a manufacturing process is a major objective in producing competitive products. The use of statistical experimental design techniques has been successful in agriculture and in the chemical industry. In more recent years, it has been introduced into discrete manufacturing.

With this grant, the Center for Quality and Productivity Improvement of the University of Wisconsin will pursue a program of research to improve the statistical techniques themselves. Research will be done on the sequential approach to experimental design and on adapting experimental design to the industrial environment. (Project Director: Dr. George E. P. Box, Director of Research, Department of Industrial Engineering, University of Wisconsin, Madison; Grant period: July 1, 1992–December 31, 1994.)

MANUFACTURING AND TECHNOLOGY, OFFICER GRANTS

Carnegie Mellon University **$10,000**
Pittsburgh, Pennsylvania 15213

Planning grant for the preparation of a survey of manufacturing innovation and performance. (Project Director: Professor Wesley M. Cohen, Department of Social & Decision Sciences, Carnegie Mellon University; Grant period: January 1, 1993–June 30, 1993.)

Corporate Design Foundation **$26,000**
Boston, Massachusetts 02115

To support a program for collaborative teaching of industrial design, engineering design and business practices. (Project Director: Peter Lawrence, Chairman; Grant period: September 1, 1992–August 31, 1993.)

The Research Foundation of State University of New York **$24,900**
Stony Brook, New York 11794

Support to study the effects of the investments in computers on manufacturing productivity growth. (Project Director: Professor Donald Siegel, Harriman School of Management and Policy, SUNY, Stony Brook; Grant period: July 15, 1992–October 31, 1993.)

MANUFACTURING AND MANAGEMENT, OFFICER GRANTS

Columbia University **$30,000**
New York, New York 10027

To begin a study of the effects of computers on business productivity. (Project Director: Professor Michael van Biema, Department of Computer Science, Computer Science Building, Columbia University; Grant period: April 1, 1992–July 31, 1993.)

Cornell University **$26,845**
Ithaca, New York 14853

Partial support for the study of mechanical tolerancing and for a book on the subject. (Project Director: Herbert B. Voelcker, Professor, The Sibley School of Mechanical and Aerospace Engineering, Cornell University; Grant period: July 1, 1992–November 30, 1993.)

HUMAN RESOURCE MANAGEMENT, TRUSTEE GRANTS

Carnegie Mellon University **$173,521**
Pittsburgh, Pennsylvania 15213

This project takes advantage of two large surveys that were carried out with NSF support in 1987 and 1991. The project will investigate three different types of employee participation: (1) formal mechanisms of employee voice, such as labor-management problem-solving committees; (2) work organization reforms, such as self-managed work teams; and (3) gain-sharing mechanisms through which workers participate in sharing profits or stock ownership.

The study will focus on the prevalence of these different forms for a representative cross-section of metal-working establishments in different industries. And it will track change in the use of such participating mechanisms over time in a large cross-section of workplaces. With panel data collected in 1987 and 1991 for about 1,000 manufacturing establishments, the project will investigate patterns of diffusion of various participatory mechanisms and their effects on organizational performance. In addition, the project involves a series of in-depth case studies. (Project Director: Maryellen Kelley, Associate Professor of Management & Public Policy, H. John Heinz III School of Public Policy and Management; Grant period: October 6, 1992–June 30, 1995.)

Massachusetts Institute of Technology **$149,388**
Cambridge, Massachusetts 02139

In 1992, a large group of researchers in the human resource field from universities across the country met for two days at MIT for a Foundation-supported conference. All the Sloan industry study groups were represented as well as a number of others from labor economics, industrial relations, and related areas. The conference was convened in response to the Foundation's initiative to give greater attention to human resource and labor management systems and practices.

The participants agreed to form a Human Resource Research Network and adopted a statement of goals "to support efforts to improve the competitiveness and economic, social, and psychic standards of living in American society by improving the human resource policies and practices governing American workers and their employees. More specifically, the primary objectives of this network are to (1) deepen the analytical foundations and generalizability of the research on human resource practices conducted under the auspices of the industry studies, (2) expand and strengthen the community of researchers who study human resource issues, and (3) use our research process and results to provide a stronger analytical and empirical foundation for human resource policy-makers and practitioners." This grant will support the first year of the Human Resource Research Network. The Network's administrative headquarters will be at MIT's Sloan School under the direction of Professor Thomas Kochan. (Project Director: Thomas A. Kochan, George Maverick Bunder Professor of Management, Sloan School; Grant period: January 1, 1993–December 31, 1993.)

University of California, Berkeley **$551,498**
Berkeley, California 94720

The Sloan supported center for the study of semiconductor manufacturing at Berkeley spent the first year in a pilot study of manufacturing and business practices in three factories (Intel, Hewlett-Packard, and NEC) to (1) understand issues that are key to this kind of manufacturing and (2) develop the appropriate performance measures for their full-scale study of twenty-five factories around the world.

During these intensive visits, made by engineering and business school faculty and graduate students, observations were made of work organization, and the assignments, behavior, and responses to the work environment of managers, engineers, and operators. It became quite evident that these organizational and human resource factors were quite different in each of the factories. The group now believes it very much needs to understand more closely and more systematically how key issues affect the overall performance and productivity of the factory. These include hiring levels, incentives and environment for improvements, the distribution of responsibilities for quality, organization of maintenance workers, the form in which equipment engineering is done, the manning of the transfer from product development etc.. These issues have been studied in the traditionally labor-intensive industries (auto-

mobile, steel, apparel) but not much attention has been paid to their role in an advanced, partially automated, process-oriented industry such as semiconductors.

This grant will enable the Berkeley Center to enlarge their study to systematically study human resource and organizational practices in the semiconductor manufacturing industry. (Project Director: Professor David A. Hodges, Dean of Engineering and The Roy W. Carlson Professor of Engineering; Grant period: October 15, 1992–January 31, 1995.)

University of Southern California **$90,000**
Los Angeles, California 90089

The work supported by this grant involves testing theories of work organization using a pair of unique surveys on employee involvement and total quality management. The surveys were carried out in 1,000 companies in 1987 and 1990 by the General Accounting Office and the University of Southern California. No other data source has detailed data on so many companies employing such a large proportion of the work force. And no other source has such wide breadth of subjects covered.

The products of this study will be three papers. The first paper will examine a broad array of outcome measures. It will link the survey data on employee involvement and total quality management with financial data from Compusat.

The second paper will focus on the central features of total quality programs (e.g. enhanced training, statistical process control, customer satisfaction) and the conditions under which they succeed. Although total quality programs have spread throughout U.S. industry, this will be the first research on the conditions required for their success and the magnitude of their effects.

The third paper will examine the dynamics of employee involvement programs. It will measure how cashflow problems and layoffs affect both the introduction and death rates of employee involvement programs. (Project Director: David I. Levine, Haas School of Business, University of California, Berkeley; Grant period: October 6, 1992–October 31, 1994.)

The College of William and Mary **$30,000**
Williamsburg, Virginia 32187

Support for a conference on workplace literacy. (Project Director: David H. Finifter, Director, The Thomas Jefferson Program in Public Policy, The College of William And Mary; Grant period: November 2, 1992–December 31, 1993.)

Columbia University **$29,473**
New York, New York 10027

Support for background paper for a program on human resource management. (Project Director: Thomas Bailey, Associate Professor, Conservation of Human Resources, Columbia University; Grant period: April 9, 1992–March 31, 1993.)

Economic Policy Institute **$30,000**
Washington, DC 20036

Support for the project "Transforming the Production System in U.S. Firms." (Project Director: Eileen Appelbaum, Associate Research Director, Economic Policy Institute; Grant period: May 11, 1992–May 31, 1993.)

Massachusetts Institute of Technology **$30,000**
Cambridge, Massachusetts 02139

Support for a Human Resource and Management Policy Forum. (Project Director: Thomas A. Kochan, Professor of Management, Sloan School of Management, M.I.T.; Grant period: June 1, 1992–May 31, 1993.)

New Ways to Work **$30,000**
San Francisco, California 94103

To support the completion of an econometric analysis of the costs and benefits of contingent work. (Project Director: Ms. Barney Olmsted, Co-Director; Grant period: November 15, 1992–January 31, 1994.)

ROLE OF THE CORPORATION, TRUSTEE GRANTS

Boston University **$190,138**
Boston, Massachusetts 02215

The basic goal of this study is to shed light on how the modern corporation has evolved since the 1950s in terms of the classic questions: To whom, and for what, is the corporation responsible?

James E. Post will examine these questions and the changing role of the corporation from the perspective of corporate policy and decisionmaking. The project will involve empirical work using archival sources, collection of corporate performance data, and interviews. A number of industries and specific firms will be studied in detail. The practical implications of this research approach are twofold: (1) it will shed light on the myriad ways that companies have historically understood and linked commitments to employees, communities, and other stakeholders to economic performance objectives; and (2) it will highlight the similarities and differences between established firms that have learned to adapt to changing values and newly-created firms that are contemporaneous with these new values.

The project will proceed in two roughly equal stages. First, a thorough review will be undertaken of the evolution of the changing relationship of the corporation in society since the 1950s with an emphasis on the decision processes that acknowledged stakeholder interests. Second, a more refined analysis of several specific industries and firms will focus on the more subtle ways in which companies have integrated the

many different stakeholder interests. The final product of this project is expected to be a series of conceptual and empirical papers. (Project Director: Professor James E. Post, Professor of Management and Public Policy; Grant period: June 16, 1992–August 31, 1994.)

The Business Enterprise Trust **$500,000**
Stanford, California 94305

The Sloan Foundation has a long tradition of interest in business history. In 1963 Alfred P. Sloan, Jr. published his classic account of business enterprise, My Years with General Motors. In the preface Mr. Sloan acknowledged the important assistance he had received from a young historian at MIT, Alfred D. Chandler, Jr. Fifteen years later, Chandler published his own classic work, The Visible Hand. In the preface he acknowledged the important assistance he received from a grant provided by the Sloan Foundation. That book was awarded the Pulitzer Prize and Bancroft Prize in American history—the first Sloan-supported book to receive those honors.

Chandler's history ends in the 1940's. A new generation of scholars has recently begun to pay attention to the role of the corporation in the second half of the 20th Century. New hypotheses are being propounded and research to test their validity is beginning to appear. The stakeholder theory, for example, argues that successful relationships with shareholders, employees, customers, suppliers, and the community are correlated with successful corporate performance. Is this true? Research and analysis is required if Chandler's "reality test" is to be applied: "The lesson to be learned form history is that awareness of reality acquired through the study of specific cases is more important that indoctrination in generality."

The Business Enterprise Trust (BET) has taken this Chandler dictum to heart. Established three years ago through the leadership of a group of CEO's of major corporations, BET has a research staff head-quartered at Stanford that does detailed review of American corporations. This grant to the Business Enterprise Trust supports its research, education, and awards program. (Project Director: Mr. Kirk O. Hanson, President; Grant period: June 16, 1992–June 30, 1995.)

The University of Michigan **$99,303**
Ann Arbor, Michigan 48109

This grant supports analysis of longitudinal trends in American earnings since 1967. The study will use the unique data of the Panel Study of Income Dynamics (PSID), a longitudinal study that has received Sloan Foundation support in the past.

Unlike most data available on earnings and related economic trends, the PSID data will allow examination, for example, of the actual earnings histories of cohorts that were aged 18 in 1968 (and hence 30 in 1980) with those who were 18 in 1978 (and hence 30 in 1990). It will also allow comparisons of the earnings experiences of these cohorts with those of their fathers. The goal is to shed light on the contentious issue of whether or not the American standard of living has been declining and whether or not the middle class is shrinking. (Project Directors: Dr. Greg J. Duncan, Professor of Economics and Research Scientist, Survey Research Center, Institute for Social Research, University of Michigan, and Dr. Timothy M. Smeeding, Professor of Economics and Public Administration, Syracuse University; Grant period: January 1, 1993–December 31, 1993.)

Carnegie Mellon University **$248,272**
Pittsburgh, Pennsylvania 15213

Japanese transplants in the U.S. of manufacturing facilities and some research and product development facilities have apparently brought with them new approaches to production, product development, human resource management and even community and state relationships.

With support from this grant, Richard Florida of Carnegie Mellon University will focus on the efficiency of production at these plants and the effectiveness of human resource management and organizational learning. He will extend his data and analysis to include suppliers and also product development functions. Are the Japanese transplants forming the kind of total production complexes (assembly plants, suppliers, special services organizations) they have established in Japan and, if so, in which industries? Do advanced product development activities remain at home or does that transplanting include research and development? On the human resource side, are greater efficiencies gained by "Japanese" methods when they are applied to American workers? What are the obstacles to these methods? Direct data from workers will be obtained. The study will examine rubber, steel, automobile and automobile parts, and electronics plants across the U.S., comparing within each industry where possible, American owned and Japanese owned and managed plants. (Project Director: Dr. Richard Florida, Associate Professor of Management & Public Policy, H. John Heinz III School of Public Policy & Management; Grant period: October 15, 1992–January 31, 1995.)

University of California, Berkeley **$3,400,000**
Berkeley, California 94720

In December 1989, the Foundation provided a three year, $3 million grant to the Consortium on Competitiveness and Cooperation. This combined effort of faculty and students from Berkeley, Columbia, Harvard and Stanford has developed into a visible, useful national organization of scholars for research in the management and

use of technologies in companies and across industries. The studies have also dealt with the relationship of technology to national financial and other public institutions and to the macro-economic workings of national economies. The academics involved have achieved a more realistic understanding from direct contact with a large number of industrial corporations. They have developed a more coherent view of the connections between the strategic handling of technology by firms and the micro- and macro-economic environments which surround firms and industries. The consortium has served to focus its own faculty members, its graduate students, and even business and engineering schools at its universities more directly on competitiveness issues.

The Consortium has produced nine books, over 100 papers, a new journal, large numbers of workshops and conferences, and full or partial support of nineteen Ph.D. theses.

The additional support provided by this grant will enable the Consortium to continue its workshops at each of the four universities and to add a fifth at the Wharton School; to continue the development of the curriculum in the management of technology at Berkeley; to continue the research programs; and as part of a move toward becoming self-sustaining, to develop executive education programs. Further support will be sought from government, university, and private sources. The Consortium plans, in addition to a large number of other research products, to produce a book which will draw together the several main technological, managerial, and economic topics that make up its research program. (Project Director: David J. Teece, Director, Center for Research and Management, Walter A. Haas School of Business, University of California, Berkeley; Grant period: January 1, 1993–June 30, 1996.)

Massachusetts Institute of Technology **$9,000**
Cambridge, Massachusetts 02139

Support for a symposium on the implications of the changing international environment on American colleges and universities. (Project Director: Katharine H. Hanson, Executive Director, Consortium on Financing Higher Education; Grant period: March 10, 1992–December 31, 1992.)

National Academy of Engineering Fund **25,000**
Washington, DC 20418

Partial support for a symposium and publication on Product Liability and Innovation. (Project Director: Mr. Bruce R. Guile, Director; Grant period: December 1, 1992–November 30, 1993.)

University of Pittsburgh **$30,000**
Pittsburgh, Pennsylvania 15260

Support of research project entitled: "Cultivating Competitiveness: The Economic Ramifications of Presidential Trade Policy." (Project Director: Professor Simon F. Reich; Grant period: November 30, 1992–February 28, 1994.)

Yale University **$30,000**
New Haven, Connecticut 06520

To support a conference entitled "Foreign Direct Investment in Japan: Corporate Strategies and Government Policies for the 1990's." (Project Director: Professor Mark Mason, Chair (Conference), Yale University; Grant period: September 1, 1992–August 31, 1993.)

EDUCATION IN SCIENCE, TECHNOLOGY, AND MANAGEMENT

The Foundation's program in this traditional area of support reflects a broad scope of interests. In science and engineering education, important issues are being addressed, such as: understanding how and why people choose or do not choose to enter professions in science and technology and the reasons for continuing or leaving those professions, training a future scientific and technical elite, analyzing and initiating programs to address the underrepresentation of women and minorities in science and engineering, and developing educational programs and materials.

The Foundation is also exploring innovative approaches for education outside the classroom or school system. The effort is aimed at independent learning in science and technology as a supplement to classroom materials and as an avenue for exploring new interests. One focus is on education, using computer and multi-media technologies, for students and professionals stimulated to teach themselves. Another focus is on the use and development of science and technology centers and museums for highly motivated students.

Enhancing public understanding and interest in science and technology is another area which the Foundation is pursuing. A Sloan grant supported the four part television series, Made in America?, broadcast in 1992. Two new major documentary series were funded in 1992 and will be broadcast in late 1993 and early 1994. One is a six part series on Women in Science. The second documentary, Challenge to America, will be a comparative analysis of the economic, political, cultural, and social characteristics of Germany, Japan, and the United States and their impact on competitiveness in the global economy.

During 1992, the commissioning of a Technology Book Series was nearly completed. The series will focus on some of the major technologies of the twentieth century and their role in our society. The Foundation also made a grant to National Public Radio for technology reporting broadcasts.

SCIENTIFIC AND TECHNICAL LITERACY, OFFICER GRANT

The New York Academy of Sciences **$30,000**
New York, New York 10021

For an evaluation of the Foundation's New Liberal Arts Program. (Project Director: Dr. Oakes Ames; Grant period: July 1, 1992–March 31, 1993.)

ENTRY AND RETENTION, TRUSTEE GRANTS

The Consortium for Mathematics and its Applications (COMAP) Inc. **$295,441**
Arlington, Virginia 02174

With Sloan support, COMAP and two collaborating institutions, the New York Hall of Science and the Educational Film center, working closely with professionals from industry and education, will develop three prototype multimedia modules with highly visual and personalized information on three occupations.

The core of the material will be interactive video profiles of individuals working in various science and engineering jobs. In each profile, the individual will be observed on the job, working on a problem or assignment, and away from work, interacting with others, pursuing other interests and hobbies. From the profiles, viewers will get a true sense of what a job entails. They will learn why the individuals profiled chose the work, what their training was, what they like and don't like about what they do. The people profiled will not be stars, and they will not be depicted as heroic archetypes.

There are two additional components. The first will be a computer-assisted self-evaluation of the viewer's personal interests, ambitions, abilities and ideas about science and mathematics. The second will be a data base of additional information about some 200 occupations that can be queried by the viewer.

The target audience for the modules will be students twelve to sixteen years of age,

but the videos have the potential of appealing to and informing both younger and older viewers. The fully interactive modules will be distributed to science and technology centers and to libraries and schools with the appropriate equipment. (Project Director: Dr. Solomon A. Garfunkel, Executive Director; Grant period: May 15, 1992–May 15, 1993.)

University of Chicago **$2,999,905**
Chicago, Illinois 60637

In June of 1991 the Board approved a pilot study by the University of Chicago on how young people develop their choices of careers. The purposes of the pilot study were: to test methods of obtaining information on knowledge and choice of work in jobs and careers directly from junior and senior high school students in differing social, economic, ethnic, and other settings; to carefully follow specific occupation and career choices as the students develop and proceed through these school years, and thus, to build our understanding of who chooses to enter science and engineering and how they arrive at that choice.

This grant will support the full-scale longitudinal study of the process of the development of career and work understanding in secondary school students. The study will cover five years, starting with the 6th, 8th, 10th, and 12th grades at ten school systems, sited to cover geographical regions in the United States and the appropriate socio-economic and ethnic variables. Interviews, Experimental Sampling Method records, and the rest of the field data will be collected each year until the 6th grade cohort graduates. Telephone interviews will be done throughout the five years with each class after it graduates. The study will comprise 2,800 interviews of students, plus another several hundred interviews of parents, teachers, etc. Class observations by interviewers will be added to the data-gathering. An advisory panel will be convened regularly to review methods and results. Publications and presentations will be made continuously, including early reporting of the pilot study. A number of doctoral candidates will be engaged. (Project Director: Dr. Barbara Schneider, Ogburn-Stouffer Center, University of Chicago; Grant period: October 15, 1992–June 30, 1998.)

ENTRY AND RETENTION, OFFICER GRANTS

National Research Council **$25,000**
Washington, DC 20418

Partial support for an international conference on Changing Interests in Science and Technology Careers. (Project Director: Dr. Alan Fechter, Executive Director; Grant period: May 1, 1992–April 30, 1993.)

Purdue University **$29,816**
West Lafayette, Indiana 47907

To study best practices for encouraging U.S. students to attend engineering graduate school. (Project Director: Professor W. Dale Compton, School of Industrial Engineering, Purdue University; Grant period: May 1, 1992–August 31, 1993.)

WOMEN AND MINORITIES, TRUSTEE GRANT

The Board of Trustees
University of Illinois at Urbana-Champaign **$600,000**
Champaign, Illinois 61820

The Committee on Institutional Cooperation, a consortium of 14 Mid-West research universities, is in the second year of an "Alliance for Success" with 6 historically Black colleges. The goal of the joint effort is to increase the number of minority students completing the baccalaureate and going on to graduate work, (the universities are Chicago, Illinois, (Chicago and Urbana), Indiana, Iowa, Michigan, Michigan State, Minnesota, Northwestern, Ohio State, Pennsylvania State, Purdue, and Wisconsin, (Madison and Milwaukee). The colleges are Coppin State, Jackson State, Lincoln, Prairie View A&M, Texas Southern, and Xavier. The program covers a wide range of academic disciplines. The Foundation is supporting the fields of science, engineering, and mathematics.

The approach involves several phases:

• Minority sophomores and juniors in good standing from any of the 20 participating institutions take part in an 8-10 week "Summer Research Opportunities Program" consisting of a one-on-one research project with a faculty member at one of the research universities. The student writes a research proposal, conducts the research, and presents a final paper at a campus symposium.

• In the ensuing academic year, back at his or her own campus, the student takes part in a series of weekly seminars and workshops designed both to enrich the regular academic program and to present information about technical and scientific careers.

• In July of the summer after the initial research project, all of the participants (600, of whom 135 are science, engineering and mathematics students) meet on a single university campus for an academic and social conference.

The goal of this effort is to improve the retention rate of undergraduates who will go on to graduate study. (Project Director: Ms. Jean E. Girves, Associate Director, Committee on Institutional Cooperation; Grant period: July 1, 1992–June 30, 1995.)

WOMEN AND MINORITIES, OFFICER GRANTS

Center for Excellence in Education **$30,000**
McLean, Virginia 22102

To support five minority high school juniors at an M.I.T. program. (Project Director: President Joann P. DiGennaro; Grant period: April 15, 1992–December 31, 1992.)

Clark Atlanta University **$25,000**
Atlanta, Georgia 30314

To study the feasibility of adding a manufacturing education component to the curriculum. (Project Director: Professor Edward L. David; Grant period: September 25, 1992–June 30, 1993.)

St. John's University **$1,500**
Jamaica, New York 11439

Partial support for "Sonia Kovalesky Mathematics Day." (Project Director: Reverend Donald Harrington, President; Grant period: March 15, 1992–December 31, 1992.)

Women's College Coalition **$25,000**
Washington, DC 20005

To support a meeting November 6-8, 1992 on "Women in Science." (Project Director: Ms. Jadwiga S. Secrechts; Grant period: May 1, 1992–December 31, 1992.)

RESEARCH UNIVERSITIES: THE SYSTEM OF EDUCATION AND RESEARCH, TRUSTEE GRANT

Stanford University **$255,706**
Stanford, California 94305

The Sloan Foundation is interested in learning more about the working of the university science and engineering establishment—as producers both of research and of scientists and engineers. The leading U.S. research universities are unique institutions with substantial impacts upon the U.S. economy, society and culture, and yet we have only limited understanding of the way they function as complex social and economic systems.

The research supported by this grant will develop dynamic modelling and simulation techniques aimed at enhancing our understanding of the functioning of this system of research universities. The model will include at least four sub-systems: the demand for and supply of PhD places, and the "production process" in science and engineering; the demand for undergraduate and professional school places, and the production process for these students as they affect the demand for PhD's; the impacts of faculty norms and demographics upon supply and demand; and the

nature of institutional finance and budgeting. (Project Director: Dr. William F. Massy, Professor of Education and Business Administration, Director, Stanford Institute for Higher Education Research; Grant period: May 1, 1992–April 30, 1994.)

IMMIGRATION, OFFICER GRANT

Georgetown University **$29,880**
Washington, DC 20057

Support for exploratory research on highly-skilled migration to the U.S. by "non-immigrants." (Project Director: Charles B. Keely, Herzberg Professor of International Migration; Grant period: July 1, 1992–December 31, 1992.)

TRUSTEE GRANTS

The Carnegie Science Center **$155,569**
Pittsburgh, Pennsylvania 15212

In 1991, the Foundation began an initiative to encourage the emulation of the Junior Academy of the New York Academy of Sciences. This student-run membership organization has, for over a quarter of a century, offered a successful model for encouraging student interest in science, mathematics and engineering. Because it operates outside the established school system and deploys the energies and enthusiasm of its own student members, it is both effective and low in cost.

A similar program at the Franklin Institute was funded in 1991. This grant provides support for the Carnegie Science Center to also establish a Junior Academy of Science.

In addition to developing the program for the Pittsburgh metropolitan area, the Carnegie Science Center includes efforts to network the three student-led groups (in New York, Philadelphia and Pittsburgh). Sloan funds are included to finance occasional joint workshops of the leadership groups from the three academies, with the first such meeting planned for Philadelphia. In addition, efforts are planned to develop computer mail networks that would allow members of the three junior academies to communicate with one another. (Project Director: Dr. David E. Chesebrough, Assistant Director for Allegheny Square Annex; Grant period: July 1, 1992–June 30, 1995.)

Recording for the Blind **$300,000**
Princeton, New Jersey 08540

Recording for the Blind (RFB) is a well established national non-profit organization that has long provided audio tapes of books and other print material for those with visual and other print disabilities. Using a large network of volunteer readers, RFB records written materials on cassette and then provides copies of such cassettes to

users on a free-loan basis. RFB is now working also with the newer technical possibilities and with wider groups of disabled.

The development of powerful personal computers and other hardware has made it possible for the first time to provide texts in computer-readable form, which users can then "read" via a variety of output mechanisms ranging from large-print monitors, to voice synthesizers, to refreshable braille devices. Diskettes of novels and other non-technical materials are now prepared and loaned on the same basis as audio cassettes.

This grant supports a project to develop standard notation and procedures for putting scientific and mathematical material into "E-text", which is the format currently used for electronic or computerized books. This would make it possible to take publishers' computer tapes, edit out typesetting codes and edit in newly-developed notations for scientific and mathematical materials, and then provide such technical texts in computer readable form. (Project Director: Mr. John A. Churchill, Vice President, Production Services; Grant period: January 1, 1993–December 31, 1995.)

Stanford University **$330,262**
Stanford, California 94305

Computer-assisted instruction has proved effective in schools in many curriculum areas including mathematics. However, there has been little experience with computer-based instruction as a means of serious study of mathematics at home. Professor Patrick Suppes, Director of the Institute for Mathematical Studies in the Social Sciences at Stanford, will conduct a pilot experiment to test the efficacy and cost-effectiveness of such a program of home mathematics instruction for adult community college students.

Patrick Suppes was one of the earliest developers of computer-assisted instruction in schools. For the past five years, Suppes and his Stanford graduate students have been using computers to teach math courses, extending through advanced placement calculus, to small groups of gifted elementary and junior high school students.

The present study will seek to determine if this system can be adapted for use with older students studying at home. Twenty young adults will be provided with computer equipment and offered three software-based courses: Algebra I, Algebra II, and Precalculus. The courses will be coordinated through, with credit offered by, Foothill Community College. Contact with the students will be primarily by e-mail and phone conversations, in order to build a cost-effective model of home instruction. A central concern of the study will be the intensity of the support, mathematical and other, necessary to keep the students on track. The final report will document the technical, economic, and human aspects of the project and discuss the feasibility of implementing it on a larger scale. (Project Director: Professor Patrick Suppes, Institute of Mathematical Studies in the Social Sciences; Grant period: May 1, 1992–September 30, 1993.)

EDUCATION OUTSIDE THE CLASSROOM, OFFICER GRANTS

Interactive Educational Systems Design, Inc. **$15,000**
New York, New York 10025

Research on Online Services addressing the educational needs of students at home. (Project Director: Mr. Jay P. Sivin-Kachala, Vice President; Grant period: February 12, 1992–November 12, 1992.)

New School for Social Research **$30,000**
New York, New York 20011

Planning grant to develop a core curriculum in science and mathematics for the adult learner. (Project Director: Dean Elizabeth Dickey; Grant period: June 1, 1992–November 1, 1992.)

TRUSTEE GRANTS

American Mathematical Society **$86,944**
Providence, Rhode Island 02940

The American Mathematical Society publishes 60-80 books a year and 22 journals as well as video tapes and publications on CD-ROM, all intended primarily for the mathematics community. However, until now the Society has not had a regular publication that provides information for a wider audience about recent important developments in the mathematical sciences. What's Happening in the Mathematical Sciences is intended to fill that niche. It will be an annual publication of fifty to seventy-five pages designed to promote broader public understanding of current work in the mathematical sciences and the contributions they make to advances in other fields. The first edition is scheduled to appear during Mathematics Awareness Week in April, 1993.

What's Happening is intended for a broad spectrum of readers, including science administrators, college and university mathematics departments, high school math teachers, government staffs, and science journalists.

Sloan Foundation support will enable the AMS to publish the first year's edition of What's Happening and to distribute it free of charge. Starting with the second annual edition, copies will be offered for sale. (Project Director: Samuel M. Rankin III, Associate Executive Director and Director of Publications; Grant period: January 1, 1993–December 31, 1994.)

The Greater Washington
Educational Telecommunications Association, Inc. **$525,000**
Washington, DC 20013

With this grant, WETA and Hedrick Smith Productions, Inc. will collaborate on a four-part documentary series entitled Challenge to America. It will serve as a complement to Made in America?.

The series will compare the economic performance of the United States, Germany, and Japan and examine how each country's performance is affected by its social values and the character of its institutions. The style will be journalistic, not didactic. "Personal case histories" will be presented to document the cultural differences and contrasting business practices of the three countries. Central to these stories about people is the understanding that a society's use of its human resources determines in no small measure its economic success or failure.

The first program, The Stakes and the Race, will show, in human terms, the stakes of the global economic competition for individual Americans and for the nation.

The second program, The Heart of the Nation, will sketch in broad strokes the central values of the United States, Japan and Germany. The third program, The Culture of Commerce, will explore the systemic differences between the individualistic capitalism of America and Britain and the communitarian capitalism of Japan and Germany. The final program, Strategies for the Future, will show strategies that American companies, communities, and political leaders have begun to implement to recapture the United States' competitive edge and to regenerate its strengths. The series will be completed for broadcast early in 1994. (Project Director: Hedrick Smith-Author/Journalist/Producer, Johns Hopkins Foreign Policy Institute; Grant period: October 6, 1992–December 31, 1994.)

National Public Radio **$400,000**
Washington, DC 20036

Mass media coverage of modern technologies and their significance for the U.S. economy is very limited. This grant will support the development of a specialized technology reporting capacity within the Science Desk of National Public Radio's (NPR) news and information programming.

The NPR Science Desk, created in 1980 with support from the National Science Foundation, has established a reputation for the quality, depth and balance of its reporting on complex scientific issues. Science Desk stories appear regularly on NPR's daily programs All Things Considered, Morning Edition, and Weekend Edition.

This grant will enable NPR News to extend its currently occasional coverage of modern technologies, and the public policy issues surrounding them, into a full-time activity for a senior reporter assisted by others. A sophisticated technology reporting capacity can add an important dimension to much of NPR's general news coverage. NPR technology reporters will also provide All Things Considered and Morning Edition with documentary-length stories on technological innovation, creativity and production. Finally, NPR plans to produce radio profiles of the men and women who shape technological developments. (Project Director: Anne Gudenkauf, Senior Editor, Science Desk, National Public Radio; Grant period: May 1, 1992–April 30, 1994.)

Research Foundation of the City University of New York **$30,000**
New York, New York 10003

Science and Engineering Television Network (SETN) **$40,000**
New York, New York 10040

The Science and Engineering Television Network (SETN) is a special interest cable television service for America's science and engineering communities. The first broadcast took place in April 1992. SETN is planning to air about 30 hours of pilot programming tailored to the interests and needs of America's 5.3 million scientists and engineers. This will cover a wide range of fields in the physical sciences, life sciences, and engineering and is designed to supplement professional science and engineering journals with timely, visual reports on current research and other matters of interest both within and across disciplines. The Sloan Foundation is providing support for planning the production, broadcast, and evaluation of pilot programs for SETN. (Project Director: Mr. Gary Welz, Adjunct Lecturer in Mathematics, (CUNY) and President, SETN; Grant periods: February 15, 1992–August 15, 1992 (CUNY) and April 7, 1992–October 31, 1992 (SETN).)

WGBH Educational Foundation **$3,500,000**
Boston, Massachusetts 02134

With funding from the Foundation, WGBH-TV (Boston) will produce an anthology series on women in science consisting of six one-hour documentary films to be aired over the Public Broadcasting Network in the 1993 winter season.

Each hour will be a self-contained program presenting the life and work of one prominent woman scientist. These will be women at the top of their fields who have ignored or overcome the myriad pressures and prejudices which have for generations discouraged women from entering science as a career. Driven by creative curiosity and devoted to the pursuit of scientific excellence, the women profiled in the series should attract a wide general audience with their enthusiasm for their work and their inspiring personal stories.

Recognizing that not all scientists are superstars, the series will include as secondary characters, many other women—teachers, colleagues, graduate students and mentors—who, while not as well-known as the principal character, share their commitment to science and to scientific inquiry.

To ensure that the series' educational impact reaches far beyond the initial broadcasts, WGBH has designed a national outreach campaign and developed an array of companion materials to support the series' use in elementary, middle, and high school classrooms throughout the country. WGBH will work with the National Science Teacher's Association and other organizations to develop meaningful companion projects and reinforce one of the series' goals of encouraging girls to consider careers in science. (Project Director: Ms. Judy Crichton, Executive Producer, The American Experience, WGBH/Boston; Grant period: June 16, 1992–December 31, 1993.)

OFFICER GRANTS

Carnegie Institution of Washington **$20,000**
Washington, DC 20005

Partial support of the 1993-94 Capital Science Lectures. (Project Director: Dr. Maxine Singer, President; Grant period: December 7, 1992–December 31, 1994.)

Cornell University **$28,645**
Ithaca, New York 14853

For partial funding of "Across Space and Time", a PBS documentary on the Green Bank Telescope and the science of radio astronomy. (Project Director: Dr. Martha P. Haynes, Professor of Astronomy, Space Sciences Building, Cornell University; Grant period: July 1, 1992–December 31, 1992.)

The Foundation will attempt to contribute to the major issues of our time, but in a way appropriate to its expertise and size. Usually this requires a special approach so that a meaningful contribution can be made to issues and problems that are widely recognized. The Foundation will pursue work in those areas where such an approach can be developed that will enhance understanding of complex issues.

While no major projects were funded in 1992, studies which were funded earlier in 1990 and 1991 are ongoing and include research on the public perception of nuclear power, the long-term clean-up of radioactive waste at federal reactor sites, deep ocean waste disposal options, and a comparative analysis of American and European experiences with different programs and policies regarding illicit drugs. A brief review of these projects is contained in the General Information section of this report.

TRUSTEE GRANTS

New York Public Library **$93,000**
New York, New York 10018

The New York Public Library plans to open a major new research center in 1995, on the site of the former B. Altman department store on Madison Avenue and 34th Street, that will be devoted to science, industry, and business. The Science, Industry and Business Library (SIBL) will serve large and small business, educators, and students, as well as the corporate community, in ways that will benefit the local and regional economies.

SIBL will bring together in one place materials from the science, technology, economics, and business collections now housed at the 42nd Street Center, and will add new acquisitions. The new library will feature indexes, abstracts, data bases, the U.S. Census in digital format, government documents via compact disks and dial-access to government computers, international trade data, world scientific and business journals, corporate annual reports and SEC filings, as well as basic texts and reference works. This Sloan grant will support planning and trials over the next year aimed at developing systems for facilitating electronic on-site access to SIBL's collections. (Project Director: William D. Walker, Associate Director for the Science, Industry and Business Library, New York Public Library; Grant period: January 1, 1993–January 31, 1994.)

New York University **$200,000**
New York, New York 10003

Manufacturing plays an important role in New York City with regard to specialized, custom-made products in the apparel, furniture, printing, machine tool, metal-working, and food-processing industries. There are currently hundreds of such firms operating in New York, typically with several dozen employees, located in the boroughs outside Manhattan, and drawing significantly on recent immigrants for their work force.

The Urban Research Center of New York University will study these firms to identify the common traits that have made for survival and success, and to suggest policies that city, state, and regional government should follow to encourage further growth of manufacturing. Such growth, even if modest, would be beneficial to New York, because of the relatively high wages that manufacturing jobs offer to workers with limited formal education.

The output of this research will be both a written report and a series of seminars and conferences designed to focus public attention on manufacturing. (Project Director: Professor Mitchell L. Moss, NYU-Director-Urban Resources Center, R.F. Wagner School of Public Service; Grant period: January 1, 1993–December 31, 1994.)

SPECIAL PROJECTS

OFFICER GRANT

The Business Enterprise Trust **$30,000**
Stanford, California 94305

Support for planning, research and development on their future program. (Project Director: Mr. Kirk O. Hanson, President; Grant period: April 21, 1992–October 31, 1992.)

ADDITIONAL GRANTS

OFFICER GRANTS

Council on Foundations, Inc. **$24,700**
Washington, DC 20036

General support (Membership dues). (Project Director: Mr. James A. Joseph, President; Grant period: January 1, 1992–December 31, 1992.)

Independent Sector **$7,400**
Washington, DC 20036

General support (Membership dues). (Project Director: Jeanne Bohlen, Vice President, Membership and Development; Grant period: January 1, 1992–December 31, 1992.)

New York Regional Association of Grantmakers **$7,125**
New York, New York 10018

General support (Membership dues). (Project Director: Ms. Barbara Bryan, Executive Director; Grant period: January 1, 1992–December 31, 1992.)


ALFRED P. SLOAN FOUNDATION
1934

FINANCIAL REVIEW

The financial statements and schedules of the Foundation, which have been audited by Ernst & Young, independent auditors, appear on pages 105 to 114. They include balance sheets, statements of income, expenses and changes in fund balance and changes in financial position, and schedules of management and investment expenses.

Investment and other income for 1992 was $37,557,600, an increase of $2,433,014 from $35,124,586 in 1991. After the deduction of investment expenses and provision for Federal excise tax from investment and other income, net investment income was $34,286,881 in 1992 as compared with $32,232,276 for the prior year. Investment expenses during 1992 totaled $2,270,719 of which $1,737,766 represented investment counsel fees. Provision for Federal excise tax amounted to $1,000,000. The total of these deductions from income in 1992 was $3,270,719 versus $2,792,310 in 1991.

The total of grants and appropriations authorized, net of grant refunds, and management expenses during 1992 was $36,649,976 and was $2,363,095, greater than 1992 net investment income. Of this total, grants and appropriations authorized amounted to $33,997,634 while management expenses were $2,812,942. Since the Foundation's inception in 1934, the cumulative excess of grants and expenses over the Foundation's income has amounted to $15,438,365.

Grant and appropriation payments in 1992 were $32,625,776 compared with $28,626,395 the prior year. Together with management expenses, investment expenses, Federal excise taxes paid and other charges, the total cash expenditures net of grant refunds in 1992 was $43,867,732 while in 1991 the amount was $35,019,668.

FINANCIAL REVIEW

Grants and appropriations authorized and payments made during the year ended December 31, 1992 are summarized on the following table:

Grants and appropriations unpaid at December 31, 1991	**$29,136,574**
Authorized during 1992	33,997,634
	63,134,208
Payments during 1992	32,625,776
Grants and appropriations unpaid at December 31, 1992	**$30,508,432**

The market value of the Foundation's total assets was $775,698,874 at December 31, 1992 including investments valued at $775,906,065 as compared with total assets of $727,641,989 at December 31, 1991.

AUDITORS' REPORT

Report of Ernst & Young
Independent Auditors

Board of Trustees
Alfred P. Sloan Foundation

We have audited the accompanying balance sheets of the Alfred P. Sloan Foundation as of December 31, 1992 and 1991, and the related statements of income, expenses and changes in fund balance and changes in financial position for the years then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. 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 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 Alfred P. Sloan Foundation at December 31, 1992 and 1991, and the results of its operations and changes in its fund balance and financial position for the years then ended in conformity with generally accepted accounting principles.

Our audits were conducted for the purpose of forming an opinion on the basic financial statements taken as a whole. The accompanying other financial information of management and investment expenses for the years ended December 31, 1992 and 1991 is presented for purposes of additional analysis and is not a required part of the

basic financial statements. Such other financial information has been subjected to the auditing procedures applied in our audits of the basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

Ernst + Young

January 29, 1993

Assets	1992	1991
INVESTMENTS:		
Fixed income:		
Government and agency	$146,576,613	$134,596,349
Corporate and other	144,477,540	173,263,732
	291,054,153	307,860,081
Equity:		
General Motors Corporation	17,244,708	17,244,708
Other	360,654,639	283,294,403
	377,899,347	300,539,111
Other	20,845,334	21,799,082
Total investments	689,798,834	630,198,274
INTEREST PURCHASED	252,876	1,040,159
CASH	(460,067)	77,653
Total	**$689,591,643**	**$631,316,086**
Liabilities and Fund Balance		
GRANTS AND APPROPRIATIONS UNPAID	$ 30,508,432	$ 29,136,574
OTHER	210,537	4,631,446
FUND BALANCE	658,872,674	597,548,066
Total	**$689,591,643**	**$631,316,086**

See accompanying notes to financial statements.

STATEMENTS OF INCOME, EXPENSES AND CHANGES IN FUND BALANCE

For the years ended December 31	1992	1991
INVESTMENT INCOME:		
Dividends	$12,630,420	$12,118,898
Interest	24,919,067	23,000,500
Other	8,113	5,188
	37,557,600	35,124,586
LESS:		
Investment expenses	2,270,719	1,935,310
Provision for Federal excise tax	1,000,000	857,000
	3,270,719	2,792,310
Net investment income	34,286,881	32,332,276
Grants and management expenses:		
Grants and appropriations authorized (net of grants refunds of $160,600 in 1992 and $228,044 in 1991)	33,837,034	29,977,323
Management expenses	2,812,942	2,808,716
Total	36,649,976	32,786,039
EXCESS OF INCOME OVER EXPENSES (EXPENSES OVER INCOME)	(2,363,095)	(453,763)
NET GAIN ON DISPOSALS OF SECURITIES	63,687,703	58,364,588
NET INCREASE IN FUND BALANCE FOR YEAR	61,324,608	57,910,825
FUND BALANCE–BEGINNING OF YEAR	597,548,066	539,637,241
FUND BALANCE–END OF YEAR	$658,872,674	$597,548,066

See accompanying notes to financial statements.

STATEMENTS OF CHANGES IN FINANCIAL POSITION

For the years ended December 31	1992	1991
SOURCE OF FUNDS:		
Investment income	$37,557,600	$35,124,586
Net gain on disposals of securities	63,687,703	58,364,588
Other	897,986	5,518,705
	102,143,289	99,007,879
APPLICATION OF FUNDS:		
Grant and appropriation payments (net of grant refunds of $160,600 in 1992 and $228,044 in 1991)	32,465,176	28,398,351
Management expenses	2,812,942	2,808,716
Investment expenses	2,270,719	1,935,310
Federal excise taxes and other	6,318,895	1,877,291
	43,867,732	35,019,668
INCREASE (DECREASE) IN FUNDS CONSISTING OF:		
Cost of investments	59,600,560	64,276,405
Interest purchased	(787,283)	(314,191)
Cash balances	(537,720)	25,997
NET INCREASE	$58,275,557	$63,988,211

See accompanying notes to financial statements.

1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation

The accompanying financial statements have been prepared substantially on the accrual basis of accounting and, accordingly, reflect all significant assets and liabilities. Investment income and investment and management expenses are recorded on the cash basis, the effect of which on the accompanying financial statements is not materially different from the accrual basis.

Accounting for Investments

Investments purchases are recorded at cost. Investments received by gift or bequest are recorded at market value at date of such gift or bequest. Gains or losses on disposal of investments are determined generally on a first-in, first-out basis, but in certain instances the specific identification basis is used. Net gain or loss on disposal of securities is applied to the principal section of the fund balance. Market value for traded securities is based on quoted market prices and real estate investments are reported at estimated fair values based upon appraisals as determined by the manager of the real estate interest.

Grants, Appropriations and Federal Excise Tax

Grants and appropriations are accrued at the time authorized by the Trustees and federal excise tax is accrued in the year to which it relates.

2. FINANCIAL INSTRUMENTS WITH OFF-BALANCE SHEET CREDIT OR MARKET RISK

The Foundation's investment strategy incorporates off-balance sheet financial instruments. These instruments include financial futures, forward foreign currency contracts, loaned securities and securities sold, not yet purchased. Off-balance sheet

financial instruments involve, to varying degrees, elements of market risk and credit risk in excess of the amounts recorded on the balance sheet.

The Foundation is subject to market risk associated with the changes in the value of the futures contracts. The Foundation held S&P 500 and U.S. Treasury futures contracts at December 31, 1992 and 1991 valued at approximately $50.6 million and $78.6 million, respectively. This amount, however, may differ from the Foundation's future cash requirements as the Foundation may close out futures positions prior to settlement and thus be subject only to the change in value of the futures contracts. The net appreciation in the market value as of December 31, 1992 and 1991 of the outstanding futures contracts, amounting to $1.2 million and $5.5 million, respectively has been deferred and included in other liabilities until the contracts expire or are closed out. The margin requirements on deposit with a third party for futures contracts were approximately $2.7 million at December 31, 1992 and $2.8 million at December 31, 1991.

During the year ended December 31, 1992, the Foundation purchased forward foreign currency contracts as a hedge against fluctuations in currency prices. The Foundation held forward foreign currency contracts at December 31, 1992 valued at approximately $41.2 million.

Securities sold, not yet purchased ($24.5 million at December 31, 1992 recorded net in the Foundation's investment accounts) have market risk to the extent that the Foundation, in satisfying its obligations, may have to purchase securities at a higher value than recorded. Required collateral is held by a third party.

Management does not anticipate that losses, if any, resulting from its market or credit risks would materially affect the financial position and statement of income, expenses and changes in fund balance of the Foundation.

3. INVESTMENTS

Investments at December 31, 1992 are summarized as follows:

	Cost	Market	% of Total Investment
Fixed income:			
Government and agency	$146,576,613	$151,582,002	19.5
Corporate and other	144,477,540	145,458,799	18.8
	291,054,153	297,040,801	38.3
Equity:			
General Motors Corporation	17,244,708	20,640,000	2.7
Other	360,654,639	438,626,755	56.5
	377,899,347	459,266,755	59.2
Real Estate:	20,845,334	19,598,509	2.5
	$689,798,834	$775,906,065	100.0

At December 31, 1991, the market value of investments exceeded cost by $96,325,903.

4. SECURITIES LENDING PROGRAM

Through a securities lending program managed by its investment advisor, the Foundation loans certain stocks and bonds included in its investment portfolio. The Foundation's investment advisor has indemnified the program. The Foundation's gross securities loaned to certain borrowers at December 31, 1992 amounted to $49 million.

5. RETIREMENT PLAN

The Foundation has a defined contribution retirement plan covering substantially all employees under arrangements with Teachers Insurance and Annuity Association of America and College Retirement Equities Fund which provides for the purchase of annuities for employees. Retirement plan expense amounted to $208,260 and $191,397 in 1992 and 1991, respectively.

In addition, the Foundation provides certain health care and life insurance benefits for retired employees. The Foundation recognizes the cost of providing nonpension benefits to retired employees ($54,467 in 1992 and $50,466 in 1991) on a pay-as-you-go basis. FASB Statement 106, Employer's Accounting for Postretirement benefits Other Than Pensions, requires that the projected future cost of providing postretirement benefits be recognized as an expense as employees render service instead of when the benefits are paid. The Foundation will be required to comply with the new rules, which will have an immaterial impact on the Foundation's financial position, beginning in 1995.

6. LEASE

The Foundation's lease for its office space expires December 31, 1998. The lease contains an escalation clause which provides for rental increases resulting from increases in real estate taxes and certain other operating expenses. Under the lease, rent expense amounted to $372,360 and $629,483 in 1992 and 1991 respectively. At December 31, 1992, base rent commitments aggregate approximately $2,426,000 and are payable at approximately $404,000 annually.

7. FUND BALANCE

Fund balance at December 31 is comprised of the following:	**1992**	**1991**
Principal	$674,311,039	$610,623,336
Income—cumulative excess of grants and expenses over income from inception of the Foundation	(15,438,365)	(13,075,270)
Fund balance	$658,872,674	$597,548,066

SCHEDULES OF MANAGEMENT AND INVESTMENT EXPENSES

For the years ended December 31	1992	1991
Management Expenses		
Salaries and employee benefits:		
Salaries	$1,556,091	$1,414,162
Employees' retirement plan and other benefits	501,113	439,507
Total	2,057,204	1,853,669
Rent	372,360	629,483
Program expenses	464,616	399,917
Office expenses and service	337,283	342,470
Reports and publications	50,539	51,590
Professional fees	63,893	57,628
Total management expenses	3,345,895	3,334,757
Less management expenses applicable to investments	532,953	526,041
Management expenses applicable to grant making	$2,812,942	$2,808,716
Investment Expenses		
Investment counsel fees	$1,737,766	$1,409,269
Management expenses applicable to investments	532,953	526,041
Total investment expenses	$2,270,719	$1,935,310

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1993 ANNUAL REPORT

ALFRED P. SLOAN FOUNDATION

Alfred P. Sloan, Jr.
1875-1966

LIFE OF ALFRED P. SLOAN, JR.

Alfred Pritchard Sloan, Jr., was born in New Haven, Connecticut, May 23, 1875, the first of five children of Alfred Pritchard Sloan, Sr., and Katherine Mead Sloan. His father, a machinist by training, was then a partner in a small company importing coffee and tea. In 1885 the family moved to Brooklyn, where it was particularly active in the Methodist Church. (Young Alfred's maternal grandfather was a Methodist minister.) Alfred, Jr., excelled as a student both in the public schools and at Brooklyn Polytechnic Institute where he completed the college-preparatory course. After some delay in being admitted to the Massachusetts Institute of Technology (which considered him too young when he first applied), he matriculated in 1892 and took a degree in electrical engineering in three years as the youngest member of his graduating class.

Mr. Sloan began his working career as a draftsman in a small machine shop, the Hyatt Roller Bearing Company of Newark, New Jersey. At his urging, Hyatt was soon producing new antifriction bearings for automobiles. In 1898 he married Irene Jackson of Roxbury, Massachusetts. The next year, at age 24, he became the president of Hyatt, where he supervised all aspects of the company's business. Hyatt bearings became a standard in the automobile industry, and the company grew rapidly under his leadership. In 1916 the Hyatt Roller Bearing Company, together with a number of other manufacturers of automobile accessories, merged with the United Motors Corporation, of which Mr. Sloan became President. Two years later that company became part of the General Motors Corporation (itself established in 1908 as the General Motors Company), and Mr. Sloan was named Vice President in Charge of Accessories and a member of the Executive Committee.

He was elected President of General Motors in 1923, succeeding Pierre S. du Pont, who said of him on that occasion: "The greater part of the successful development of the Corporation's operations and the building of a strong manufacturing and sales organization is due to Mr. Sloan. His election to the presidency is a natural and well-merited recognition of his untiring and able efforts and successful achievement." Mr. Sloan had developed by then his system of disciplined, professional management that provided for decentralized operations with coordinated centralized policy control. Applying it to General Motors, he set the Corporation on its

course of industrial leadership. The next 23 years, with Mr. Sloan as Chief Executive Officer, were years of enormous expansion for the Corporation and of a steady increase in its share of the automobile market.

In 1937 Mr. Sloan was elected Chairman of the Board of General Motors. He continued as Chief Executive Officer until 1946. When he resigned from the chairmanship in 1956, the General Motors Board said of him: "The Board of Directors has acceded to Mr. Sloan's wish to retire as Chairman. He has served the Corporation long and magnificently. His analysis and grasp of the problems of corporate management, his great vision and rare good judgement, laid the solid foundation which has made possible the growth and progress of General Motors over the years." Mr. Sloan was then named Honorary Chairman of the Board, a title he retained until his death on February 17, 1966. For many years he had devoted the largest share of his time and energy to philanthropic activities, both as a private donor to many causes and organizations and through the Alfred P. Sloan Foundation, which he established in 1934.

Mr. Sloan, as a realist as well as a humanist and philanthropist, looked upon the Foundation as an extension of his own life and work. Although he recognized the inevitability of change that might dictate a different course, he expected that the Foundation would "continue as an operating facility indefinitely into the future...to represent my accomplishments in this life." His accomplishments during his lifetime were of the highest order, and in themselves provide the most dramatic and lasting tribute to his extraordinary talent. Through the Foundation, his accomplishments have been extended and expanded.

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TRUSTEES

COMMITTEES OF THE BOARD OF TRUSTEES

Executive Committee

Howard W. Johnson, Chairman

Stephen L. Brown — Frank Press

Ralph E. Gomory — Harold T. Shapiro

Investment Committee

Stephen L. Brown, Chairman

S. Parker Gilbert — Howard W. Johnson

Ralph E. Gomory — Harold T. Shapiro

Robert M. Solow

Audit Committee

Lewis T. Preston, Chairman

Stephen L. Brown — Cathleen S. Morawetz

ADMINISTRATIVE OFFICERS AND STAFF 1993

Ralph E. Gomory
President

Stewart F. Campbell
Financial Vice President and Secretary

Arthur L. Singer, Jr.
Vice President

Hirsh G. Cohen
Program Officer

Maureen Gassman
Assistant Secretary

Samuel Y. Gibbon, Jr.
Program Consultant

Ted Greenwood
Program Officer

A. Frank Mayadas
Program Officer

Christopher T. Sia
Controller

Michael S. Teitelbaum
Program Officer

Harry Weiner
Program Consultant

GENERAL INFORMATION

INTRODUCTION

"In managerial technique I emphasize the necessity of the scientific approach; this affects men, tools and methods. Many associate the word scientific with physics. But it means a constant search for the facts—the true actualities—and their intelligent, unprejudiced analysis. Spend any proper amount of money to get the facts. Only by increased knowledge can we progress, perhaps I had better say survive."

—Alfred P. Sloan, Jr.

The Alfred P. Sloan Foundation, a philanthropic non-profit institution, was established by Alfred P. Sloan, Jr. in 1934. During 1993, the Sloan Foundation authorized grants totaling $31 million. The market value of the Foundation's total assets at the end of 1993 was $850 million.

PROGRAMS AND INTERESTS

The main interests and programs of the Foundation are concentrated primarily in four areas:

- Science and Technology
- Standard of Living, Competitiveness, and Economics
- Education and Careers in Science and Technology
- Selected National Issues

This section provides a brief description of the Foundation's evolving program in each of these areas.

Science and technology are major interests of the Foundation. Fellowships account for expenditures of more than $4 million annually. Grants for the direct support of research in selected fields, for studies of the research process, and for work in the history of science and technology are also important components of the Foundation's program.

FELLOWSHIPS

Sloan Research Fellowships are awarded in chemistry, computer science, economics, mathematics, neuroscience, and physics. (Computer science, just added to the program, will have its first ten fellowships awarded in 1994.) These are competitive grants given to young faculty members with high research potential on the recommendation of department heads and other senior scientists. Information on these fellowships, as well as ***Sloan Dissertation Fellowships*** in economics and mathematics, may be obtained by inquiry to the Foundation.

DIRECT SUPPORT OF RESEARCH

The Sloan Foundation seeks to identify areas of scientific research that are or have the potential to become significant, but are either neglected by major governmental funding agencies or do not fit well within their disciplinary structures or program orientations.

Molecular Evolution was one such area when Foundation support began in 1986. Since then, important new insights into the process of evolution have been developed, and evolutionary perspectives have entered into the mainstream of molecular biology. Beginning in 1994, the program will follow two new paths. Together with the National Science Foundation, there will be a jointly-funded and operated program of post-doctoral research fellowships. Also, a program of support for young scientists in molecular evolution, configured so as to complement the new joint NSF-Sloan postdoctoral program, will be initiated.

Another area for direct support of research is a major ***Sky Survey Project.*** Since 1992, Foundation grants totaling $8 million have been made for the Sloan Digital Sky Survey. The astronomical survey, using a specially designed telescope system and complex new software, will produce three-dimensional position and spectrographic information for a million galaxies and one hundred thousand quasars. The five-year construction plan is more than half completed, supplementary funding continues to grow, and the observational program of the northern skies is scheduled to begin in 1996.

A new research program in ***theoretical neurobiology*** will be undertaken in 1994.

During 1992, the Foundation began a program of selective grants aimed at preserving those sectors of ***science in the former Soviet Union*** that represented leading components of the worldwide scientific enterprise. Support has been given to American scientific societies in astronomy, crystallography, mathematics, and physics, all of which have initiated direct efforts to preserve the quality core of their fields in Russia and other former Soviet republics.

The Foundation is interested in learning more about the ***working of the university science and engineering system.*** Support in this area was initiated in 1992 with a grant to William F. Massey at Stanford University to work on a university-based model of the production of Ph.D.'s in scientific and engineering fields. During 1993 a special issue of *Daedalus* entitled The American Research University was published with Foundation support. Other efforts in this area are being explored.

Support continues, mainly by officer grants, for special-purpose conferences and workshops in mathematics, physics, and other fields.

HISTORY OF SCIENCE AND TECHNOLOGY

Work continued during the year on the Foundation's ***three long-term projects:*** The Collected Papers of Albert Einstein, The Thomas A. Edison Papers, and The Correspondence of Charles Darwin.

Two additions to the Sloan ***series of books*** on eminent 20th century scientists were

published in 1994: Robert L. Sinsheimer's The Strands of a Life: The Science of DNA and the Art of Education, University of California Press, and Abraham Pais's Einstein Lived Here, Oxford University Press. Volume 1 of a biography of Hans Bethe is due in 1995.

With Foundation support, preliminary steps have been completed in the development of a ***new American history textbook*** that will give proper emphasis to the role science and technology have played throughout the country's history. The book will be structured as a narrative and will be targeted at both college students and a general trade audience. The authors, Daniel Kevles (Cal Tech), Alex Keyssar (Duke), Pauline Maier (MIT), and Merritt Roe Smith (MIT), are now at work on this multi-year writing project.

STANDARD OF LIVING, COMPETITIVENESS, AND ECONOMICS

The goal of this program is to contribute to the understanding of the basic forces making for American economic prosperity in an increasingly competitive world economy.

ECONOMICS

The economics program is centered on the contribution which economic analysis can make to understanding competitiveness. For example, among several Sloan-supported studies from the Institute for International Economics was Laura D'Andrea Tyson's Who's Bashing Whom? Trade Conflict in High-Technology Industries. This 1993 book contains detailed case studies of trade disputes between the United States, Japan, and Europe with respect to various high-technology products and discusses policies to promote U.S. competitiveness.

A 1994 grant to a team of economists at the National Bureau of Economic Research supports ***empirical industry research.***

INDUSTRY STUDIES

The primary goal of this program is to create academic groups, both faculty and students, with direct knowledge of industry. Over time, this should lead to observations, data, and concepts that will be useful to American companies and also will contribute to better governmental understanding of important sectors of the economy. As part of the work by faculty and graduate students at the Sloan Centers for the study of various industries, more than 450 companies have been visited. Almost 40 Ph.D. theses have been completed and many more are underway.

The Center studying ***competitiveness in the steel industry*** at Carnegie Mellon University and the University of Pittsburgh has engaged 25 faculty and 25 students in studies that range from technology through human resource management to firm strategy and corporate management. Fifty steel mills, mini and integrated, have been visited and 500 employees at all levels have been interviewed. Material from the various studies is being used in many courses in engineering economics and business.

The ***International Motor Vehicle Program*** at MIT has now completed its second assembly plant survey and is studying differences in production and quality among the large regional groups (Japan, United States, Japanese transplants, Europe) and also variations in performance of plants within these groups. Work on recycling and on appropriate materials in new car design is ongoing.

The overall operation of chip fabrication plants is the main subject of study at the ***Center for Competitive Semiconductor Manufacturing*** at the University of California, Berkeley. Variation among surveyed plants turns out to be large and learning curves for new chip introductions are very different. This observation has led to a special study of the way manufacturers organize the hand-off from development to manufacturing.

The ***Computer Industry Center*** at Stanford University is expanding its survey of product demand and changes in computer usage beyond the 90 firms initially interviewed. Twelve faculty and more than 20 students, with 16 Ph.D. theses underway, are working with this Center.

At a 1993 workshop organized by the ***Program on the Pharmaceutical Industry*** at MIT, price regulation methods in various countries were presented and compared. Material from these studies now appears in chemical engineering, technology management, and economics courses, and there have been courses for company managers each summer. Twenty faculty and 28 students are at work in the Program.

At Harvard University, the ***Center for the Apparel and Textile Industry*** has continued its approach of viewing the retail-manufacturer-textile channel from the retail end. More than a dozen faculty and graduate students, as well as a number of undergraduates, are involved in various parts of this Center's work.

The Wharton ***Center for the Financial Services Industry*** is studying productivity and its relation to technology and also risk-adjusted performance measures across the industry, among banking, insurance, and investment firms. Twenty faculty and 14 Ph.D. students are at work on various Center projects.

The newest of the industry studies is the ***Powder Metals Industry Center*** at Worcester Polytechnic Institute. Powder metal parts are important components in automobiles, aircraft, and other primarily mechanical products. Research topics include supplier-customer relations, interfirm collaboration, and global marketing.

The ***Industrial Performance Center*** at MIT, whose purpose is to pursue common elements from the various industry studies, is concentrating its work on three major areas: new product design and development, human resource management practices, and the process equipment supply chain. Twenty faculty and 25 graduate students are now working with the Center.

EDUCATION AND TRAINING FOR MANUFACTURING

The Foundation's support of manufacturing education, from high school apprenticeships to Ph.D. programs, has been based on the view that manufacturing is a key area for the United States but has been receiving relatively little academic attention.

At the graduate level, the ***Stanford Ph.D. program*** aims to prepare professors of manufacturing. Several of the students are already beginning fieldwork for their thesis research. All of the special courses, emphasizing manufacturing and developed with Sloan support, have attracted a large number of business and industrial engineering students.

In Cornell's ***masters in manufacturing program,*** students spend an entire semester in one course, thus allowing for time to be spent outside of the classroom in plants and company offices. At Northwestern, the master's level course in manufacturing has become very popular and is attracting students from other MBA concentrations and engineers from industry.

The Foundation is exploring means by which the considerable amount of curricular material in manufacturing that has been developed over the past years in its manufacturing education program can be made available to a larger audience.

At the *community college level*, the Foundation's grant to Regional Technology Systems supports a wide variety of projects undertaken by The Consortium for Manufacturing Competitiveness, a group of fourteen community colleges, one in each of fourteen southeastern states.

Apprenticeships for high school students is also an interest of the Foundation. The Pennsylvania Youth Apprenticeship Program (PYAP), now in its third year, involves high school juniors and seniors working at factories for half of the school week and taking full credit in specially prepared academic subjects for the other half. Wide interest has been shown in the curricular materials, classroom approaches, and teacher training developed in the PYAP, as the states respond to an invitation from the Department of Education and Labor to apply for planning grants. Major governmental grants for apprenticeship programs are expected to go to several states, with others to be added later.

The Foundation is considering support of a study of the school-to-work transition programs that have been operating across the country for the past several years. These include apprenticeships, new technical ("tech prep") high schools, and occupational academies. The role of technicians in the workplace is another subject of interest to the Foundation.

HUMAN RESOURCES MANAGEMENT

Reflecting the Foundation's belief that human resources management is one of the most important areas for improving U.S. industrial productivity, a network of experts was funded late in 1992. The principal researchers in the field from universities across the country make up the core of the network. Working groups on white collar issues and on human resource innovations and their diffusion are underway, and the network has served to highlight common human resource issues involved in the various Sloan industry studies.

Working with Foundation support, Eileen Appelbaum and Rosemary Batt completed a book entitled High Performance Work Systems, the first comprehensive review of how

widespread such systems are and why organizational change is not more prevalent.

A grant for a pilot project to survey workers in the apparel industry for their reactions to new methods of work may suggest future support for a large-scale, multi-industry survey.

ROLE OF THE CORPORATION

With a Sloan grant, MIT's Carl Kaysen is organizing a group of essayists to produce a volume on the present day corporation, its place in our society, its changing nature, and the social consequences of its structure and operation.

Early in 1994 and with Foundation support, WNET produced a Socratic dialogue (the program was aired in March) on the changing role of the corporation as an economic and cultural institution.

The Foundation continues to be interested in stimulating new research and education on the corporation and society, focused on empirical inquiry into how corporate goals and behavior relate to profitability, long-term growth, market share, and cultural impact. Also of interest is work on alternative forms of capitalism on the international stage.

WORKPLACE AND FAMILY

Although two-worker families have become more common than the traditional single-male-worker family, the work environment has changed very little. Nine-to-five, forty hour jobs are still the norm, with the result that family life and relationships, especially with children, have been significantly changed. New arrangements, such as day-care centers and after-school schools, are increasingly important.

The Foundation's interest in this topic resulted in recent grants for a study of the effects of working full-time or part-time on women and their families, and for two workshops on the role of women in part-time work. Further studies are being planned of the availability of work for those who have professional, college-graduate qualifica-

tions and want to work part-time. This is especially relevant for younger women with families and for people nearing retirement age.

COMPETITIVENESS STUDIES

With Foundation support, the ***Consortium on Competitiveness***, a combined effort of faculty and students at Berkeley, Columbia, Harvard, MIT, Pennsylvania, and Stanford, continues to serve as a central focal group for scholarly work on managing and using technologies in companies and industries. Ten books, over 100 articles, a new journal, numerous workshops and conferences, and new Ph.D.'s have resulted from Consortium efforts. The Foundation is supporting the work of the Board on Science, Technology and Economic Policy of the National Research Council, whose charter is to forward the relationship between economic and technical policy issues. Also being supported are two fellowship programs aimed at bringing knowledge of industry into key areas of the executive branch, one which sends experienced industry people to the Office of Science and Technology Policy, the other which provides engineers with extensive industrial experience to the Technology Administration of the U.S. Department of Commerce.

Beginning in 1989, the Foundation has made a number of grants directed toward better understanding the impacts of the ***U.S. liability system*** upon economic performance. A recent activity in this area was a conference on Liability and Product Innovation, organized by the National Academy of Engineering. Also, a renewal grant to the Rand Institute for Civil Justice will support continued research on how the product liability system shapes the real and perceived incentives facing companies as they make their business decisions.

EDUCATION AND CAREERS IN SCIENCE AND TECHNOLOGY

Programs to strengthen science and engineering education and to increase interest in these fields have long been supported by the Foundation. One key area is ***career choice***. Having chosen, there is the problem of ***retention***. Increasingly important are opportunities presented by electronic technologies for ***learning outside the classroom***. Influencing all this is the ***public perception of science and technology***. In addition there are issues relating to special groups, such as ***especially interested younger students*** and the ***immigrant*** population of scientists and engineers. And there is the continuing problem of the underrepresentation of ***minorities and women*** in science and engineering professions.

CAREER CHOICE

The Foundation's objective is to understand how American students develop interests in and then proceed toward careers in science and engineering. A major grant to the University of Chicago supports a six-year longitudinal study in which a rich and large amount of data is being gathered in ten junior and senior high school systems across the U.S. and also across economic, social, and ethnic groupings. The project is expected to yield important information on how career and work ideas develop for young students. A companion study of how college students develop knowledge about occupations and choose a field of work is being considered.

RETENTION

The first Sloan-funded study of retention focused on students at four Colorado colleges and universities who switched out of science and engineering and on those who stayed. An early hypothesis generated in this ethnographic research, that "weeding out" was harshly removing students of high caliber and that engineering and science faculty alienated students by their teaching methods, has attracted wide attention and generated much discussion. A study at Berkeley confirms the tentative finding of no significant difference in scores and grades between switchers and stayers. A second grant to the University of Colorado researchers, Elaine Seymour and Nancy Hewitt, is supporting a test of these first results and methods at three large universities in other parts of the country. Preliminary results so far are consistent with

those of the earlier study. A project conducted by Dartmouth on its own students and those at Brown, Cornell, and Yale, showed that both switchers and stayers felt that science is not taught as well as the social sciences and humanities. For these eastern schools, the main reason for leaving science and engineering studies was a positive attraction to another field.

The Foundation's interest in retention issues has been extended to graduate education with a recent grant supporting a pilot study of the causes and consequences of departure from doctoral programs before completing a degree.

LEARNING OUTSIDE THE CLASSROOM

The advance of electronic technologies has made it possible to provide education outside the classroom, for those motivated to seek it, in science, mathematics, engineering, and other subjects required in the world of work. The Foundation is supporting innovative approaches based on the use of computers, coupled with modern telecommunication networks, to advance this type of education.

Recent Sloan-supported projects include: recasting physics courses at Cornell University into a form that encourages electronic collaboration, more personalized teaching, and more efficient use of students' time; use of videotape and computer conferencing to establish a B.S. home degree program in Information Systems at New Jersey Institute of Technology; development of a networked Circuits course at the University of Illinois to be available on Internet for both on- and off-campus students; providing at Pennsylvania State University a videotape and voice system for interactive tutoring of engineers at home as they prepare for the Professional Engineers exam; design and delivery of four courses, required for Northern Virginia Community College's Associate of Science degree in Engineering, for home-based learners, by using print, video, audio, and computer conferencing technologies to provide course material and to link students to resources of all kinds, including faculty, tutors, and fellow students; and production of six information systems and software engineering courses by Drexel University's College of Information Studies, using computers and networking to serve students both on and off campus and to permit some degree of self-pacing. Additional

efforts in the use of electronic technologies for application to distance learning continue to be considered for Foundation support.

PUBLIC UNDERSTANDING OF SCIENCE AND TECHNOLOGY

Two television series, The Secret of Life, on DNA, medical genetics and biotechnology, and Challenge to America, on competitiveness in the global economy, both supported by the Foundation, were viewed by millions of people. Another major series, Great Projects in Engineering, in production, will include, among others, a program on the bridges, tunnels, and water system of New York City and another on engineering projects along the Mississippi and Colorado rivers. Explorations are underway to give technology a larger role in WGBH's series The American Experience.

The Foundation is also supporting a new effort by National Public Radio to increase the ***reporting of technology***. Some examples of such reports, many featured on NPR's popular news magazine programs, include a four-part series on manufacturing, and stories on computer and communication technologies, electronic superhighways, and biotechnology.

Commissioning of the ***Technology Book Series*** was completed in 1993 and 23 books are now in preparation on major technologies of the twentieth century. The series is expected to make an important contribution to the public understanding of technology.

ESPECIALLY INTERESTED STUDENTS

Beginning in 1992, the Foundation has supported the efforts of two ***science and technology museums***, the Franklin Institute in Philadelphia and the Carnegie Science Center in Pittsburgh, to emulate the long-standing success of the New York Academy of Sciences Junior Academy, an active peer-group of high school students interested in science and engineering. The new Student Academy at the Franklin Institute has succeeded in building a lively membership and has created four special interest groups in astronomy, biological sciences, computers, and environmental science. Meetings are held on Saturdays twice each month, along with a number of additional

activities, including visits to working scientific laboratories. The new Carnegie Science Academy has only completed one year of operation, but already has 300 student members and plans for an active program.

Another approach being pursued by the Foundation is to work with ***special secondary schools*** whose objective is to educate high-performing students at an advanced level. A prize of $2500 is being funded, awarded by the National Consortium of Specialized Schools of Mathematics, Science, and Technology to the twenty outstanding graduating high school seniors from among the 35 schools in the consortium. The first such annual prizes were awarded in 1992. The aim of this program is both to recognize academic achievement and to help the schools raise money for long-term support of the awards from local industries.

IMMIGRATION

During 1992, the Foundation began a new immigration research support program, with a focus on the impact of the immigration of scientists and engineers on the U.S. economy and workforce. Grant recipients under the new program were selected during 1993, at which time a workshop was held to discuss research proposals, identify common research interests and needs, and generally to encourage continued conversation among participants. One example of the topics under study is the career path for foreign students of science and engineering who are educated in leading U.S. universities, in particular, the extent to which they stay in the U.S. or leave. Additional grants in this area are under consideration.

MINORITIES AND WOMEN IN SCIENCE AND ENGINEERING

The Foundation continues to support efforts to ameliorate the underrepresentation of minorities and women in science and engineering. Three types of grants characterize this program: for ***motivational*** activities; for ***research*** on the nature of the problem and what works to redress it; and for direct ***intervention***.

Two examples of the ***motivational approach*** involve television productions, one a WGBH six-part series on women, the other a Blackside, Inc. six-part series on minorities in science and engineering. These programs, expected to be seen by large audiences, are intended to raise public consciousness on the contributions of women and minorities to science and engineering, and also to help young people become more aware that science and engineering are options they might consider.

Among ***research grants*** in the program, a new longitudinal study of men and women in engineering has been funded and two projects have received renewal support: continued research at Wellesley College on factors that influence women to pursue studies and careers in science, and work by Anne Preston of SUNY at Stony Brook on the departure of women from science and engineering occupations. Two major research conferences, one on women and the other on minorities, will be held in 1994 to review the research record and to suggest agendas for additional research and action on the underrepresentation problem.

The ***intervention program*** is now focused not only on encouraging larger numbers of women and minority students to enter and remain in mathematics, science, and engineering programs at all levels, but also on promoting college and university environments that foster success for women and minority undergraduates, graduate and postdoctoral students, and faculty in these fields. In addition, new grantees are being asked to commit themselves to preserving, after a grant expires, whatever successful program or organization is created or expanded with Foundation funds.

Project 1000 at Arizona State University, initially funded by the Foundation in 1990 in an effort to increase the number of Hispanic graduate students in mathematics, science, and engineering, was favorably reviewed and received renewal support. A grant to The Minority Engineering Program at the City College of the City University of New York, designed to increase minority enrollment and retention, also was renewed. A new grant to the University of Maryland, Baltimore County, will strengthen the internship, postgraduate placement, and evaluation components of the existing Meyerhoff Scholarship Program. This nationally acclaimed program recruits highly capable African-American students, supports them in their pursuit of mathematics, science, or engineering undergraduate degrees, and sends them on to graduate school.

Support of the successful Freshman Engineering Program of the Women in Engineering Initiative at the University of Washington and of Purdue University's project to improve recruitment and retention of women engineering students was renewed. Both programs will be extended to include women mathematics and science students. Each will also focus on means to combat sexism and to improve the climate for women in science and engineering classrooms.

Three new major programs for women were initiated during 1993. Support for the Douglass Project for Rutgers Women in Math, Science, and Engineering at Douglass College of Rutgers University will promote recruitment and retention of undergraduate women in mathematics, science, and engineering. At Dartmouth College, the Women in Science Program will be refocused on producing an environment in engineering and the physical sciences in which women are encouraged to succeed. A grant to the highly successful Women in Engineering Program Advocates Network, which promotes and assists in the creation of Women in Engineering Programs around the country, will help make its training program self-financing.

The Foundation expects to continue and strengthen its focus on the institutional climate for women and minorities in science, mathematics, and engineering, and also on the institutionalization of successful programs that receive Foundation support.

The Foundation attempts to contribute to other major issues of our time in a way appropriate to its expertise and size. A special approach to the study and understanding of broadly recognized problems is a requirement for Foundation support.

DRUG ABUSE

A major Foundation-supported project at the RAND Corporation to analyze the variety of ***experiences with changes in the legal status of drugs*** in twentieth century industrial societies is scheduled for completion in 1994. Several conferences have been held, large amounts of data have been collected, and many books and papers have been prepared to report preliminary findings. The project will culminate with a comprehensive report released with appropriate publicity. Evidence will be laid out for the first time on the impact of different legal and enforcement regimes on drug use and harm. The final report will offer no policy prescription, but, as intended by the grant, the data it presents will provide the empirical underpinnings for policy debate.

ENERGY AND THE ENVIRONMENT

Completed in 1993 was the project by the Woods Hole Oceanographic Institution to study the use of the ***deep ocean as waste depositories***. Although preliminary scientific and engineering analyses indicated feasibility, the economic and policy portion of the study showed that, at present and for the near future, the cost of deep ocean deposition and maintenance is too high. Analysis of reduction of waste by conservation and recycling indicates that it simply will not be economically attractive to use the deep oceans.

Another project underway with Foundation funding is a study by Decision Research Inc. of the ***public perception of nuclear power***. The approach taken was to look beneath the usual poll-taking or partisan anecdotal material by focusing on risk measurement and by carefully understanding the world views of respondents. A large survey, probably the largest ever, was administered in the U.S. and France. Preliminary analysis shows, for example, that although the fear of nuclear power is about equal in the two countries, the French are far more positive about the way their

own nuclear power supply is managed. Apparently the French trust in the government's management is strong enough to outweigh personal fears. This is not the same in the U.S. where mistrust of both private management of nuclear power and government regulation is high. Analysis of all the data and a survey of Japan will be completed in 1994 and a book is in preparation.

A Sloan-supported project by Resources for the Future to carry out a feasibility study of ***cost/benefit analysis applied to the nuclear facilities clean-up program*** is also expected to be completed in 1994.

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In addition to its four main areas of funding, the Foundation will continue its tradition of a *Civic* program for projects aimed at benefiting the New York area. Ongoing activities include support for City College's program for minority engineering students and the Sloan Public Service Awards of the Fund for the City of New York. A 1994 major civic grant assists New York's Polytechnic University in establishing a new Center for Technology and Financial Services.

HOW TO APPLY FOR A GRANT

Applications can be made at any time for support of activities related to the range of interests indicated above. Grants of $30,000 or less are made throughout the year by officers of the Foundation. Officer grants enable the Foundation to respond quickly to proposals for many activities, such as workshops, symposia, and conferences, that fall within its program areas and interests, but require only moderate funding (at most $30,000). Officer grants can also be helpful for the preliminary planning and exploratory stages of major projects.

Grants over $30,000 are made by the Trustees who meet four times a year for that purpose. Letters of application are normally sent to the president or an officer of the Foundation and include, in addition to details about the applicant and the proposed project, information on the cost and duration of the work. Officer grants may not include any overhead charge; for trustee grants, at most fifteen percent of direct project costs can be budgeted for overhead. In the case of new applicants, the proof of tax-exempt status of the organization that would administer the grant should be included unless it is a recognized institution of higher education.

The Foundation's activities do not generally extend to religion, the creative or performing arts, medical research or health care, or to the humanities. Grants are not made for endowments or for buildings or equipment, and are made only occasionally for general support or for activities outside the United States.

The Foundation has no deadlines or standard forms. Often a brief letter of inquiry, rather than a fully developed proposal, is an advisable first step for an applicant, conserving his or her time and allowing for a preliminary response regarding the possibility of support.

1993 GRANTS AND ACTIVITIES

SCIENCE AND TECHNOLOGY

Science and technology continue as major interests of the Foundation. Research and Doctoral Dissertation Fellowships accounted for expenditures of $4 million in 1993. Trustee and officer grants for the direct support of research are part of this program. A $3 million trustee grant in 1993 supplied additional support for the Sloan Digital Sky Survey, a major astrophysics project consisting of detailed optical imaging and spectrographic measurements of most of the extra-galactic northern sky.

A particular emphasis in the direct support of research is concentration on a selected area where Sloan funding can have a substantial impact on enhancing the development of a significant field, or intersection of fields, which are newly emerging, but as yet are not able to generate sufficient research resources. The Sloan Foundation began this effort in the late sixties, and since that time has supported focused programs in the neurosciences, in cognitive science, and over the past seven years, in molecular studies of evolution. With the goals of the molecular evolution program largely realized, future funding will follow two new paths. During 1993, a program of postdoctoral research fellowships, jointly-funded and operated with the National Science Foundation, was put in place. Also, a program of support for young scientists in molecular evolution, configured so as to complement the new postdoctoral program, was approved. The first awards in both programs are scheduled to be announced in 1994. A new program supporting research in theoretical neurobiology will also be initiated next year.

The program also includes grants, both large and small, for many other research projects in mathematics, science, and technology. It also includes studies concerning the infrastructure of science and science and technology policy. Scholarly work in the history of science and technology is another interest which the Foundation pursues, illustrated by a major grant in 1993 supporting continued editorial work on the correspondence of Charles Darwin. As in past years, a substantial number of officer grants support special scientific symposia, workshops, and conferences.

Sloan Research Fellowships **$2,700,000**

Initiated in 1955 and by far the oldest among active Foundation programs, the Sloan Research Fellowship Program aims to stimulate fundamental research by young scholars of outstanding promise at a time in their careers when their creative abilities are especially high and when federal or other support may be difficult to secure. Fellowships have gone to more that 2800 scientists at over 180 colleges and universities and have accounted for expenditures of about $63 million. Sloan Research Fellows continue to receive numerous prizes and awards in recognition of their major research accomplishments. Seventeen Fellows have received Nobel prizes and twelve have been awarded the prestigious Fields Medal in mathematics.

Fellowship awards in 1993 were made in chemistry, economics, mathematics, neuroscience, and physics. A sixth field, computer science, will have its first fellowships awarded in 1994. Each fellowship is administered by the Fellow's institution and is designed to allow the greatest possible freedom and flexibility in its use. A brochure entitled "Sloan Research Fellowships," available from the Foundation, describes the program in detail.

Candidates for Sloan Research Fellowships are nominated by department heads or other senior scientists familiar with their work. Within each discipline, a committee composed of three distinguished scientists reviews all nominations and recommends the final selections. When evaluating nomination forms and supporting documents, committee members are asked to identify those nominees who show the most outstanding promise of making fundamental contributions to new knowledge. During 1993, the Foundation awarded Research Fellowships of $30,000 each, over a two year term, to 90 scholars at 49 institutions. To arrive at the final selection, some 400 nominations were reviewed by the following committees:

Chemistry: Dr. Jacqueline K. Barton, California Institute of Technology; Dr. Richard Bersohn, Columbia University; Dr. Samuel Danishefsky, Yale University.

Economics: Dr. Gary Chamberlain, Harvard University; Dr. Rudiger W. Dornbusch, Massachusetts Institute of Technology; Dr. Jose Scheinkman, The University of Chicago.

Mathematics: Dr. Spencer J. Bloch, The University of Chicago; Dr. Richard B. Melrose, Massachusetts Institute of Technology; Dr. William P. Thurston, University of California, Berkeley.

Neuroscience: Dr. Lily Jan, University of California, San Francisco; Dr. Bruce S. McEwen, The Rockefeller University; Dr. Robert H. Wurtz, National Institutes of Health.

Physics: Dr. Robert C. Dynes, University of California, San Diego; Dr. Saul Teukolsky, Cornell University; Dr. Frank Wilczek, Institute for Advanced Study.

FELLOWSHIP RECIPIENTS

Arizona, University of
Mathematics: Zhen-Su She
Neuroscience: Paul Bloom
Physics: Supapan Seraphin

Calgary, University of
Neuroscience: Naweed I. Syed

California Institute of Technology
Chemistry: Barbara Imperiali
Mathematics: Tomasz Mrowka

California, University of, Berkeley
Chemistry: John Arnold
Yongqin Chen
Economics: Hua He
Mathematics: Steven Neil Evans
Alexander Givental
Neuroscience: Ehud Y. Isacoff
John J. Ngai

California, University of, Irvine
Chemistry: A. J. Shaka

California, University of, Los Angeles
Chemistry: Emily Ann Carter
Richard B. Kaner
Economics: Janet Currie
Physics: Zvi Bern
James B. Rosenzweig

California, University of, Riverside
Chemistry: Steven R. Angle

California, University of, San Diego
Mathematics: Frederic B. Bien
Neuroscience: Neal R. Swerdlow
Physics: Scott R. Renn

California, University of, San Francisco
Neuroscience: Allison J. Doupe

California, University of, Santa Barbara
Physics: Christopher W. Stubbs

California, University of, Santa Cruz
Chemistry: Pradip K. Mascharak

Chicago, University of
Mathematics: Igor Kriz
Neuroscience: Yan-yi Peng
Physics: Thomas C. Halsey

Colorado State University
Chemistry: Debbie C. Crans

Colorado, University of
Physics: Anthony R. Barker

Columbia University
Physics: Steven Ritz

Cornell University
Physics: Eberhard Bodenschatz
Brian R. Greene

Duke University
Chemistry: Weitao Yang

Harvard University
Economics: James Bradford De Long
Neuroscience: Stephen C. Cannon
Physics: Eric D. Carlson
Alyssa A. Goodman
Sanjib R. Mishra

Illinois, University of, Urbana-Champaign
Chemistry: Andrew A. Gewirth

Institute for Advanced Study
Mathematics: Weinan E

Johns Hopkins University
Neuroscience: David J. Linden

Kansas, University of
Chemistry: Jeffrey Aube

Massachusetts Institute of Technology
Economics: John C. Heaton
David S. Scharfstein
Physics: Pawan Kumar
Xiao-Gang Wen

Massachusetts, University of
Physics: Martin D. Weinberg

McGill University
Physics: Louis Taillefer

McMaster University
Mathematics: Pengfei Guan

Michigan, University of
Chemistry: Stephen Lee
Mathematics: Richard D. Canary
Trevor D. Wooley

Minnesota, University of
Chemistry: Steven R. Kass

New York University
Mathematics: Stephane Mallat
Tamar Schlick

Northwestern University
Economics: Bo Erno Honore
Bruce D. Meyer
Mathematics: Mikhail M. Kapranov
Neuroscience: Christina R. Artalejo
Physics: Heidi M. Schellman

Notre Dame, University of
Chemistry: Dennis C. Jacobs

Ohio State University
Neuroscience: Harald Vaessin

Pennsylvania State University
Physics: Thomas J. Gramila

Pittsburgh, University of
Chemistry: Michael D. Hopkins
Mathematics: Xinfu Chen

Princeton University
Mathematics: Grzegorz Swiatek
Physics: Jacques Distler

Purdue University
Mathematics: Antonio Sa Barreto

Queen's University
Neuroscience: Douglas P. Munoz

Rochester, University of
Physics: Nicholas P. Bigelow

Rutgers University
Mathematics: YanYan Li
Neuroscience: Elizabeth D. Abercrombie
Monica Driscoll

Scripps Research Institute
Chemistry: M. Reza Ghadiri
Kim D. Janda

Southern California, University of
Mathematics: Xianzhe Dai

Stanford University
Chemistry: Robert M. Waymouth
Physics: Zhi-xun Shen

State University of New York, Stony Brook
Neuroscience: James W. Gnadt

Texas A & M University
Chemistry: Kevin Burgess

Texas, University of, Austin
Chemistry: Jennifer S. Brodbelt

Uniformed Services University of the Health Sciences
Neuroscience: Asaf Keller

Utah, University of
Mathematics: Gordon Savin

Wisconsin, University of
Chemistry: Samuel H. Gellman
Mathematics: Robin Pemantle

Yale University
Chemistry: John P. Caradonna
Economics: Steven T. Berry
Physics: Karin M. Rabe

1993 DOCTORAL DISSERTATION FELLOWSHIPS

Doctoral Dissertation Fellowships **$1,250,000**

The Sloan Dissertation Program, established in 1984, is designed to assist doctoral candidates in two fields of traditional interest to the Foundation: economics and mathematics. Completing the doctoral research and writing a dissertation in these fields are tasks performed with difficulty alongside a candidate's teaching duties and other obligations. The Sloan awards allow Fellows to concentrate on finishing their doctoral work.

Fellowships have been received by 490 graduate students and have accounted for expenditures of over $9 million. In 1993, awards covering full tuition plus a stipend of $14,000 were made to 25 doctoral candidates in each field. Nominations were solicited from the heads of leading graduate departments of economics and mathematics. They were reviewed, and final selections made, by the following committees:

Economics: Dr. Bengt Holmstrom, Yale University; Dr. Edward E. Leamer, University of California, Los Angeles; Dr. Sherwin Rosen, University of Chicago.

Mathematics: Dr. Richard W. Beals, Yale University; Dr. William Fulton, University of Chicago; Dr. Allen Hatcher, Cornell University.

FELLOWSHIP RECIPIENTS

Boston University
Economics: Alessandra Guariglia

Brown University
Economics: Chengze Fan

California Institute of Technology
Economics: John Duggan
Mathematics: Lawrence Alexander Kolasa

California, University of, Berkeley
Economics: Luisa Lambertini
Mathematics: James Hiroshi Akao
Jianduan Chen
Bjorn Mikhail Poonen

California, University of, Los Angeles
Economics: Craig Ernest Mitchell
Kwanho Shin
Mathematics: Vladimir Masek

Chicago, University of
Economics: Stephanie Shmitt-Grohe
Christopher Taber
Amir Yaron
Mathematics: Jan Lye-Im Cheah
Nadine Kowalsky

Columbia University
Economics: Douglas Dwyer
Mathematics: Jiandong Guo

Cornell University
Mathematics: Thomas A. Stiadle

Harvard University
Economics: Igal Hendel
Norman Loayza
Mathematics: Misha Verbitsky
Jiu-Kang Yu

Indiana University
Mathematics: Caixing Gu

Massachusetts Institute of Technology
Economics: Peter L. Klibanoff
David Isaac Laibson
Owen A. Lamont
Mathematics: Dan Arnon
Andrew W. Hassell

Michigan, University of
Mathematics: Judith R. Miller

New York University
Mathematics: Xavier Cabre

Northwestern University
Economics: Michael T. Horvath
Leslie McFarland Marx

Pennsylvania, University of
Economics: Nikolas Vettas
Mathematics: Xiaobo Liu

Princeton University
Economics: Kenneth S. Corts
Mathematics: Laszlo Erdos
Peter S. Ozsvath

Rutgers University
Mathematics: Andras Stipsicz

Stanford University
Economics: Antonio Fausto Ciccone
Thomas Frederik Hellman
Giovanni Maggi
Mathematics: Marc D. Sanders

State University of New York, Stony Brook
Mathematics: Pedro Ontaneda

Utah, University of
Mathematics: Sandor J. Kovacs

Virginia, University of
Economics: Catherine M. O'Connor

Yale University
Economics: Christopher John McDermott
Etsuro Shioji
Mathematics: Pavel Il'ich Etingof
Tomasz Hrycak

DIGITAL SKY SURVEY, TRUSTEE GRANT

Astrophysical Research Consortium $3,000,000
Seattle, WA 98195

In 1992, the Foundation made a grant of $3 million to the Astrophysical Research Consortium for the development of what is now known as the Sloan Digital Sky Survey. This grant was the first phase of a planned $8 million contribution to the total cost of construction and operation of the survey. The project involves the building of a specially designed telescope system and development of complex new software to produce detailed optical imaging and spectrographic measurements of most of the extra-galactic northern sky. Information is expected to be gathered for a million galaxies and 100,000 quasars.

The scientific goals of the project are: (1) to produce a very substantial increase in knowledge about quasars—their location, history, and structure—and, by using quasars as "searchlights" (because they are so distant and bright) to learn about galaxy structure; (2) to produce data on enough galaxies and clusters of galaxies to allow statistical analysis on the evolution of structure; (3) to understand more about other major structures of the universe; (4) to serve as a long-lasting map of a large portion of the sky; and (5) to present a very grand opportunity for the kind of serendipitous discoveries that occur in this kind of large observational project.

The project will be conducted over a ten-year period and will involve support, scientific or financial, from NSF, NASA, The Naval Observatory, the Fermi National Accelerator Laboratory, a Japanese astronomy group, Johns Hopkins University, the Institute for Advanced Study, Princeton University, the University of Chicago, and perhaps others. Progress during the first year of the project has been excellent. The current grant is the second installment of Sloan support. (Project Director: Dr. Donald G. York, Director, Apache Point Observatory; Grant Period: April 1, 1993–September 30, 1994.)

MOLECULAR EVOLUTION

Starting in 1986 the Foundation has supported studies in molecular evolution to enhance research capabilities in this emerging field of science. The field has advanced remarkably over this short time. It has produced dramatic new insights into the process of evolution, and evolutionary insights have entered into the mainstream of molecular biology. Increasingly, molecular biologists have been focusing their attention upon regions of the genome that evolutionary analyses have shown to be critical for survival, and biotechnologists have recognized the potential of evolutionary ideas as tools for the development of new products.

The sixth and final year of the Foundation's Postdoctoral Fellowship Program in Molecular Evolution was 1993, although Fellows receiving awards were announced in last year's annual report. Included in this report are the results of the fourth and final round of the Sabbatical Awards Program in Molecular Evolution.

Arrangements were completed during 1993 for the program to move into a new phase. An expanded program of postdoctoral research fellowships, jointly-funded and operated by the National Science Foundation and the Sloan Foundation, was put in place. Also, a jointly-managed program of support for young scientists in molecular evolution, configured so as to complement the new postdoctoral program, was approved. The new joint NSF/Sloan postdoctoral program was announced in October 1993, with a January 1994 application deadline. Formal announcement of the young investigator award program is planned for early 1994. The first awards in both programs are scheduled to be announced in 1994.

During 1993, the following advisory committee assisted the Foundation in all aspects of the program: **Michael T. Clegg**, University of California, Riverside; **Russell F. Doolittle**, University of California, San Diego; **Morris Goodman**, Wayne State University; **Leroy Hood**, University of Washington; **James A. Lake**, University of California, Los Angeles; **Philip J. Regal**, University of Minnesota.

Sabbatical Awards Program in Molecular Evolution **$303,390**

This competitive program is intended for established scientists interested in expanding their research knowledge and activities into molecular studies of evolution. Foundation support is supplemental to that provided under the terms of normal university sabbatical or research leave programs. The following awards were made in 1993, the fourth and final round in the program. Citations are given in the form: name and affiliation of the fellow; host department, institution, and laboratory director; research topic. (In each case, grants were made to the university with which the fellow is affiliated.)

William R. Atchley, Department of Genetics, North Carolina State University; Department of Developmental and Cell Biology, University of California, Irvine, Marianne Bronner-Fraser; "Molecular aspects of the evolution of neural crest derived tissues."

Catherine L. Craig, Department of Biology, Yale University; Department of Biology, Yale University, Margaret Riley; "Molecular evolution of silk proteins spun by orb-web weaving spiders."

Junetsu Ito, Department of Microbiology and Immunology, University of Arizona; Department of Biochemistry, Dalhousie University, W. Ford Doolittle; "Molecular evolution of DNA polymerase families."

Anita S. Klein, Department of Biochemistry, University of New Hampshire; Department of Environmental, Population, and Organismic Biology, University of Colorado, Jeffry A. Mitton; "Evolution of North American Picea species."

E. Stuart Maxwell, Department of Biochemistry, North Carolina State University; Department of Biochemistry, University of Massachusetts, Maurille J. Fournier; "Evolutionary conservation of U14 snRNA genomic organization, gene structure, and RNA processing mechanisms."

Richard M. McCourt, Department of Biology, DePaul University; Department of Geology, Field Museum of Natural History, Peter R. Crane; "Molecular systematics, biogeography, and evolution of Chara, green algal members of the land-plant clade."

Thomas Mitchell-Olds, Division of Biological Sciences, University of Montana; Boyce Thompson Institute for Plant Research, Division of Biological Sciences, Cornell University, Charles F. Aquadro and Robert L. Last; "Molecular evolution of protection against UV radiation in Arabis fecunda."

Bruce N. Runnegar, Department of Earth and Space Sciences, University of California, Los Angeles; Research School of Biological Sciences, Australian National University, George L. G. Miklos; "Molecular exploration of the roots of the Metazoa."

MOLECULAR EVOLUTION, OFFICER GRANTS

American Society for Neurochemistry **$3,000**
Tampa, FL 33612

Support for a colloquium on molecular evolution at the annual meeting of the Society. (Project Director: Dr. Robert M. Gould, Department of Pharmacology, University of South Florida College of Medicine; Grant Period: January 1, 1994–June 30, 1994.)

Boston University **$30,000**
Boston, MA 02215

Support for a symposium entitled "Macromolecules, Genes, and Computers: Chapter Three." (Project Director: Dr.Temple F. Smith, Director, Biomolecular Engineering Research Center; Grant Period: July 1, 1993–December 31, 1993.)

International Council of Scientific Unions $25,000
75016 Paris, France

Support for a workshop entitled "Open Questions in Molecular Genetics." (Project Director: Professor Giorgio Bernardi, Institut Jacques Monod; Grant Period: August 1, 1993–July 31, 1994.)

Smithsonian Institution $20,560
Washington, DC 20560

Support for the second International Ancient DNA Conference. (Project Director: Dr. Michael J. Braun, Director, Laboratory of Molecular Systematics; Grant Period: July 1, 1993–December 31, 1993.)

University of California, Davis $30,000
Davis, CA 95616

For a symposium in molecular evolution on "Sines, Lines, and Retrotransposable Elements: Functional Implications." (Project Director: Dr. Carl Schmid, Professor of Genetics and of Chemistry; Grant Period: October 1, 1993–September 30, 1994.)

MATHEMATICS, TRUSTEE GRANT

Institute for Advanced Study $790,000
Princeton, NJ 08540

In 1991–92, the Foundation sponsored a special year in fluid dynamics within the School of Mathematics at the Institute. Based on the success of that year, especially the interactions among visiting senior and junior faculty, post-docs, and several of the permanent members, the School now plans to make programs in other applied topics an ongoing part of its activities. This grant supports the first three years of this new project. In the 1993–94 academic year, two fields will be explored: materials science and combinatorial and logical studies of circuit complexity. Expert junior and senior visitors will be joined by Professors Luis Caferelli and Thomas Spencer, permanent members of the Institute, for the materials science program. The complexity group is to be led by Noga Alon, Tel Aviv University, and Alexander Razborov of Moscow, and will include permanent Institute member Professor Enrico Bombieri.

Each year there will be conferences or workshops to bring researchers in the special topic to the Institute. Where appropriate, as in the materials science program, experimentalists will be invited. The special years will provide members and visitors with new connections to applications and applied mathematicians. The Institute's plan is to use the three years of special programs to secure a place for applied mathematics in the School. (Project Director: Professor Thomas Spencer, School of Mathematics; Grant Period: July 1, 1993–December 31, 1996.)

OFFICER GRANTS

Rutgers University Foundation $30,000
New Brunswick, NJ 08903

Partial support for a conference on the future of functional analysis which will honor Professor Israel Gelfand. (Project Director: Professor Robert Wilson, Department of Mathematics; Grant Period: April 1, 1993–March 31, 1994.)

Santa Fe Institute $26,740
Santa Fe, NM 87501

Support for a workshop on The Limits to Scientific Knowledge. (Project Director: Professor Joseph Traub, Computer Science Department, Columbia University; Grant Period: November 1, 1993–December 31, 1994.)

University of Colorado Foundation $30,000
Boulder, CO 80306

Support to help initiate a program of collaboration with Russian theorists. (Project Director: Dr. Mark J. Ablowitz, Director, Program in Applied Mathematics; Grant Period: April 1, 1993–March 31, 1995.)

University of Minnesota $30,000
Minneapolis, MN 55455

Support for a workshop on Mathematics in Manufacturing Logistics. (Project Director: Dr. Avner Friedman, Director, Institute for Mathematics and Its Applications; Grant Period: August 1, 1993–December 31, 1994.)

OTHER SCIENCE, OFFICER GRANTS

American Crystallographic Association $25,000
Buffalo, NY 14205

For matching funds to assist research of crystallographers in the Republics of the former Soviet Union. (Project Director: Dr. William L. Duax, Executive Officer; Grant Period: June 1, 1993–May 31, 1994.)

New York Academy of Sciences $10,000
New York, NY 10021

Support of a conference on the "Fundamental Problems in Quantum Theory." (Project Director: Dr. Daniel Greenberger, Professor of Physics, City College of New York; Grant Period: May 1, 1994–December 31, 1994.)

New York University $20,000
New York, NY 10003

Support of a study titled, "The Input-Output Structure of Scientific Knowledge." (Project Director: Wassily Leontief, University Professor, Institute for Economic Analysis; Grant Period: August 1, 1993–December 31, 1994.)

Santa Fe Institute $30,000
Santa Fe, NM 87501

Support of a summer workshop on theoretical neurobiology. (Project Director: Dr. Charles F. Stevens, The Salk Institute; Grant Period: April 1, 1993–March 31, 1994.)

University of Southern California $20,000
Los Angeles, CA 90089

To take a computer science perspective of nanosystems and molecular robotics, and to develop an introductory course. (Project Director: Aristides Requicha, Professor and Director, Institute for Robotics and Intelligent Systems; Grant Period: April 1, 1994–June 30, 1995.)

TRUSTEE GRANT

American Council of Learned Societies $350,000
New York, NY 10017

The Correspondence of Charles Darwin project was begun in 1975. The eight volumes published through 1993 cover the period 1821–1860. They have been enthusiastically reviewed in newspapers and in both scholarly and general journals. Stephen Jay Gould wrote, in a review of the first volume: "An hour with this book will convince anyone that the proper compilation of correspondence is no mere drudge work of service to learning, but a high form of scholarship. The letters are no passive record, but a set of intricate puzzles,...(the footnotes to each letter are often longer than the text and make fascinating reading both for content and methodology of scholarly detection)...We may read this book at so many levels and for so many purposes—for insight into the nature of genius; for human drama at its most basic and universal; and for social commentary..." When complete in time for the celebration of the 200th anniversary of Darwin's birth, the project is planned to total thirty volumes of 15,000 letters.

The Sloan grant supplements contributions to this project by other funders, including the National Science Foundation and the National Endowment for the Humanities. As work continues on editing the letters, arrangements are also underway to make the complete collection electronically accessible. (Project Director: Frederick H. Burkhardt, Senior Editor; Grant Period: January 1, 1994–December 31, 1998.)

OFFICER GRANTS

Rockefeller University $25,000
New York, NY 10021

Support for writing an autobiography. (Project Director: Professor Abraham Pais, Department of Physics; Grant Period: October 15, 1993–October 31, 1996.)

Stanford University $30,000
Stanford, CA 94305

Support for a conference on interviewing in the history of contemporary science. (Project Director: Horace Freeland Judson, Senior Research Scholar; Grant Period: December 1, 1993–December 31, 1994.)

TRUSTEE GRANTS

Institute of Electrical and Electronics Engineers, Inc. **$260,000**
Washington, DC 20036

In 1992, the Foundation made a one-year grant to enable the Institute of Electrical and Electronics Engineers (IEEE) to proceed with an experimental fellowship program in cooperation with the Technology Administration of the U.S. Department of Commerce. The goal was to complement the capacities of this governmental agency with electrical and electronic engineers who have deep understanding of the product development process in key industries. The program has been a success. For example, one Fellow succeeded in creating an industry/government working group in the crucial area of optoelectronics, with special reference to the technologies involved in flat-panel displays. Both past and present Under Secretaries of Commerce for Technology strongly endorse continuation of the program. Reviewers in industry also report positively on the program. This grant will continue support for three more years. (Project Director: Dr. Charles A. Eldon, Chairman, IEEE-USA Committee on U.S. Competitiveness; Grant Period: January 1, 1994–December 31, 1996.)

Massachusetts Institute of Technology **$280,819**
Cambridge, MA 02139

This grant supports the initiation of an annual 2–3 day seminar for senior Congressional staff on emerging science and engineering policy issues. House and Senate staffers have indicated that they would welcome an opportunity to get together away from Washington for extended substantive discussions of such policy issues with MIT faculty. The focus will be on issues that are likely to be significant in the near future and to remain so. Initial suggestions for possible seminar topics include: information technology; materials science; biotechnology and medical technology; technology and mass transportation; technology and aviation safety; science and technology of the environment; technology and industrial productivity; and international implications of technological change. (Project Director: Professor Eugene Skolnikoff, Center for International Studies; Grant Period: January 1, 1994–December 31, 1996.)

STANDARD OF LIVING, COMPETITIVENESS, AND ECONOMICS

The goal of this program is to contribute to the understanding of the basic forces that will maintain and improve a high American standard of living in an increasingly competitive global economy. The program spans a broad range of areas which affect the ability of U.S. industry to compete in world markets: the vitality of manufacturing industries; the availability and application of technology; management of the product development process; training and education for manufacturing; human resource management; the impact of U.S. liability law; international economics; and so forth.

In 1990, the Foundation launched a major effort within this program by establishing interdisciplinary centers at leading research universities to study selected U.S. industries. The objective is to support the growth and evolution of an academic community involving scholars in engineering, management, and economics who will develop close contacts with industry and provide realistic research and education on American manufacturing industries.

In 1993, renewal grants were approved for continued operation of industry centers studying semiconductor manufacturing (at University of California, Berkeley), the automobile industry (at MIT), and the steel industry (at Carnegie Mellon and the University of Pittsburgh). A new center for the powder metallurgy industry (at Worcester Polytechnic Institute) was established. Activities continue at the other established centers: pharmaceuticals (MIT), textiles and apparel (Harvard), computers (Stanford), and financial services (Wharton). Also, MIT's Industrial Performance Center draws on the results from all the industry centers while undertaking its own program of research on various aspects of productivity and industrial performance.

Other major 1993 grants, all reported in this section, supported research in manufacturing and technology, economics and competitiveness, liability and its effects on business decisions, human resource management, workplace and family issues, and in the nature and evolving role of the corporation in modern society.

TRUSTEE GRANTS

Massachusetts Institute of Technology **$1,898,917**
Cambridge, MA 02139

The International Motor Vehicle Program (IMVP) was supported with a major Foundation grant in 1990. IMVP's assembly plant study, reported in The Machine that Changed the World, and its articulation of the concept of lean production have been influential in the industry worldwide. As part of its continuing study of comparative worldwide best practices in the industry, IMVP has analyzed data on close to 300 automobile introductions between 1980 and 1990. Concurrent product development was shown to be more successful at capturing market share and in accruing revenue than sequential development. Larger variety, filling more market niches, smaller production runs, and shorter product cycles have made for a better strategy than sequential development of new platforms. The next step in this product development analysis is to understand the complexities of managing concurrent development and the difficulties of its application in companies in different countries.

IMVP researchers have developed a characterization of supplier relations in terms of closeness and interdependency. It contrasts long-term, information sharing, problem solving relations aimed at cost, quality, and timeliness, with competitive but discontinuous, adversarial, low information exchange. Overall, in all performance measures, suppliers with the former arrangements did better. Further research on supplier relations is planned, including a joint U.S., Japan, and European study using both interviewing and a survey. Also, the successful assembly plant study will be expanded to include measures of changes in performance over the past few years. Research on marketing and distribution will be expanded to include analysis of differences between Japan and the U.S. on price posting, dealer relations, customer satisfaction, and production-marketing information flow. Studies of environmental regulatory influences on auto design and on manufacturing will continue. Companies are working cooperatively with IMVP and it is expected that the Center will continue to receive substantial support from the auto industry. (Project Director: Professor Daniel Roos, Director, Center for Technology Policy and Industrial Development; Grant Period: April 1, 1993–October 31, 1996.)

MPC Corporation **$1,950,000**
Pittsburgh, PA 15213

In 1991, a new Center for study of the steel industry was established with Foundation support. Faculty and students from the departments of economics and the engineering and business schools at Carnegie Mellon University and the University of Pittsburgh have since developed close contacts with the companies of the industry. Extensive data have been collected from close to 50 steel plants, both integrated and mini-mills. In a study of the relation between new technology and plant efficiency, 30 technologies and 50 detailed performance measures were considered. As expected, efficiency for both kinds of plants was found to be higher with newer technologies. However, some mills with older and less technology equalled the best in efficiency. From in-plant observations, these mills organize their work flow exceedingly well and make maximum use of their skilled work forces. In another study, on the effects of new human resource management practices on productivity, 26 steel finishing lines were visited and data collected on key production variables and line output. Output was then correlated with human resource variables such as work in teams, training, no layoff policy, job rotation, customer visits, and incentives. The Center has also studied the growth of capacity in the steel industry, how government involvement helped produce it, and actions taken by various countries to deal with it.

Continued research at the Center will focus on technology (including some environmental issues), human resource and work organization, and aspects of management and corporate strategy. Intensive case analysis of mini-mills will be carried out to gain a deeper understanding of their successes. The studies on integrated mills will concentrate on understanding how downsizing, new technology, and management practice changes have brought some mills and companies back to profitability. The Center plans to look carefully at emerging technologies in steel and at the growing competition with other materials. The human resource studies will be extended to cover Japanese and European plants. A book is planned on the technical, management, and business changes in the steel industry. (Project Director: Richard J. Fruehan, Professor of Metallurgical Engineering, Carnegie Mellon University; Grant Period: March 1, 1994–December 31, 1997.)

University of California, Berkeley **$1,200,000**
Berkeley, CA 94720

The Competitive Semiconductor Manufacturing Program was established with a Foundation grant to the University of California, Berkeley, in 1991. Faculty and graduate students from the engineering and business schools, the economics department, and the Berkeley Roundtable for International Economics, participate in the Center's research, which has been focused on manufacturing. Field work has resulted in the collection of an unusually detailed set of production, work organization, human resource management, financial, and other business data. Twenty major factories in the United States, Europe, Japan, and Taiwan have been observed and have supplied data. Data on performance have been obtained for several years so that rates of improvement can be measured. For example, large differences among companies have been found in effectiveness in process and product design for manufacturing and in the hand-off of products and process from development to full-scale manufacturing divisions.

In the next phase of its work, supported by this renewal grant, the Center will continue to gather and report on manufacturing data. Measurements must be made often enough to capture the rapid changes in this industry of process, product, technology, and demand. Also to be studied, as a means of understanding functions upstream of manufacturing, are product definition, design, and development. Research on marketing and demand in this industry, and on the specialized topic of the role of software for microprocessors and similar devices, determined in the first phase to be vital, will also be carried out. The Center plans to produce a book on the industry, aimed at a general audience. (Project Director: David A. Hodges, Dean and Professor of Engineering; Grant Period: March 1, 1994–December 31, 1997.)

Worcester Polytechnic Institute **$296,544**
Worcester, MA 01609

A Center is to be established at Worcester Polytechnic Institute (WPI) to study the powder metals industry. Powder metal parts are used in automobiles, aircraft, and other primarily mechanical products. The U.S. has held technological leadership in the industry, but both Germany and Japan have rapidly improving capabilities. The Center will work with companies of this industry, on technological and business issues on a comparative worldwide basis. WPI faculty and graduate students in materials science and engineering, as well as management, will be joined by senior technical and business people from other universities and business institutions to work on Center research. Initial topics for study include supplier-customer relations, interfirm collaboration, cost methodologies, and global marketing issues. The industry is made up of powder makers, component makers, and equipment suppliers. Companies from all these sectors have agreed to contribute to the Center and cooperate in its research program. (Project Director: Diran Apelian, Provost; Grant Period: November 1, 1993–May 31, 1997.)

MANUFACTURING AND TECHNOLOGY, TRUSTEE GRANT

Carnegie Mellon University **$245,502**
Pittsburgh, PA 15213

Researchers from Carnegie Mellon, Columbia, and Yale Universities will conduct a survey of a large number of U.S. companies, as part of an international effort which includes coordinated surveys in Europe and Japan, to examine company research and development strategies and practices. Of interest are how technology is created or absorbed by companies and how it is then introduced into products. A survey questionnaire, prepared after extensive interviews with company managers, will explore the management of technological research and development in industries and in companies within industries. For example, industries differ in their reliance on patents and in their use of external sources of technology. Companies within industries differ in their use of innovative technologies in products or processes, compared to their reliance on manufacturing excellence or large product variety or marketing expertise. The questionnaire will be sent to a large enough set of companies, grouped in industries, to allow for comparisons of companies within an industry. Responses will allow differentiation of technology strategies and management by product and by company. A similar survey, carried out in the early eighties, generated much useful data. The new international cooperative project will be broader and benefit from considerable information and insight gained over the past decade. (Project Director: Professor Wesley M. Cohen, Department of Social and Decision Sciences; Grant Period: July 1, 1993–December 31, 1995.)

TRAINING AND EDUCATION, OFFICER GRANTS

Johns Hopkins University **$30,000**
Baltimore, MD 21218

Support to develop a preliminary specification of an AA degree in manufacturing. (Project Director: Dr. Arnold Packer, Institute for Policy Studies; Grant Period: April 1, 1993–March 31, 1994.)

Massachusetts Institute of Technology **$28,456**
Cambridge, MA 02139

For a study of the economic outcome of apprenticeship educational programs. (Project Director: Professor Frank Levy, Department of Urban Studies and Planning; Grant Period: October 15, 1993–December 31, 1994.)

TRUSTEE GRANTS

Foundation for American Economic Competitiveness **$250,000**
Washington, DC 20006

This grant contributes to the support of a project by the Council on Competitiveness, an organization of leading companies and research universities, to study the future of the U.S. information infrastructure. Both economic competition and a satisfactory standard of living, it is argued, call for optimal development of the public and private information systems. The Council will seek to contribute to policy understanding and debate. Study groups have been formed of representatives from the major information and communication provider companies, including telephone, cellular, cable, broadcast, and computer companies and publishers and banks. Policy questions to be considered include those that govern the rate of development of new information infrastructure, for example, antitrust, liability, security, and spectrum allocation standards, as well as those that assure the public interest, such as privacy, access, affordability, and first amendment issues. The plan is to provide the results of small policy teams working on various issues, together with the Council's recommendations, to those in the government who are debating and developing legislative initiatives. (Project Director: Suzanne Tichenor, Council on Competitiveness; Grant Period: July 1, 1993–December 31, 1995.)

Princeton University **$90,573**
Princeton, NJ 08544

Economists William Baumol and Edward Wolff published their landmark book, Productivity and American Leadership: The Long View (MIT Press) in 1989. With Foundation support, their research and writing on long-term productivity growth has continued and two additional volumes have been completed: William Baumol's Entrepreneurship, Management, and the Structure of Payoffs, and Edward Wolff's and David Dollar's Competitiveness, Convergence, and International Specialization. Two additional volumes are in progress. One is the edited proceedings of the 1992 conference on "Historical Perspectives on the International Convergence of Productivity." The other will report on the work underway on feedback mechanisms in productivity growth. This growth is influenced by such economic stimulants as the rate of investment and the education and health of the labor force, while at the same time each of these factors influencing productivity is itself affected by the state of the economy's productivity. This supplementary grant supports the ongoing research and writing. (Project Directors: William J. Baumol, Professor of Economics, and Edward N. Wolff, Professor of Economics, New York University; Grant Period: March 8, 1993–February 28, 1996.)

University of California, Berkeley **$900,000**
Berkeley, CA 94720

The work of the Berkeley Roundtable on the International Economy (BRIE) on industrial, trade, and competitive issues is characterized by an emphasis on detailed knowledge of companies, governmental institutions, and individuals in the U.S. and abroad. Much work is conducted in the field and detailed case information is acquired. During the initial period of Foundation support, dating from a major grant in 1990, BRIE has formulated a linked trade policy and industrial strategy (Laura Tyson's "cautious activism") aimed at enabling American companies to compete internationally. Also, it has examined supply sources and chains of supply for major industries and how these are shaped by their national settings. Detailed research on how particular industries operate in different countries have included studies on semiconductors, flat-panel displays, aircraft, and cellular telephones.

This renewal funding will support research on the influence of information technology on future production, the effect on industries of the continued evolution of such "transforming" technologies as electronics and communications, a new comparison of industrial organization by region (Pacific, North America, Europe), and an examination of predicted limits to GATT and the trade arrangements which are likely to follow. These will again be grounded in particular industry studies, including the chemical and automobile industries. (Project Director: Professor Stephen S. Cohen, Berkeley Roundtable on the International Economy; Grant Period: April 1, 1993–October 31, 1996.)

American Academy of Arts and Sciences **$30,000**
Cambridge, MA 02138

Support of a project to produce a book of essays by corporate leaders entitled "American Industry at the Crossroads." (Project Director: Dr. Elkan Blout, Treasurer; Grant Period: June 15, 1993–September 30, 1994.)

Columbia University **$28,865**
New York, NY 10027

To support a study on The Impact of Information Technology Investments and the Performance of Service Sector Firms. (Project Director: Professor Frank R. Lichtenberg, Graduate School of Business; Grant Period: June 15, 1993–September 30, 1994.)

George Mason University Foundation **$29,486**
Fairfax, VA 22030

For the Program on Integrating Trade and Technology Policies. (Project Director: Professor J. Thomas Ratchford, International Institute; Grant Period: January 1, 1994–September 30, 1994.)

University of Arkansas **$30,000**
Fayetteville, AR 72701

Support for a program on poultry research productivity. (Project Director: Dr. Preston LaFerney, Department of Economics and Rural Sociology; Grant Period: April 1, 1993–March 31, 1994.)

Yale University **$28,400**
New Haven, CT 06520

To study the results of and the reactions to Japanese direct investment in Europe and to compare these with similar investment in the U.S. (Project Director: Professor Mark Mason, School of Organization and Management; Grant Period: September 1, 1993–December 31, 1994.)

TRUSTEE GRANT

The RAND Corporation **$200,000**
Santa Monica, CA 90407

A 1988 Foundation grant to the RAND Institute of Civil Justice supported research on the economic consequences of expanded business liability, including an examination of the direct and indirect costs to American firms arising from legal liability of three kinds: employment termination, environmental, and product safety. In general, it appears that the direct cost of such liability is dwarfed by the indirect costs, usually in the form of management decisions aimed at preventing litigation, for example, by avoiding certain kinds of products. The new research supported by this grant seeks a better understanding of how the product liability system shapes the real and perceived incentives facing companies as they make their business decisions. Three key industries, pharmaceuticals, medical devices, and automobiles, will be studied, and the research will emphasize interactions of the liability system with the regulatory environment and with the marketplace, especially as it is affected by mass media coverage of product safety issues. (Project Director: Dr. Steven Garber, Senior Economist; Grant Period: January 1, 1994–December 31, 1995.)

TRUSTEE GRANTS

Educational Broadcasting Corporation **$294,222**
New York, NY 10019

This grant supports the production for public television of a Socratic dialogue seminar to explore the changing role of the corporation as an economic and cultural institution. This format uses role playing, hypothetical situations, and a roving inquisitor to urge panelists to confront what they would do in complicated situations when a "right choice" is not clear. As panelists wrestle with the hypothetical at hand, the drama created helps examine complex issues in a compelling and stimulating way. The seminar will focus on such questions as: How can large corporations balance their fiduciary duties to shareholders with their traditional commitments to other stakeholders such as workers, managers, and communities? How can these groups protect their own interests as they interact with the changing corporation? How can corporations reconcile their own financial self-interest with broader social and cultural responsibilities? In general, how is the role of the corporation being redefined to face the challenges of the 21st century? Participants in the seminar will include business and government leaders, academics, unionists, and private citizens. The objective is to open minds to the complexity of the issues facing all sectors of contemporary society as they intersect with the modern corporation. (Project Director: Marc Morgenstern, Jack Hilton, Inc.; Grant Period: June 15, 1993–May 31, 1994.)

Massachusetts Institute of Technology **$117,875**
Cambridge, MA 02139

The business corporation is such an important economic institution and is so thoroughly integrated into our culture, that questions as to whom and for what ends the corporation is responsible are central to American society. MIT's Professor Carl Kaysen will convene a small planning group of scholars to reflect on the historic changes in the role of the corporation which have occurred in the second half of this century. A set of essays on different aspects of the topic will be commissioned. Essayists will write on various legal, economic, political, and social aspects of the corporate

system. The authors will be brought together for discussions with some corporate leaders, and a book will then be published composed of the academic essays and the corporate leaders' commentaries. (Project Director: Carl Kaysen, David W. Skinner Professor of Political Economy, Center for International Studies; Grant Period: June 15, 1993–December 31, 1994.)

OFFICER GRANTS

Educational Broadcasting Corporation $25,000
New York, NY 10019

Support for the planning of a TV production on the role of the corporation. (Project Director: Marcie Setlow, Producer, Setlow Media, Inc.; Grant Period: February 4, 1993–May 31, 1993.)

Swarthmore College $30,000
Swarthmore, PA 19081

Support for the development of a project on the evolution of U.S. economic institutions. (Project Director: Frederic L. Pryor, Professor of Economics; Grant Period: March 1, 1993–February 28, 1994.)

Urban Institute $15,000
Washington, DC 20037

Support for a research project on corporation pensions and health plans. (Project Director: Gene Steuerle, Senior Fellow; Grant Period: October 15, 1993–December 31, 1994.)

TRUSTEE GRANTS

Economic Policy Institute $450,000
Washington, DC 20036

Changes in work organization and human resource practices have attracted much interest in the past few years. What is surprising is that information about the current wave of innovation in work arrangements, employee involvement, and total quality management has come almost entirely from managers and not from workers. The Economic Policy Institute has proposed to undertake a major survey of employee perceptions of total quality systems, employee participation, and other new human resource practices put in place to improve organizational performance and personal employee satisfaction. The survey would include 5,000 workers in 50 plants in six industries and would be developed after extensive field work involving employee focus groups and interviews with managers. The present grant supports a pilot study to test the survey procedure and determine whether the methodology allows for the discovery of conclusive findings. The pilot survey will be limited to six plants (three matched pairs of transformed and non-transformed companies) all in the apparel industry. A sample of 400–600 workers will be surveyed after interviews held with plant managers. Data on plant performance will be obtained and integrated with data from the employee survey. A decision on the larger cross-industry survey will be made after this pilot study is completed and evaluated. (Project Director: Eileen Appelbaum, Associate Research Director; Grant Period: June 15, 1993–December 31, 1994.)

Economic Policy Institute $35,125
Washington, DC 20036

With the support of a 1992 Foundation officer grant, the Economic Policy Institute produced a valuable report on work reform efforts in the United States. It carried out a comprehensive review of surveys of firms between 1982 and 1992 and of case studies of 185 firms in order to learn in detail about experiments with total quality management and participatory work organization and about conclusions of compa-

nies concerning these experiments. This grant supports the dissemination of this report and its main findings to a broad audience, including corporate managers, union officials, government policymakers, and the press. (Project Director: Eileen Appelbaum, Associate Research Director; Grant Period: March 8, 1993–November 30, 1993.)

Massachusetts Institute of Technology **$157,221**
Cambridge, MA 02139

Last year a large group of researchers in the human resource field from universities across the country and including representatives of all the Sloan industry centers and others from labor economics, industrial relations, and related areas, met at MIT and agreed to form a Human Resources Network. A 1992 Foundation grant supported the first year of operation of the Network.

Recent activities include: organizing working groups on white collar issues and on human resource innovations and their diffusion; preparing and distributing summaries of key human resource issues to each of the Sloan industry research teams; compiling and distributing copies of survey instruments and interview guides used in the field; and discussing how the results of the research of network members can be of use to the government's efforts to promote diffusion of workplace innovations that enhance national competitiveness. These activities (and those planned for the future) help expand and strengthen the community of researchers who study human resource issues and also generally raise the level of attention given to human resource and labor management systems and practices. This grant supports the Network's program for an additional year. (Project Director: Thomas A. Kochan, George Maverick Bunder Professor of Management, Sloan School of Management; Grant Period: January 1, 1994–December 31, 1994.)

HUMAN RESOURCE MANAGEMENT, OFFICER GRANTS

Cornell University **$6,875**
Ithaca, NY 14853

Support for publication of the manuscript "Transforming the Production System in U.S. Firms," by Eileen Appelbaum and Rose Batt. (Project Director: Frances Benson, Director, ILR Press, New York State School of Industrial and Labor Relations; Grant Period: June 14, 1993–December 31, 1993.)

Cornell University **$27,484**
Ithaca, NY 14853

Support for a conference on the technical workforce. (Project Director: Stephen R. Barley, Director, Program on Technology and Work; Grant Period: September 1, 1993–August 31, 1994.)

The RAND Corporation **$30,000**
Santa Monica, CA 90407

Support of a conference on Human Capital Investments and Economic Performance. (Project Director: Dr. Christoph F. Buechtemann, Senior Economist; Grant Period: July 1, 1993–June 30, 1994.)

WORKPLACE AND FAMILY ISSUES, TRUSTEE GRANT

University of California, Berkeley **$138,000**
Berkeley, CA 94720

The possibilities and difficulties associated with professional careers based on something other than the full-time work day that now dominates the workplace is a topic whose exploration is of interest to the Foundation. Most of the literature focuses on the adjustments that must be made by workers and their families. Much is yet to be done on the changes that can be made by organizations in the way the work of their members is structured. Sociologist Arlie Hochschild, author of The Second Shift: Working Parents and the Revolution at Home (Viking Press, 1989), will examine the practices of flextime, flexplace, permanent part-time, job sharing, compressed workweek, and parental leave. Her research methodology combines ethnography—she works on the plant floor and in workers' homes—with the analysis of data and secondary sources. She aims to learn why these practices have not become more widespread and how the adoption of the most promising of them might be accelerated. The book she plans to write will profile a number of organizations that have overcome the obstacles to this kind of change in work arrangements. (Project Director: Professor Arlie R. Hochschild, Institute for the Study of Social Change; Grant Period: November 1, 1993–April 30, 1996.)

OFFICER GRANT

University of California, Los Angeles **$25,000**
Los Angeles, CA 90024

To support two conferences on Gender and Work, sponsored by the Institute of Industrial Relations. (Project Director: Dr. Judith Glass, Coordinator of Public Programs, Center for Management Research and Education; Grant Period: October 1, 1993–September 30, 1994.)

EDUCATION AND CAREERS IN SCIENCE AND TECHNOLOGY

The Foundation's program in this traditional area of support reflects a broad scope of interests. In science and engineering education, important topics are being considered, such as: understanding how and why people choose or do not choose to train for and enter careers in science and technology and the reasons for remaining in or leaving these fields; educating future scientists and engineers; studying the current dimensions and future prospects of employment for scientists and engineers; and developing educational programs and materials.

The underrepresentation of women and minorities in mathematics, science, and engineering is an issue of continuing interest to the Foundation. Grants made in 1993 and reported in this section include motivational projects to interest more women and minorities in these fields, research studies to improve understanding of the nature of the underrepresentation problem and of what actions work to overcome it, and intervention programs designed to influence outcomes.

Explorations are underway on innovative approaches to education outside the classroom or school system. The effort is aimed at independent learning in science and technology as a supplement to classroom materials and as an avenue for exploring new interests. One focus is on learning at home by students and professionals, using computer and multimedia technologies and networking.

Enhancing public understanding and interest in science and technology is another topic of long-standing interest to the Foundation. A number of multi-program television series are in production, such as Great Projects in Engineering and Women in Science. In 1993, a major grant supported the production of a six-hour series on minorities in science and engineering. A Foundation grant also supports the broadcasting of technology news items and features on National Public Radio.

Commissioning of the Technology Book Series was completed in 1993. The series will focus on some of the major technologies of the twentieth century and treat their emergence, development, and role in our society.

ENTRY AND RETENTION, TRUSTEE GRANT

University of Maryland **$84,962**
College Park, MD 20742

Attrition from Ph.D. programs at American universities is known to be high, but the causes of early departure and the consequences for students who do not complete their degree program are not well understood. This grant supports a study of this subject.

The research will focus on American full-time graduate students who entered any of nine departments at two research universities in the years 1981–83 with the intention of obtaining a Ph.D. The estimated 1,700 such students will be surveyed and follow-up intensive ethnographic interviews will be conducted with a small sample who withdrew from graduate school. It is expected that the data in this study will permit comparisons among various departments with respect to retention, will yield information on how respondents view their experiences in graduate school and subsequently in the job market, and will also reveal possible other consequences of early departure. The University's Survey Research Center will provide support in all phases of the survey, including sampling, questionnaire design and testing, tracking procedures, mail and telephone data collection, and data file preparation. (Project Director: Barbara Lovitts, Faculty Research Assistant; Grant Period: September 1, 1993–June 30, 1995.)

OFFICER GRANTS

Educational Testing Service **$28,500**
Princeton, NJ 08541

To study retention in science, mathematics, and engineering, using a large data base. (Project Director: Dr. Maria Pennock-Roman, Research Scientist, Division of Measurement, Research and Services; Grant Period: August 1, 1993–December 31, 1994.)

Siena College **$8,810**
Loudonville, NY 12211

To support a conference to welcome undergraduate mathematics students into the greater mathematics community. (Project Director: Professor Emelie Kenney, Chair, Department of Mathematics; Grant Period: October 15, 1993–August 31, 1994.)

University of Washington **$9,489**
Seattle, WA 98195

To allow analysis of the University's data set in support of the larger study by Hewitt and Seymour of the reasons for the switching of engineering and science students to other majors. (Project Director: Angela Ginorio, Director, Northwest Center for Research on Women; Grant Period: February 1, 1993–September 30, 1993.)

WOMEN AND MINORITIES, TRUSTEE GRANTS

American Indian Science and Engineering Society **$304,600**
Boulder, CO 80301

One of the major activities of the American Indian Science and Engineering Society (AISES) is to motivate and assist American Indian youth to pursue science and engineering careers. In recent years, AISES has focused primarily on college scholarships and pre-college recruitment activities and only secondarily on assisting their college chapters with retention efforts. This grant supports greatly extended attention by AISES to helping its college students to stay and earn a degree.

The number of American Indian students entering college with an interest in mathematics, science, and engineering has increased in recent years. However, the retention rate of these students, except for those who actively participate in AISES college chapters, is low. AISES currently has 93 chapters with 1,360 chapter members. This grant will enable AISES to add new chapters and strengthen existing ones, thus

significantly contributing to retention of American Indian students in these technical fields. Plans include: (1) an annual competition in which $2,000 prizes will be awarded to local chapters for projects to effect positive change in their campus climate for Indian students; (2) production of a college handbook to encourage expansion of the AISES chapter network, including to tribal and community colleges; (3) attendance of headquarters personnel at AISES regional conferences as one way to strengthen local chapters; and (4) a two-day workshop at the annual AISES national conference to train college chapter advisors. (Project Director: Dwight A. Gourneau, Deputy Director; Grant Period: January 1, 1994–December 31, 1996.)

Arizona State University **$334,000**
Tempe, AZ 85287

Arizona State's Project 1000 makes contact with Hispanic undergraduates throughout the country and encourages and facilitates their application to graduate programs. An initial Foundation 1990 grant supported a special effort by Project 1000 to identify and work with Hispanic students majoring in mathematics, science, and engineering. The results have exceeded projections and Project 1000 estimates that it now serves almost half of all Chicano and Puerto Rican students who take the Graduate Record Examination and apply to graduate school with full-time status in mathematics, science, and engineering.

Project 1000 has forged special relationships with both undergraduate colleges that are primary producers of Hispanic students in these fields and with a group of universities whose graduate schools have been welcoming of and successful with these students. The schools now accept a copy of a single application packet and waive application fees, thereby greatly facilitating the application process for Project 1000 students. Project 1000 has conducted numerous workshops on the Graduate Record Examinations for over 1500 Hispanic and other underrepresented minorities, approximately 560 of whom were in the fields of mathematics, science, and engineering. It has developed a network of relationships with minority professional organizations in science and engineering, with national laboratories, and with companies that offer internships to students and provide speakers. This renewal

grant will allow Project 1000 to continue its various efforts to expand the number of underrepresented minorities (mostly, but no longer exclusively, Hispanics) accepted into graduate school in mathematics, science, and engineering. (Project Director: Professor Gary D. Keller, Director, Project 1000; Grant Period: September 1, 1993–August 31, 1997.)

Dartmouth College **$300,784**
Hanover, NH 03755

Dartmouth's Women in Science Program has promoted recruitment and retention by focusing primarily on assisting women students to cope with an existing learning environment that is less than ideal for women wishing to pursue engineering or physical science majors. It has included a mentoring program, seminars with scientists and engineers from industry and government, industrial site visits and field trips, a newsletter, and research internships for first year women students.

Dartmouth will now expand its efforts to make the educational environment in the engineering and physical science departments more accommodating of women's needs and learning styles and to eliminate negative stereotyping of women by faculty and male students. This will be done by: providing more cooperative learning opportunities in mathematics and science courses; recruiting more women study group leaders in these fields; developing new course materials for the introductory physics sequence, with the assistance of women who have experienced discouragement in science and mathematics courses; establishing an annual three-day summer institute for science and engineering faculty to explore why women become discouraged from pursuing mathematics, science, and engineering majors and to develop corrective strategies; and convening periodic faculty meetings to reinforce the summer institute and to serve as catalysts for discussion and consciousness raising among the faculty. The program will be carefully evaluated in order to guide Dartmouth's internal efforts and to derive lessons that can be disseminated to other colleges and universities. (Project Directors: Carol B. Muller, Dean of Administration, Thayer School of Engineering, and Karen Wetterhahn, Dean of the Faculty for the Sciences; Grant Period: June 15, 1993–June 30, 1998.)

Purdue University **$369,307**
West Lafayette, IN 47007

Purdue University's School of Engineering has one of the highest percentages of women students, 23 percent compared with the national average of 18 percent. Its Women in Engineering Program, aimed at improving recruitment and retention of women engineering students and supported by the Foundation since 1991, is widely emulated as a model. This renewal grant will continue, extend, and institutionalize the existing successful program. The videotapes produced during the first grant will now be sent to prospective women students as an aid in recruitment. The personal connection program, in which current students or alumni have improved the rate of actual enrollment of women admitted into the School of Engineering by making early contacts with them or their families, will be extended to include almost all admitted women students. The current mentoring program will also be expanded to include both first- and second-year students.

A new seminar series will be organized for junior and senior women in both the School of Engineering and the School of Science. Graduate student instructors will inform the undergraduates about graduate school and encourage them to apply. Mentoring arrangements will be significantly expanded. The program will also employ interactive theater and follow-on discussions to focus the attention of teaching and research assistants in both Schools on the issue of climate for women in the classroom. If this program works as intended, Purdue will develop a pilot workshop for faculty. (Project Director: Henry T. Yang, Dean, School of Engineering; Grant Period: November 1, 1994–October 31, 1997.)

Research Foundation of State University of New York **$126,804**
Stony Brook, NY 11794

In the first phase of Anne Preston's research on career paths of women in science and engineering professions, funded in 1991, she created and analyzed a data set on 1,500 men and women graduates in mathematics, science, and engineering from Stony Brook, and also held in-depth interviews with 26 matched pairs of women (one

remained in a science or engineering career, the match did not) selected from the survey. The interviews identified four major factors contributing to the exit of women from science and engineering careers: (1) the struggle to balance family and career, in which career is often compromised; (2) absence of a mentor to provide encouragement and support, especially early in a career; (3) a perceived mismatch between women's broad interests and the requirements of a narrowly focused scientific career and job; and (4) frustration by what is thought by women to be more stringent standards for judging their performance and behavior compared to those of men. The first of these supports the finding from the survey that family considerations were an important reason for the higher exit rates for women from science and engineering careers.

For the second phase of her study, Dr. Preston will explore in greater depth the differences between men and women with respect to factors contributing to their success as scientists and engineers, the effects of spouse's career and home activities on career development, and the effects of gender on job mobility. The Stony Brook survey will be expanded to more respondents and questions about spouse's education, profession, and work status will be added. Comparisons will be able to be made of the experiences of the women interviewed earlier with those of more than 50 men to be interviewed as part of the extended study. (Project Director: Anne Preston, Associate Professor of Economics; Grant Period: November 1, 1993–October 31, 1995.)

Rutgers University **$461,630**
New Brunswick, NJ 08903

The Douglass Project for Rutgers Women in Math, Science and Engineering has focused both on assisting women students to cope with a sometimes discouraging learning environment and on altering that environment. Its peer study groups, career panels, and pre-college programs are primarily coping mechanisms. A special women's math-science dormitory and new research opportunities for women students have significantly altered the environment.

Rutgers now will create an enhanced Douglass Project for students interested in engi-

neering or physical science fields, in which women remain significantly underrepresented. Fifty such students will participate annually in a special four-day orientation program. They and other Project students will attend career workshops and a new Introduction to Research course. Twenty-five of these women will be selected for intense mentoring and summer research internships. The placement of these women in laboratories to participate in faculty members' research is expected to affect the faculty as well as benefit the students. The experience of working closely with capable women students on serious science should help eliminate what may remain of the faculty's negative stereotypes about such students. As with the Dartmouth program (see above), each element of this program will be carefully evaluated in order to guide Rutgers' internal efforts and to derive lessons that it will disseminate to others. (Project Director: Dr. Ellen F. Mappen, Director, Douglass Project for Rutgers Women in Math, Science and Engineering; Grant Period: June 30, 1993–December 31, 1996.)

University of Maryland Baltimore County **$203,412**
Baltimore, MD 21228

The Meyerhoff Scholarship Program at the University of Maryland Baltimore County (UMBC) is a nationally acclaimed program that recruits highly capable African-American students, supports them in their pursuit of mathematics, science, or engineering undergraduate degrees, and sends them on to graduate school. To be eligible a student must declare his or her intention to go on for a Ph.D. and this intention is strongly reinforced during the student's years at UMBC. A primary goal of the program is to increase the number of African-American faculty in mathematics, science, and engineering departments around the country.

The additional funding will support an increase in the Program's administrative staff in order to improve performance of placement functions, now involving finding research internships for over 100 students and properly placing almost 40 graduates in graduate school each year. A small portion of the new funds will help pay for a comprehensive evaluation of the entire scholarship program. (Project Director: Dr. Freeman Hrabowski, President; Grant Period: January 1, 1994–December 31, 1996.)

University of Michigan **$153,453**
Ann Arbor, MI 48109

National Action Council for Minorities in Engineering, Inc. **$204,226**
New York, NY 10001

For many years institutions of higher learning have sought to build intervention programs and implement reforms designed to increase participation of women and of underrepresented minorities in mathematics, science, and engineering. The federal government, foundations, and corporations have all made major financial commitments to such programs. Until recently, however, research and evaluation have lagged behind practice, with the result that intervention programs have not been as research-based as would be desirable. Although research on these issues is now sizable and growing, it is fragmented and has been pursued in a wide range of disciplines, complicating dissemination, consensus-building, and synthesis. There has not been a systematic attempt to understand which interventions are most successful at each level of the pipeline and under different conditions.

CURIES (Cross University Research in Engineering and Science), a Michigan group of social scientists concerned with women and gender issues, will perform an assessment of the status of knowledge concerning women of all races and ethnicities in mathematics, science, and engineering, and will prepare agendas for research and action in the field. NACME (National Action Council for Minorities in Engineering, Inc.) will perform the same task concerning underrepresented minorities of both sexes. As part of each project, a series of papers by leading scholars will be commissioned to assemble existing knowledge across disciplines, identify gaps in this knowledge, and discuss implications for action and further research. Conferences will be held to discuss these papers and the issues they raise, to be followed by publication and dissemination of agendas for intervention practice and future research. The two projects will be informed of each other's progress by means of overlapping membership on their advisory committees, participation at each other's meetings, and other informal coordination between CURIES and NACME. (Project Directors: Dr. Carol Hollenshead, Director, Center for Education of Women (Michigan) and

Catherine Morrison, Director of Research (NACME); Grant Periods: January 1, 1994–May 31, 1995 (Michigan) and January 1, 1994–June 30, 1995 (NACME).)

University of Washington **$243,000**
Seattle, WA 98195

The College of Engineering at the University of Washington received a Foundation grant in 1991 for its Women in Engineering Initiative, designed to increase the number of women earning engineering degrees. An intervention program was put in place and aimed at first-year women students, the group with the highest attrition rates. Extensive interviewing and advising of students, orientation sessions, peer mentoring, peer tutoring when needed, and a variety of motivational and community-building events are all part of this program. The initiative seems to have made a difference in increasing the retention rate for women.

This renewal grant will provide partial support for the intervention program for three additional years while the School institutionalizes it and arranges for funding by the University. The program will also be extended on a pilot basis to women students intending to major in mathematics, physics, or chemistry as a way to test whether such intervention might also be appropriate (and of interest to the faculty) in mathematics and the physical sciences. Also to be organized are seminars for faculty and graduate students on the general topic of combatting sexism in the classroom, with the expectation that these will serve to improve the climate for women in engineering and science at the University. (Project Director: Dr. Suzanne G. Brainard, Director, Women in Engineering; Grant Period: September 1, 1994–August 31, 1997.)

Wellesley College **$334,630**
Wellesley, MA 02181

As part of Wellesley's Pathways for Women in Science project, alumni from the classes of 1983 through 1991 who majored in science and students in the class of 1995 through their first and second years were surveyed. Two conclusions stand out from the tracking of the class of 1995. First, as expected, encouragement from parents, high school teachers, and faculty is critical in undergraduate women's decisions to major in science. (Mothers' encouragement plays an equally important role as fathers' for these students.) Second, the study confirmed that the learning environment, such as the size of introductory classes, is very important. In the alumni study, about 25 percent had left science by the time they were surveyed. Encouragement from parents and teachers, early access to a mentor and to career advice, and opportunities for research experience as undergraduates were important in explaining persistence in a science career. As predicted, family issues, and child-bearing and child care were common causes of departure from the science career path.

The second phase of this project will complete the longitudinal study of the class of 1995 through graduation and into the fall of the first post-graduate year. It will also add cohorts from the classes of 1968 through 1982 to the alumni study. Expanding the alumni survey to older women will allow greater attention to be paid to work-family, career opportunity, and various harassment and discrimination issues. Inclusion of both science and non-science majors will permit comparisons to be made between science and other careers. (Project Director: Paula Rayman, Director, Pathways for Women in Science, and Associate Professor of Sociology; Grant Period: September 1,1993–December 31, 1995.)

Women in Engineering Program Advocates Network **$371,400**
Seattle, WA 98195

The Women in Engineering Program Advocates Network (WEPAN) was founded in 1990 to increase the number of women who pursue careers in engineering by encouraging colleges and universities to start or expand Women in Engineering Programs. WEPAN now is a professional organization with over 450 members, including 70 institutional or corporate members, and is widely recognized. Regional training seminars on developing and expanding Women in Engineering Programs are an important part of WEPAN's program. This grant will allow WEPAN, during each of the next three years, to conduct three regional training seminars and train six technical assistance consultants. By the end of that period, roughly half the engineering schools in the country will have participated in one of these seminars and about twenty new

technical assistants will have been trained. Thereafter, the seminars will no longer be needed and WEPAN's training efforts, consisting of less intensive and less expensive workshops and on-site technical assistance by the newly trained consultants, can be self-financing. (Project Director: Susan Staffin Metz, Vice President, WEPAN; Grant Period: February 1, 1994–January 31, 1997.)

WOMEN AND MINORITIES, OFFICER GRANTS

Appalachian State University **$29,933**
Boone, NC 28608

For a study of an existing data set on what works for minority students in developmental education programs at different types of institutions. (Project Director: Professor Hunter R. Boylan, Director, National Center for Developmental Education; Grant Period: September 1, 1993–August 31, 1994.)

Association for Women in Mathematics **$30,000**
College Park, MD 20742

Support for ten to twelve Sonia Kovalevsky High School Mathematics Days to be held at both large universities and small colleges. (Project Director: Alice T. Shafer, Professor of Mathematics, Marymount University; Grant Period: September 1, 1993–December 31, 1994.)

Brown University **$30,000**
Providence, RI 02912

To promote the revision of introductory science courses to assure greater success for all students. (Project Director: David Targan, Assistant Dean of the College; Grant Period: January 1, 1994–August 31, 1995.)

Carnegie Mellon University **$30,000**
Pittsburgh, PA 15213

To expand current and launch new intervention programs for women and minorities in science and engineering. (Project Director: Dr. Barbara B. Lazarus, Associate Provost for Academic Projects; Grant Period: September 1, 1993–September 30, 1994.)

Franklin and Marshall College **$29,583**
Lancaster, PA 17606

Support for a longitudinal comparative study of women and men in engineering. (Project Director: Carol Auster, Professor of Sociology; Grant Period: November 1, 1993–October 31, 1995.)

Kansas State University **$30,000**
Manhattan, KS 66506

Support of a mentoring program for new women and minority faculty in the sciences. (Project Director: James R. Coffman, Provost; Grant Period: September 1, 1993–September 30, 1994.)

National Action Council for Minorities in Engineering, Inc. **$29,418**
New York, NY 10001

Planning grant for a conference on the status of knowledge on minorities in science, mathematics, and engineering. (Project Director: Catherine Morrison, Director of Research; Grant Period: June 1, 1993–December 31, 1993.)

University of California, Davis **$27,000**
Davis, CA 95616

Funding to add a new program to the Women in Engineering Program and to take the

next step in focusing faculty on gender equity issues. (Project Director: M. S. Ghausi, Dean, College of Engineering; Grant Period: February 1, 1994–January 31, 1996.)

University of California, Los Angeles **$30,000**
Los Angeles, CA 90024

To create a series of multimedia images of women mathematicians and scientists. (Project Director: Pamela Davis, Artist in Residence, College of Letters, and Co-Director of the Art Science Center; Grant Period: November 1, 1993–September 30, 1994.)

University of Michigan **$29,958**
Ann Arbor, MI 48109

Planning grant for a conference on the status of knowledge on women in science, mathematics, and engineering. (Project Director: Carol Hollenshead, Director, Center for Education of Women; Grant Period: June 1, 1993–December 31, 1993.)

TECHNOLOGY EDUCATION, TRUSTEE GRANT

GMI Engineering and Management Institute **$400,000**
Flint, MI 48504

GMI, founded in 1926 by the General Motors Corporation, became a fully independent five-year engineering college in 1982. Its mission is to prepare engineers for American industry, mainly the auto industry. It is the nation's only fully co-op engineering college. A close partnership with industry allows GMI to provide programs that combine academic studies with practical applications in the workplace. All students alternate 12-week periods of classroom and laboratory studies on campus with increasingly more responsible work assignments at their co-op employers. During their fifth year students plan and conduct a research project on a "real world" problem of importance to their companies. The close coupling of the theoretical with the practical ensures that GMI's academic programs are directly linked to the real needs of industry. Over 90 percent of GMI's graduates are hired for full-time positions by their co-op employers.

For such an educational mission, a qualified faculty is imperative. Faculty must be able to provide classroom and laboratory instruction based on the latest industrial technology and techniques. Although GMI's faculty are technically knowledgeable and often have close ties with industry, there nevertheless would be significant benefits from a specific program that would provide faculty with opportunities for relevant work assignments in industry. This grant will allow GMI to implement a cooperative faculty development project to provide the opportunity for selected faculty members to be placed in jobs with manufacturing companies, alternating six-month industrial work with on-campus teaching. (Project Director: John Lorenz, Vice President for Academic Affairs; Grant Period: March 8, 1993–June 30, 1996.)

OFFICER GRANT

Institute of Electrical and Electronics Engineers, Inc. **$27,000**
Piscataway, NJ 08855

Support for a conference to understand the direction in continuing education. (Project Director: Peter Wiesner, Manager, Continuing Education; Grant Period: November 1, 1993–November 30, 1994.)

EDUCATION OUTSIDE THE CLASSROOM, TRUSTEE GRANTS

Cornell University **$109,370**
Ithaca, NY 14853

The Physics Department at Cornell is planning to restructure its undergraduate teaching to allow students to move through course material at a pace determined by

their own capabilities and motivations. Some students might opt for more advanced training by learning the material normally taken in the first year of physics graduate school. Others may choose to move more rapidly through the standard curriculum so as to earn a physics baccalaureate in less than the traditional four years. Still others may wish to free up time within the four-year program for other subjects and thus make it possible to earn an advanced degree, such as a master's in engineering or in business administration, in a shorter time following the undergraduate degree. And there will be those who prefer to remain within the conventional program, but find it more attractive when the learning pace is under their own control.

These choices would be made possible by restructuring selected upper division physics courses into a self-paced format, reducing the emphasis on lectures, increasing student-to-student learning, and giving more personal attention to students by teaching assistants and faculty. A good part of these person-to-person connections will be realized by means of networked computer communications. This grant, following two officer grants for early planning and preliminary program development, will carry the project to a point where some real teaching experience has been gained and where early results can be assessed. (Project Director: Professor Kurt Gottfried, Chairman, Department of Physics; Grant Period: November 1, 1993–July 31, 1994.)

Drexel University **$750,000**
Philadelphia, PA 19104

Drexel's College of Information Studies plans to create six software design courses in the areas of Information Systems and Software Engineering, to be provided to students by means of computers and networks. The information provided on-line will include the course syllabus, electronic addresses of registrants, all textbook and supplementary reading references, help facilities, and instructions on how to obtain help, share information, and send and receive printed material. Drexel students are required to take three co-op terms, during which they work at an industrial location perhaps hundreds of miles from campus. During this time, they will be able to participate in these courses, along with resident students and those who cannot attend scheduled classes because they are working. The use of on-line resources and networked instruction will permit some degree of self-pacing for students. Members of software design teams organized as part of course projects will be able to design on the network and interact electronically. Professors will supply assignments and guide courses through the computer network, but will also be available for face-to-face discussions and consultations. (Project Director: Stephen J. Andriole, Professor of Information Studies and Electrical and Computer Engineering; Grant Period: January 1, 1994–September 30, 1996.)

New Jersey Institute of Technology **$697,422**
Newark, NJ 07102

New Jersey Institute of Technology (NJIT), an 8,000 student urban technological university, has a long history of pioneering efforts in the development and assessment of computer-mediated communication for education. Virtual Classroom (VC) is NJIT's trademarked name for a computer conferencing system to support teaching and collaborative learning. Though it is possible to offer courses totally through the Virtual Classroom, a combination with videotaped lectures has been preferred.

This grant will be used for an expansion of the use of VC and videotaped lectures for a major new program for the B.A. degree in Information Systems, involving many courses. VC software will be enhanced; courses will be recast by instructors into a videotape and VC format; mechanisms will be put in place for supporting remote students when they have questions, need materials, or wish to interact with fellow students or the instructor; special classes will be held to train faculty in the use of the new system; and research will be carried out to evaluate the relative quality and efficiency of the videotape and VC format as compared to traditional means of learning. Students in this B.A. program will be able to take courses on-campus or at home. Home learning eliminates the problem of schedule conflicts among courses and also is especially useful for those students whose work schedules or family obligations make it difficult to attend on-campus classes. (Project Director: Starr Roxanne Hiltz, Professor of Computer and Information Science; Grant Period: July 1, 1993–June 30, 1996.)

Northern Virginia Community College **$320,149**
Annandale, VA 22003

Community College students are likely to be employed, have family responsibilities, or live some distance from the college, making it inconvenient to attend regularly scheduled classes on campus. The option of taking courses at home and being able to interact with faculty and students via computer is likely to be attractive to such students.

With this grant, four courses required for the Associate of Science (Engineering) degree will be developed and delivered for home-based learners. Print, video (taped or cable), audio, and computer conferencing technologies will be used to provide course material and to link students to resources, faculty, and fellow students. Registration, advising, financial aid, and other student services will be made available through touch-tone phone and computers. Special needs arising in engineering, such as the transfer of high capacity graphics files into computer conferencing software, will be taken care of. NVCC students who earn the A.S. (Engineering) degree typically transfer to university engineering programs. This project should provide increased access to engineering education at NVCC and thereby to four-year degree programs. (Project Director: Randal A. Lemke, Director, Extended Learning Institute; Grant Period: January 1, 1994–July 30, 1995.)

Pennsylvania State University **$263,000**
University Park, PA 16802

A certified Professional Engineer (PE) is registered by a state, usually in one of four major engineering disciplines: Chemical, Civil (Sanitary and Structural), Electrical, and Mechanical. A PE has the legal responsibility for certifying that engineering work complies with state and local codes and conforms with good engineering practices. To become a registered PE in most states, a candidate must complete four steps: (1) graduate from an approved four-year engineering program; (2) pass the nationwide Fundamentals of Engineering (FE) examination; (3) complete a four-year internship under the supervision of a PE; and (4) pass the state's Principles and Practices of Engineering (PE) examination.

Penn State and other universities provide review classes for those wishing to take the FE and PE exams, but these typically require students to go to a campus or to some location in a large nearby city. Home-study review materials, including videotape, are also available from some universities and professional societies. They are paid for by the students who are then left to fend for themselves. With this grant, Penn State will create an integrated, interactive, home-study review system for the FE exam, utilizing videotaped presentations, and an asynchronous voice-mail system for mentoring, assistance with problem-solving, and for work on practice examinations. The system will be designed to assist users in topics known to be difficult. Voice-mail or phone contact with instructors will also be available. Aside from making it possible to prepare for the examination at home, the goal of this project is to provide results equal or better than those achieved with the traditional in-class review process, and at comparable cost to the student. (Project Director: Alan D. Stuart, Associate Professor of Acoustics; Grant Period: November 1, 1993–November 30, 1994.)

Stanford University **$134,801**
Stanford, CA 94305

Secondary schools in many communities have bright students who seek the opportunity to take college-level mathematics or physics courses, but cannot because teachers at these schools are not qualified to teach advanced subjects. Special summer programs for such students at some colleges and universities offer one solution. Another is computer-based learning in the home. Patrick Suppes at Stanford has been a pioneer in computer-aided instruction for motivated and gifted high school students. He and his group have developed software with an audio component that allows a student to hear a lecture while the computer screen serves as a blackboard for the lecturer. Students work on problems interactively on the computer. Examinations are taken at home on the computer and transmitted electronically.

This grant will support the creation of one new course (Advanced Placement Physics C: Electricity and Magnetism) and revision of three existing courses (including AP Physics C: Mechanics) for use by students at home. An important goal of the project is to find out how best to provide support for remote learners in a cost-effective way. Software and the services of one full-time equivalent teaching assistant per 100 students, interconnected with e-mail and telephone, are now being used. A small part of the grant will be applied to provide the required computer equipment to highly qualified students from economically disadvantaged families. (Project Director: Patrick Suppes, Lucie Stern Professor of Philosophy; Grant Period: November 1, 1993–November 30, 1994.)

University of Illinois at Urbana-Champaign **$198,197**
Champaign, IL 61820

Professor Burks Oakley is the developer of CircuitTutor, an award-winning software package for review and drill of basic circuits concepts. It is used as a supplement to the text and lecture material of the fundamental lower division course on circuits required for an electrical engineering degree at Illinois and at many other universities. But it is largely a stand-alone piece of software used by students in isolation. This grant supports the creation of a shared, interactive environment on Internet that will permit over 400 students per semester to use CircuitTutor facilities, share ideas on solutions to circuit problems, and communicate hand-written equations and diagrams by use of digital tablets.

Course lectures will be videotaped and made available to both on- and off-campus students who will be able to proceed at their own pace. Most off-campus users are expected to be students at community colleges in the state, who have been at a disadvantage when transferring to the university by not having had the required circuits course available to them. All students will have full access to the shared, interactive Internet environment for problem-solving, electronic discussions, and other learning activities. (Project Director: Burks Oakley II, Professor and Assistant Head, Department of Electrical and Computer Engineering; Grant Period: November 1, 1993–July 31, 1995.)

EDUCATION OUTSIDE THE CLASSROOM, OFFICER GRANTS

Columbia University **$29,400**
New York, NY 10027

Support of a workshop to identify and discuss important directions in home-based education. (Project Director: Edward G. Borbely, Director, Off-Campus Education; Grant Period: June 1, 1993–December 1, 1993.)

Cornell University **$11,600**
Ithaca, NY 14853

Support of an invitational workshop to describe self-teaching software for physics and to exchange ideas about techniques that encourage self-paced learning in physics. (Project Director: Professor Kurt Gottfried, Chairman, Department of Physics; Grant Period: April 1, 1993–July 1, 1993.)

Cornell University **$21,400**
Ithaca, NY 14853

To support the transformation of electrodynamics and solid state physics courses into self-paced mode. (Project Director: Professor Kurt Gottfried, Chairman, Department of Physics; Grant Period: September 1, 1993–June 30, 1994.)

Maricopa Community Colleges Foundation **$4,748**
Tempe, AZ 85281

Support for a pilot program for GED students to determine the feasibility of moving to certification or Associate degrees in computer applications from the home. (Project Director: Betsy Frank, Associate Dean of Instructional Technology, Rio Salado Community College; Grant Period: December 1, 1993–July 31, 1994.)

New York University $27,300
New York, NY 10003

To support development of curriculum using Lotus Notes, and evaluation of desktop video technologies. (Project Director: Richard Vigilante, Director, Information Technologies Institute, School of Continuing Education; Grant Period: June 1, 1993–January 31, 1994.)

University of Michigan $29,000
Ann Arbor, MI 48109

Support for a guidebook on basic, easy-to-use tools and methods for visual communications in engineering education. (Project Director: Professor Lynn Conway, Associate Dean for Instruction and Instructional Technology; Grant Period: November 1, 1993–October 31, 1994.)

TRUSTEE GRANT

Commission on Professionals in Science and Technology $58,728
Washington, DC 20005

Over the past several years there has been increasing concern in the scientific community about the employment prospects for those receiving the Ph.D. degree. Not long ago there was talk of a looming shortage of such highly educated scientists. Recent trends have brought this concern into question, but the available evidence remains inconclusive.

The project supported by this grant consists of three parts: (1) developing a compendium of hard data and other existing evidence now available only in widely scattered form; (2) planning and holding a workshop of concerned specialists from the science and engineering societies, government agencies, universities, and industry; and (3) developing a plan for continuous monitoring of the supply and demand picture for young research scientists and engineers. (Project Director: Betty M. Vetter, Executive Director; Grant Period: December 1, 1993–September 30, 1994.)

OFFICER GRANTS

Commission on Professionals in Science and Technology $7,650
Washington, DC 20005

For distribution of the report, "Setting The Record Straight: Shortages in Perspective" and solicitation of corporations for membership. (Project Director: Betty Vetter, Executive Director; Grant Period: June 1, 1993–December 31, 1993.)

Population Reference Bureau, Inc. $25,000
Washington, DC 20009

Support for a comparative study of how the supply of scientists and engineers in

seven industrial countries relates to national competitiveness and the quality of life. (Project Director: Martha Farnsworth Riche, Director; Grant Period: November 1, 1993–October 31, 1994.)

Society of Women Engineers **$30,000**
New York, NY 10017

To complete data analysis on a survey of men and women engineers and publish an updated version of The Profile of the Woman Engineer. (Project Director: B. J. Harrod, Executive Director; Grant Period: January 1, 1993–July 1, 1993.)

University of Iowa **$30,000**
Iowa City, IA 52242

To support a study of the literature of career development of college students. (Project Director: Professor David A. Jepsen, College of Education; Grant Period: November 1, 1993–June 30, 1994.)

IMMIGRATION OF SCIENTISTS AND ENGINEERS

Last year, the Foundation began a new program to support research on immigration to the United States, with a special focus on the effects of the migration of foreign scientists and engineers on U.S. firms, educational institutions, and the resident workforce. The subject is one on which there are often polarized differences of opinion, ranging from the view that such flows must be increased if the U.S. is to remain internationally competitive, to concerns that foreign-born dominance of key technical sectors creates national vulnerabilities and diminishes the attractiveness of science and engineering as careers for Americans. Very sparse evidence is actually available to support such arguments. The Foundation program is designed to increase our knowledge in this area.

Grant recipients under this new competitive program were selected and grants made to the following sponsoring institutions in 1993. In each of these trustee grants, both the research topic to be pursued and the names and affiliations of the researchers (project directors) are specified.

Georgia State University Research Foundation, Inc. **$114,592**
Atlanta, GA 30303

Research topic: The Birth Origin and Educational Background of Scientists and Engineers Making Exceptional Contributions to U.S. Science and Engineering. (Project Directors: Paula E. Stephan, Professor of Economics and Senior Associate, Policy Research Center, Georgia State University, and Sharon G. Levin, Professor and Chair of Economics, University of Missouri, St. Louis; Grant Period: June 1, 1993–May 31, 1995.)

Oak Ridge Associated Universities **$37,872**
Oak Ridge, TN 37831

Research topic: Improving Estimates of the Number and Characteristics of Foreign Science and Engineering Doctorate Recipients Staying in the United States.

(Project Director: Dr. Michael G. Finn, Deputy Director, Labor and Policy Studies Program, Oak Ridge Institute for Science and Education; Grant Period: July 1, 1993–June 30, 1994.)

Population Reference Bureau, Inc **$25,530**
Washington, DC 20009

Research topic: Two Very Different Sets of Gatekeepers: INS and ETS and Their Screenings of Foreign-Born Scientists and Engineers. (Project Director: David S. North, Senior Associate; Grant Period: July 1, 1993–June 30, 1994.)

Princeton University **$73,298**
Princeton, NJ 08544

Research topic: Foreign Graduate Students in U.S. Doctoral Programs in Sciences and the Humanities. (Project Directors: Dr. Thomas J. Espenshade, Professor of Sociology and Faculty Associate, Office of Population Research, and Dr. German Rodriguez, Senior Research Demographer, Office of Population Research; Grant Period: July 1, 1993–December 31, 1994.)

Research Foundation of The City University of New York **$147,585**
New York, NY 10003

Research topic: Factors Determining Successful Economic Integration of Scientific and Technical Immigrants from the Former Soviet Union. (Project Directors: Randall K. Filer, Professor of Economics, Hunter College, and Anne Krill, Research Assistant, Department of Economics; Grant Period: August 1, 1993–July 31, 1995.)

Rutgers University **$127,291**
New Brunswick, NJ 08903

Research topic: A Comparison of the Careers, Commitment, and Contributions of U.S. Born and Immigrant Scientists and Engineers in U.S. Industrial Laboratories.

(Project Directors: Dr. Nancy DiTomaso, Chair, Organization Management Area, and Dr. George F. Farris, Acting Dean, Graduate School of Management; Grant Period: June 1, 1993–May 31, 1995.)

University of California, Los Angeles **$99,830**
Los Angeles, CA 90024

Research topic: Immigrant and Native Engineers in California. (Project Directors: Roger Waldinger, Professor of Sociology, and Dr. Mehdi Bozorgmehr, Lecturer and Postdoctoral Fellow, Department of Sociology; Grant Period: September 1, 1993–August 31, 1995.)

TRUSTEE GRANTS

The Civil Rights Project, Inc. **$150,000**
Boston, MA 02118

This grant (and an earlier officer grant listed below) supported preliminary research and the development of a detailed plan for a new television series on minorities in science and engineering. A major grant was subsequently made to support production of the six-hour documentary by Blackside, Inc., an independent television production company. Founded in 1968, Blackside developed and produced "Eyes on the Prize," the fourteen-hour PBS film series on America's civil rights movement. Broadcast nationally in prime time, it reached over 20 million viewers with each airing and won numerous awards, including duPont-Columbia and Peabody awards for excellence in broadcast journalism, and six Emmys. See the next entry below for a description of the new project. (Project Director: Henry Hampton, President, Blackside, Inc.; Grant Period: June 15, 1993–December 31, 1993.)

The Civil Rights Project, Inc. **$3,800,000**
Boston, MA 02118

This major grant supports the production of a six-hour documentary television series on the accomplishments of minority scientists and engineers, and on the challenges that confront people of color who pursue careers in science and engineering. The six programs, to be broadcast over PBS in prime time, will be targeted at public television's large prime-time adult viewing audience. Special efforts will be made to attract minority viewers. The series goal is to make the general public more aware of the contributions of minorities to science and engineering. Also, a comprehensive program of post-broadcast education and outreach activities will be developed, including written and graphic materials designed for interactive media and computer networks. Aimed primarily at young people, both in classrooms and homes, these educational materials will develop the themes of the programs and will serve a second goal of the series: to encourage youngsters, especially minorities, to consider education and careers in science and engineering. These education and outreach undertakings will be separately funded. The Sloan grant supports production of the series.

Each hour-long program will be built around three or four central scientists and engineers whose current research and personal journeys form the principal story-telling ingredients. These main figures will be chosen based on the quality of their work, and the dramatic power of their scientific and life journey as it can be translated into viewer-attracting television. This multiple character format will permit both the ethnic diversity of the subjects and the variety of their scientific and technological fields and careers to be illustrated. Although mainly biographical, the series will also focus on the process of doing science in the laboratory and in the field, and also of becoming a scientist, from family origins through graduate school, career choice, and professional accomplishment.

The production team will be assisted from the beginning by groups of scientists and engineers who will advise on the selection of principal figures and scientific themes and on the technical accuracy of the programs. (Project Director: Henry Hampton, President, Blackside, Inc.; Grant Period: October 5, 1993–December 31, 1995.)

OFFICER GRANTS

The Palmer R. Chitester Fund, Inc. **$20,000**
Erie, PA 16506

Support for ten hours of scholarly conversations on the Idea Channel. (Project Director: Robert J. Chitester, President; Grant Period: March 23, 1993–December 31, 1993.)

The Civil Rights Project, Inc. **$30,000**
Boston, MA 02118

Support for preliminary planning of a television series on minorities in science and engineering. (Project Director: Henry Hampton, President, Blackside, Inc.; Grant Period: April 26, 1993–December 31, 1993.)

Columbia University $20,000
New York, NY 10027

Support for writing a book on molecular biology of disease. (Project Director: Professor Robert E. Pollack, Department of Biological Sciences; Grant Period: July 1, 1993–December 31, 1993.)

Rensselaer Polytechnic Institute $4,500
Troy, NY 12180

Support for continuation of the Breakfast Seminars for journalists on science and technology policy. (Project Director: Dr. Herbert I. Fusfeld, Chairman, Advisory Board, School of Management; Grant Period: September 1, 1993–August 31, 1994.)

Rockefeller University $10,000
New York, NY 10021

Support for a "Scientist as Poet" prize. (Project Director: Dr. Torsten N. Weisel, President; Grant Period: April 23, 1993–June 30, 1993.)

Sigma Xi, The Scientific Research Society $30,000
Research Triangle Park, NC 27709

Support for the writing of a book, "A Guide to the Industrial Landscape." (Project Director: Brian Hayes, former Editor, American Scientist; Grant Period: June 14, 1993–June 30, 1995.)

TECHNOLOGY BOOK SERIES

The Alfred P. Sloan Foundation is sponsoring a series of books intended to broaden public understanding of the twentieth century's critical technologies. Books in the series will describe the development of specific technologies, including the circumstances of their emergence, their early development and use, their expanding application, and their eventual impact practically, socially, and culturally.

Unlike the Foundation's now-concluded Science Book Series, which consisted of memoirs written by scientists, mainly about their own lives in science, most of the books in the new Technology Book Series will be the work of professional writers. Twenty-three books have been commissioned to date. The authors and their subjects are as follows:

William Aspray and Martin Campbell-Kelly; the computer

Robert Buderi; radar

John Cairns, M.D.; public health

Craig Canine; 20th century American agriculture

Gary Dorsey; Orbital Sciences Corporation

Susan J. Douglas; commercial radio in America

David E. Fisher; television

Helen Gavaghan; civilian space satellites

Stephen S. Hall; immunotherapy

Jeff Hecht; fiber optics

Thomas A. Heppenheimer; commercial jet aviation

Lillian Hoddeson and Michael Riordan; the transistor

Horace Freeland Judson; biotechnology

Robert Kanigel; biography of Frederick W. Taylor

Bettyann Kevles; non-invasive medical imaging technology

Charles C. Mann; birth-control technology

Victor McElheny; biography of Edwin Land

Elting E. Morison and Richard Rhodes; anthology on technology in 20th century life

Henry Petroski; communications technology

Robert Pool; nuclear power

Mark Reutter; diesel railroad engines

Richard Rhodes; the hydrogen bomb

M. Mitchell Waldrop; computer software

The first books in the new series are expected to be completed in 1994.

SELECTED NATIONAL ISSUES

The Foundation is interested in contributing to the major issues of our time, but in a way appropriate to its expertise and limited size. Usually this requires a special approach in order that a meaningful new contribution can be made to issues and problems that are widely recognized. The Foundation will support work in areas where such an approach can be developed, with the goal of enhancing understanding of complex issues of national importance.

Previous projects in this category, some completed and others still underway, are briefly described in the General Information section of this annual report. They include research on experiences with changes in the legal status of drugs in twentieth century industrial societies, a study of the deep oceans as waste depositories, a large survey to study and understand the public perception of nuclear power, and analysis of the long-term clean-up of radioactive waste at nuclear reactor facilities.

In 1993, grants were approved for two new projects: a trustee grant for analysis and development of social indicators on the position of children in the United States, and an officer grant for an exploratory conference on the evaluation of the performance of government agencies.

TRUSTEE GRANT

American Academy of Arts and Sciences **$400,000**
Cambridge, MA 02138

As part of its large program of Initiatives for Children, the American Academy of Arts and Sciences has put together a sterling interdisciplinary group that will, with the support of this grant, develop a broadly based set of indicators covering different aspects of children's lives. The aim is to produce significantly improved measures to show what has gotten better, what has gotten worse, and what has stayed the same. Alan Krueger, Kenneth Arrow, Robert Solow, and Martin Feldstein are expected to work on economic indicators; Nathan Keyfitz and Thomas Kane, on education indicators; Christopher Jencks and Susan Mayer, on indicators of family and social status;

and Lincoln Moses, on health indicators. Although the project will start with existing indicators, new measures will be developed where appropriate. In all cases, the significance of each indicator will be summarized as it relates to the quality of children's lives at the present time and as projected into the future. (Project Director: Howard H. Hiatt, M.D., Secretary; Grant Period: October 5, 1993–December 31, 1995.)

OFFICER GRANT

Brookings Institution **$29,700**
Washington, DC 20036

Support for a conference on the evaluation of government agencies' performance. (Project Director: John Dilulio, Senior Fellow, Woodrow Wilson School, Princeton University; Grant Period: January 1, 1994–August 31, 1994.)

CIVIC PROJECTS

TRUSTEE GRANT

City College of City University of New York **$333,000**
New York, NY 10031

City College graduates one of the largest numbers of African-American and Hispanic engineers in the nation. This grant will allow the college's Program for the Retention of Engineering Students to offer tutoring to students who transfer from community colleges in the CUNY system. These students, nearly half of all students admitted to the School of Engineering, are mainly minority. Their drop-out rate is high, but is expected to be reduced significantly by the use of tutoring. Also, a freshman orientation course and mentoring program will be started. The course will provide new engineering students with academic skills and guidance information required for success. Classes will be small and instructors, minority graduate student alumni trained for the purpose, will also serve as role models and mentors for their students. (Project Director: Charles B. Watkins, Dean, School of Engineering; Grant Period: January 1, 1994–December 31, 1997.)

OFFICER GRANTS

New School for Social Research **$28,000**
New York, NY 10011

To support a conference on workforce training for New York City youth. (Project Director: James A. Krauskopf, Dean, Graduate School of Management and Urban Policy; Grant Period: March 1, 1993–December 31, 1993.)

SciencePort **$10,000**
Rye, NY 10580

Support for an interactive science museum at Rye Playland. (Project Director: June K. Blanc, President; Grant Period: June 1, 1993–April 31, 1994.)

TRUSTEE GRANT

National Bureau of Economic Research, Inc. **$100,000**
Cambridge MA 02138

This grant partially supports a research study on the current conflicts in objectives and means in public economic and social policy. Child welfare, education, medical care, and treatment of the elderly, for example, are all contentious issues and various groups approach them using diverse and sometimes conflicting policy goals, such as efficiency, equity, justice, or security. As part of the project, a conference will be held for which leading scholars will prepare papers on the above four specific social issues as examples that may require new approaches to public policy. Other participants will cut across these particular issues from a variety of economic, social, political, and legal perspectives. Professor Fuchs will use the conference materials and his own research findings to prepare a book whose overall theme will be The Responsible Society. His aim is to increase understanding of the tradeoffs and complementarities among different policy goals and how these goals involve and depend on many different institutions within our society. (Project Director: Victor Fuchs, Professor of Economics, Stanford University; Grant Period: November 1, 1993–December 31, 1996.)

OFFICER GRANTS

Center for Strategic and International Studies **$30,000**
Washington, DC 20006

Support for a project on defense conversion. (Project Director: Harold Brown, Counselor; Grant Period: September 15, 1993–March 30, 1994.)

Harvard University **$30,000**
Cambridge, MA 02138

Support for a conference on The Emergence and Life Cycle of Social Issues. (Project Director: Dr. Jay A. Winsten, Associate Dean and Director, Center for Health Communications; Grant Period: March 15, 1993–December 31, 1993.)

Stanford University **$30,000**
Stanford, CA 94305

To sponsor a conference on university goals and relations to industry. (Project Director: Dr. W. Edward Steinmueller, Deputy Director, Center for Economic Policy Research; Grant Period: December 1, 1993–December 31, 1994.)

University of California, Los Angeles **$30,000**
Los Angeles, CA 90024

Support for a conference on aspects of new international regimes. (Project Director: Richard Rosecrance, Director, Center for International Relations; Grant Period: August 10, 1993–March 31, 1994.)

ADDITIONAL GRANTS

TRUSTEE GRANTS

The Foundation Center **$180,000**
New York, NY 10003

The Foundation Center disseminates information about foundation programs and priorities to grant seekers and the public. With over 25,000 private foundations in the country, such information not only helps grant seekers by identifying suitable sources of funding, but also serves foundations by encouraging proposals that fit their programmatic interests. The Center operates libraries in major cities, distributes publications such as The Foundation Directory, and maintains a computer database on foundation grants. Over half the Center's revenues come from the sale of publications and from fees, the balance from foundation and corporate grants. The Sloan Foundation has been a supporter since 1963. This grant supports the Center for three additional years. (Project Director: Sara L. Engelhardt, President; Grant Period: March 1, 1993–December 31, 1995.)

Council on Foundations **$40,000**
Washington, DC 20036

Independent Sector **$7,500**
Washington, DC 20036

New York Regional Association of Grantmakers **$10,500**
New York, NY 10018

The Council on Foundations (COF) is the foundation community's national organization. It provides a variety of services, including publications, research reports, workshops, seminars, and an annual meeting, and maintains an active government relations staff. The mission of Independent Sector (IS) is to maintain a forum for encouraging giving, volunteerism, and not-for-profit initiatives. It is active in the area of government relations, not-for-profit research, and management of not-for-profit organizations. NYRAG is one of 24 regional associations affiliated with the COF and concentrates its activities in the greater New York area, supplying programs and newsletters focusing on local foundation activities. Annual membership dues are covered by these grants. (Project Directors: James A. Joseph, President, COF; Jeanne Bohlen, Vice President, IS; Barbara Ryan, Executive Director, NYRAG; Grant Periods: all January 1, 1993–December 31, 1993.)

OFFICER GRANT

Community Funds, Inc. **$5,000**
New York, NY 10016

Support for New York City Host Committee activities at the Council on Foundations 1994 annual conference. (Project Director: Lorie A. Slutsky, President, New York Community Trust; Grant Period: December 1, 1993–June 1, 1994.)

1993 FINANCIAL REVIEW

FINANCIAL REVIEW

The financial statements and schedules of the Foundation for 1993 and 1992, which have been audited by KPMG Peat Marwick and Ernst & Young respectively, appear on pages 104 to 113. They include balance sheets, statements of investment income, grants and expenses and changes in fund balance and of changes in financial position, and schedule of management and investment expenses.

Investment income for 1993 was $33,704,513, a decrease of $3,853,087 from $37,557,600 in 1992. After the deduction of investment expenses and provision for Federal excise tax, net investment income was $28,909,375 in 1993 as compared with $34,286,881 for the prior year. Investment expenses during 1993 totaled $2,955,138 of which $2,410,693 represented investment advisor fees. The provision for Federal excise tax amounted to $1,840,000. The total of these deductions from investment income in 1993 was $4,795,138 versus $3,270,719 in 1992.

Grants and appropriations authorized, net of grant refunds, and management expenses during 1993 was $34,058,058, which was $5,148,683 greater than 1993 net investment income. Of this total, grants and appropriations authorized amounted to $31,228,102 while management expenses were $3,041,356. Since the Foundation's inception in 1934, the cumulative excess of grants and expenses over the Foundation's income has amounted to $20,587,048.

Grant and appropriation payments in 1993 were $31,509,970 compared with $32,625,176 for the prior year. Together with management expenses, investment expenses, Federal excise taxes paid and other charges, the total of cash expenditures net of grant refunds in 1993 was $40,387,638 while in 1992 the amount was $43,867,732.

Grants and appropriations authorized and payments made during the year ended December 31, 1993 are summarized in the following table:

Grants and appropriations unpaid at December 31, 1992	**$30,508,432**
Authorized during 1993	31,228,102
	61,736,534
Payments during 1993	31,509,970
Grants and appropriations unpaid at December 31, 1993	**$30,226,564**

The market value of the Foundation's total assets was $849,741,304 at December 31, 1993 including investments valued at $848,635,378 as compared with total assets of $775,698,874 at December 31, 1992.

Report of KPMG Peat Marwick
Independent Auditors

Board of Trustees
Alfred P. Sloan Foundation

We have audited the accompanying balance sheet of the Alfred P. Sloan Foundation as of December 31, 1993, and the related statements of investment income, grants and expenses and changes in fund balance and changes in financial position for the year then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these financial statements based on our audit. The financial statements of the Foundation as of and for the year ended December 31, 1992 were audited by other auditors whose report thereon, dated January 29, 1993, expressed an unqualified opinion.

We conducted our audit in accordance with generally accepted auditing standards. 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 1993 financial statements referred to above present fairly, in all material respects, the financial position of the Alfred P. Sloan Foundation as of December 31, 1993, and the results of its operations and its changes in financial position for the year then ended in conformity with generally accepted accounting principles.

Our audit was made for the purpose of forming an opinion on the 1993 basic financial statements taken as a whole. The supplementary information included in the schedule of management and investment expenses for the year ended December 31, 1993 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information for 1993 has been subjected to the auditing procedures applied in the audit of the 1993 basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

KPMG Peat Marwick

February 4, 1994

BALANCE SHEETS
DECEMBER 31, 1993 AND 1992

	1993	1992
Assets		
INVESTMENTS:		
Fixed income	$225,090,343	$291,054,153
Equity	499,543,557	377,899,347
Real Estate	21,813,124	20,845,334
TOTAL INVESTMENTS	746,447,024	689,798,834
INTEREST PURCHASED	1,191,412	252,876
CASH	(85,486)	(460,067)
Total	**$747,552,950**	**$689,591,643**
Liabilities and Fund Balance		
GRANTS AND APPROPRIATIONS UNPAID	$ 30,226,564	$30,508,432
OTHER	20,360	210,537
	30,246,924	30,718,969
FUND BALANCE	717,306,026	658,872,674
Total	**$747,552,950**	**$689,591,643**

See accompanying notes to financial statements.

STATEMENTS OF INVESTMENT INCOME, GRANTS AND EXPENSES AND CHANGES IN FUND BALANCE

Years ended December 31	1993	1992
INVESTMENT INCOME:		
Dividends	$10,943,644	$12,630,420
Interest	22,756,763	24,919,067
Other	4,106	8,113
	33,704,513	37,557,600
LESS:		
Investment expenses	2,955,138	2,270,719
Provision for Federal excise tax	1,840,000	1,000,000
	4,795,138	3,270,719
Net investment income	28,909,375	34,286,881
GRANTS AND EXPENSES:		
Grants and appropriations authorized (net of refunds of $211,400 in 1993 and $160,600 in 1992)	31,016,702	33,837,034
Management expenses	3,041,356	2,812,942
Total	34,058,058	36,649,976
EXCESS OF GRANTS AND EXPENSES OVER NET INVESTMENT INCOME	(5,148,683)	(2,363,095)
NET GAIN ON DISPOSAL OF INVESTMENTS	63,582,035	63,687,703
NET INCREASE IN FUND BALANCE	58,433,352	61,324,608
FUND BALANCE AT BEGINNING OF YEAR	658,872,674	597,548,066
FUND BALANCE AT END OF YEAR	$717,306,026	$658,872,674

See accompanying notes to financial statements.

STATEMENTS OF CHANGES IN FINANCIAL POSITION

Years ended December 31	1993	1992
SOURCE OF FUNDS:		
Investment income	$33,704,513	$37,557,600
Net gain on disposal of investments	63,582,035	63,687,703
Other	1,062,397	897,986
	98,348,945	102,143,289
APPLICATION OF FUNDS:		
Grant and appropriation payments (net of refunds of $211,400 in 1993 and $160,600 in 1992)	31,298,570	32,465,176
Cost of investments, net	56,648,190	59,600,560
Management expenses	3,041,356	2,812,942
Investment expenses	2,955,138	2,270,719
Federal excise tax and other	3,092,574	6,318,895
Interest purchased	938,536	(787,283)
	97,974,364	102,681,009
INCREASE (DECREASE) IN CASH	374,581	(537,720)
CASH AT BEGINNING OF YEAR	(460,067)	77,653
CASH AT END OF YEAR	$ (85,486)	$ (460,067)

See accompanying notes to financial statements.

NOTES TO FINANCIAL STATEMENTS

1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation

The accompanying financial statements have been prepared substantially on the accrual basis of accounting, and, accordingly, reflect all significant assets and liabilities. Investment income and investment and management expenses are recorded on the cash basis, the effect of which on the accompanying financial statements is not materially different from the accrual basis. Grants and appropriations are accrued when authorized by the Trustees.

Investments

Investments purchased are recorded at cost. Investments received by gift or bequest are recorded at market value at date of such gift or bequest. Gains or losses on disposal of investments are determined generally on the first-in, first-out basis, but in certain instances the specific identification basis is used. Market value for traded securities is based on quoted market prices, and real estate investments are reported at estimated fair values based upon appraisals by the manager of the real estate interest.

2. FINANCIAL INSTRUMENTS WITH OFF-BALANCE SHEET CREDIT OR MARKET RISK

The Foundation's investment strategy incorporates off-balance sheet financial instruments. These instruments include financial futures, forward foreign currency contracts, loaned securities and securities sold, not yet purchased. Off-balance sheet financial instruments involve, to varying degrees, elements of market risk and credit risk in excess of the amounts recorded on the balance sheet.

The Foundation is subject to market risk associated with the changes in the value of the futures contracts. The Foundation held long and short S&P 500 and U.S. Treasury futures contracts at December 31, 1993 and 1992 valued at approximately $80.0 million and $50.6 million, respectively. The amounts, however, may differ from the Foundation's future cash requirements as the Foundation may close out futures positions prior to settlement and thus be subject only to the change in value of the futures contracts since the contracts are valued daily using the mark-to-market method. The net appreciation in the market value as of December 31, 1992 of the outstanding futures contracts, amounting to $1.2 million, was deferred and included in other liabilities until the contracts were closed out. For 1993, the net appreciation was recognized as received and not deferred. The margin requirements on deposit with a third party for futures contracts were approximately $4.8 million at December 31, 1993 and $2.7 million at December 31, 1992.

The Foundation purchases forward foreign currency contracts as a hedge against fluctuations in currency prices. Forward foreign currency contracts held as of December 31, 1993 were valued at approximately $52.2 million and as of December 31, 1992 at approximately $41.2 million.

Securities sold, not yet purchased ($44.7 million and $24.5 million at December 31, 1993 and December 31, 1992, respectively) are recorded net in the Foundation's investment accounts. These securities have market risk to the extent that the Foundation, in satisfying its obligations, may have to purchase securities at a higher value than recorded. Required collateral is held by a third party.

Management does not anticipate that losses, if any, resulting from its market or credit risks would materially affect the financial position of the Foundation.

3. INVESTMENTS

Investments at December 31, 1993 are summarized as follows:

	Cost	Market	% of Total Investments
FIXED INCOME:			
Government and agency	$132,247,643	$141,272,725	16.6
Corporate and other	92,842,700	94,682,031	11.2
	225,090,343	235,954,756	27.8
EQUITY:			
General Motors Corporation	17,244,708	35,120,000	4.1
Other	482,298,849	558,160,633	65.8
	499,543,557	593,280,633	69.9
REAL ESTATE	21,813,124	19,399,989	2.3
	$746,447,024	$848,635,378	100.0

At December 31, 1992, the market value of investments exceeded cost by $86,107,231.

4. SECURITIES LENDING PROGRAM

Through a securities lending program managed by its investment advisor, the Foundation loans certain stocks and bonds included in its investment portfolio. The Foundation's investment advisor has indemnified the program. The Foundation's gross securities loaned to certain borrowers at December 31, 1993 and 1992 amounted to $63 million and $49 million, respectively.

5. RETIREMENT PLAN

The Foundation has a defined contribution retirement plan covering substantially all employees under arrangements with Teachers Insurance and Annuity Association of

America and College Retirement Equities Fund which provides for the purchase of annuities for employees. Retirement plan expense was $210,951 and $208,260 in 1993 and 1992, respectively.

In addition, the Foundation provides certain health care and life insurance benefits for retired employees. The Foundation recognizes the cost of providing nonpension benefits to retired employees ($62,194 in 1993 and $54,467 in 1992) on a pay-as-you-go basis. FASB Statement 106, Employers' Accounting for Postretirement Benefits Other Than Pensions, requires that the projected future cost of providing postretirement benefits be recognized as an expense as employees render service instead of when the benefits are paid. The Foundation will be required to comply with the new rules, which will have an immaterial impact on the Foundation's financial position, in 1995.

6. LEASE

The Foundation's lease for its office space expires December 31, 1998. The lease contains an escalation clause which provides for rental increases resulting from increases in real estate taxes and certain other operating expenses. Under the lease, rent expense amounted to $412,133 and $372,360 in 1993 and 1992 respectively. At December 31, 1993, base rent commitments aggregate approximately $2,022,000 and are payable at approximately $404,300 annually.

SCHEDULE OF MANAGEMENT AND INVESTMENT EXPENSES

Years ended December 31	1993	1992
Management Expenses		
Salaries and employee benefits:		
Salaries	$1,766,325	$1,556,091
Employees' retirement plan and other benefits	539,865	501,113
Total	2,306,190	2,057,204
Rent	412,133	372,360
Program expenses	433,451	464,616
Office expenses	331,588	337,283
Reports and publications	48,114	50,539
Professional fees	54,325	63,893
Total management expenses	3,585,801	3,345,895
Less management expenses applicable to investments	544,445	532,953
Management expenses applicable to grantmaking	$3,041,356	$2,812,942
Investment Expenses		
Investment fees	$2,410,693	$1,737,766
Management expenses applicable to investments	544,445	532,953
Total investment expenses	$2,955,138	$2,270,719

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1994 ANNUAL REPORT

ALFRED P. SLOAN FOUNDATION

Alfred P. Sloan, Jr.
1875-1966

LIFE OF ALFRED P. SLOAN, JR.

Alfred Pritchard Sloan, Jr., was born in New Haven, Connecticut, May 23, 1875, the first of five children of Alfred Pritchard Sloan, Sr., and Katherine Mead Sloan. His father, a machinist by training, was then a partner in a small company importing coffee and tea. In 1885 the family moved to Brooklyn, where it was particularly active in the Methodist Church. (Young Alfred's maternal grandfather was a Methodist minister.) Alfred, Jr., excelled as a student both in the public schools and at Brooklyn Polytechnic Institute where he completed the college-preparatory course. After some delay in being admitted to the Massachusetts Institute of Technology (which considered him too young when he first applied), he matriculated in 1892 and took a degree in electrical engineering in three years as the youngest member of his graduating class.

Mr. Sloan began his working career as a draftsman in a small machine shop, the Hyatt Roller Bearing Company of Newark, New Jersey. At his urging, Hyatt was soon producing new antifriction bearings for automobiles. In 1898 he married Irene Jackson of Roxbury, Massachusetts. The next year, at age 24, he became the president of Hyatt, where he supervised all aspects of the company's business. Hyatt bearings became a standard in the automobile industry, and the company grew rapidly under his leadership. In 1916 the Hyatt Roller Bearing Company, together with a number of other manufacturers of automobile accessories, merged with the United Motors Corporation, of which Mr. Sloan became President. Two years later that company became part of the General Motors Corporation (itself established in 1908 as the General Motors Company), and Mr. Sloan was named Vice President in Charge of Accessories and a member of the Executive Committee.

He was elected President of General Motors in 1923, succeeding Pierre S. du Pont, who said of him on that occasion: "The greater part of the successful development of the Corporation's operations and the building of a strong manufacturing and sales organization is due to Mr. Sloan. His election to the presidency is a natural and well-merited recognition of his untiring and able efforts and successful achievement." Mr. Sloan had developed by then his system of disciplined, professional management that provided for decentralized operations with coordinated centralized policy control. Applying it to General Motors, he set the Corporation on its

course of industrial leadership. The next 23 years, with Mr. Sloan as Chief Executive Officer, were years of enormous expansion for the Corporation and of a steady increase in its share of the automobile market.

In 1937 Mr. Sloan was elected Chairman of the Board of General Motors. He continued as Chief Executive Officer until 1946. When he resigned from the chairmanship in 1956, the General Motors Board said of him: "The Board of Directors has acceded to Mr. Sloan's wish to retire as Chairman. He has served the Corporation long and magnificently. His analysis and grasp of the problems of corporate management, his great vision and rare good judgement, laid the solid foundation which has made possible the growth and progress of General Motors over the years." Mr. Sloan was then named Honorary Chairman of the Board, a title he retained until his death on February 17, 1966. For many years he had devoted the largest share of his time and energy to philanthropic activities, both as a private donor to many causes and organizations and through the Alfred P. Sloan Foundation, which he established in 1934.

Mr. Sloan, as a realist as well as a humanist and philanthropist, looked upon the Foundation as an extension of his own life and work. Although he recognized the inevitability of change that might dictate a different course, he expected that the Foundation would "continue as an operating facility indefinitely into the future...to represent my accomplishments in this life." His accomplishments during his lifetime were of the highest order, and in themselves provide the most dramatic and lasting tribute to his extraordinary talent. Through the Foundation, his accomplishments have been extended and expanded.

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COMMITTEES OF THE BOARD OF TRUSTEES

Executive Committee

Howard W. Johnson, Chairman

Stephen L. Brown
Ralph E. Gomory
Frank Press
Harold T. Shapiro

Investment Committee

Stephen L. Brown, Chairman

S. Parker Gilbert
Ralph E. Gomory
Howard W. Johnson
Harold T. Shapiro
Robert M. Solow

Audit Committee

Lewis T. Preston, Chairman

Stephen L. Brown
Cathleen S. Morawetz

ADMINISTRATIVE OFFICERS AND STAFF

Ralph E. Gomory
President

Stewart F. Campbell
Financial Vice President and Secretary

Hirsh G. Cohen
Vice President

Jesse H. Ausubel
Program Officer

Kathleen E. Christensen
Program Officer

Maureen Gassman
Assistant Secretary

Ted Greenwood
Program Officer

Raphael G. Kasper
Program Officer

A. Frank Mayadas
Program Officer

Christopher T. Sia
Controller

Arthur L. Singer, Jr.
Program Consultant

Michael S. Teitelbaum
Program Officer

GENERAL INFORMATION

INTRODUCTION

"In managerial technique I emphasize the necessity of the scientific approach; this affects men, tools and methods. Many associate the word scientific with physics. But it means a constant search for the facts— the true actualities— and their intelligent, unprejudiced analysis. Spend any proper amount of money to get the facts. Only by increased knowledge can we progress, perhaps I had better say survive."

—Alfred P. Sloan, Jr.

The Alfred P. Sloan Foundation, a philanthropic non-profit institution, was established by Alfred P. Sloan, Jr. in 1934. During the past year, the Sloan Foundation has made grants of $38 million. Total assets of the Foundation at the end of 1994 were $790 million.

PROGRAMS AND INTERESTS

The main interests and programs of the Foundation are concentrated primarily in four areas:

- Science and Technology
- Standard of Living, Competitiveness, and Economics
- Education and Careers in Science and Technology
- Selected National Issues

This section provides a brief description of the Foundation's evolving program in each of these areas.

Science and technology are major interests of the Foundation. Fellowships account for expenditures of more than $4 million annually. Grants for the direct support of research in selected fields and for work in the history of science and technology are important components of the Foundation's program.

FELLOWSHIPS

One hundred ***Sloan Research Fellowships*** are now awarded each year in chemistry, computer science, economics, mathematics, neuroscience, and physics. These are highly competitive grants given to young faculty members with outstanding research potential on the recommendation of department heads and other senior scientists. Information on these fellowships, as well as ***Sloan Dissertation Fellowships*** in economics and mathematics, may be obtained by inquiry to the Foundation.

DIRECT SUPPORT OF RESEARCH

The Foundation continues to support areas of research that are or have the potential to become scientifically significant, but are either neglected by major governmental funding agencies or do not fit well within their disciplinary structures or program orientations.

A new research program in ***theoretical neurobiology*** was started in 1994 with grants totaling almost $7 million to support five new research centers at Brandeis University, California Institute of Technology, New York University, Salk Institute, and University of California, San Francisco. The program involves graduate students and postdoctoral young scientists with previous training in mathematics, physics, computer science, and other theoretical areas. They will work with senior neurobiologists in order to produce a new generation of theoreticians with intimate knowledge of important neurobiology problems. Annual workshops to bring together this new community of researchers and trainees will be held at the Santa Fe Institute starting in 1995. Additional grants in this research area may be considered.

Foundation support of research in ***molecular evolution*** began in 1986. Since then, the field has progressed rapidly. The Sloan program has now evolved into a two-part initiative operated jointly with the National Science Foundation. The first 18 postdoctoral research fellowships in the joint NSF/Sloan program were made in 1994. Awards for young investigators, the second part of the new joint program, were announced early in 1995.

Another area for direct support of research, with Foundation grants totaling $8 million since 1992, is the ***Sloan Digital Sky Survey***. The astronomical survey will produce three-dimensional position and spectrographic information on a million galaxies and one hundred thousand quasars. The specially designed telescope system is nearing completion and a period of testing will be followed by systematic observations expected to begin in 1996.

The Foundation would like to develop a program on ***limits to knowledge***. What can be learned about what we cannot ever know in the sciences, including the social sciences? A 1994 workshop at the Santa Fe Institute explored this topic. The Foundation will consider proposals on this theme.

Another possible new research topic stems from the fact that too few molecular biologists have the mathematical and computational skills needed to analyze DNA sequence and related data at the very time that large volumes of such data are being produced. An initiative is being explored that would generate a substantial number of researchers trained for the rapidly expanding ***computational challenges facing molecular biology***.

HISTORY OF SCIENCE AND TECHNOLOGY

Foundation-supported ***archival projects*** dealing with the papers or correspondence of Albert Einstein, Thomas A. Edison, and Charles Darwin continued to produce scholarly volumes.

Work progressed on the Foundation-supported project to develop a ***new American history textbook*** that will incorporate science and technology and give proper emphasis to their role throughout the history of the nation.

STANDARD OF LIVING, COMPETITIVENESS, AND ECONOMICS

The goal of this program is to contribute to the understanding of the basic forces making for American economic progress in the increasingly competitive world economy. Originally emphasizing manufacturing, the program now also includes service sector industries and study of job generation and required workforce skills and training.

INDUSTRY STUDIES

The primary objective of this program has been to create academic groups with direct knowledge of industry. There are now a large number of faculty and student participants, with many Ph.D.s completed in the past several years. Work of these groups has produced observations, data, and conceptualizations useful both to American companies and the federal government.

Research at the ***Center for Competitiveness in the Steel Industry*** at Carnegie Mellon University and the University of Pittsburgh is now concentrated on technology, human resources, and environmental impacts. Integrated and mini mill management have met in special sessions to hear the results of the studies, especially those dealing with the effects on productivity of new human resource management approaches. The Center is preparing a special comparative report for the Department of Energy on the steel industry in the United States and other countries.

Well over 70 plants and company offices have been visited as part of the MIT ***International Motor Vehicle Program's*** second assembly plant study. Results show that regional differences are narrowing but that within regions, such as the U.S., large variability exists in productivity and quality. Current work is focused on (1) production and distribution, product development, subsystem manufacturing and suppliers, assembly, and (2) societal impacts with emphasis on recycling, safety, and the environment. New studies in the coming years will involve distribution, marketing and general issues of mobility—how to plan for a world full of automobiles.

A detailed survey of manufacturers conducted by the ***Center for Competitive Semiconductor Manufacturing*** at the University of California, Berkeley, has covered 21 plants in the U.S., Japan, and Taiwan and plans to include plants in Korea and Europe. Seven measures of manufacturing performance have been developed. Company performance on these measures were found to vary very widely in spite of the fact that materials and machines used were almost all the same. Large variations uncovered in initial quality of new products have led to special efforts to study issues affecting start-up operations.

Support of the ***Computer Industry Center*** at Stanford University was renewed for another three-year period in December 1994. Participating faculty have come from the business and engineering schools, the computer science department, the Institute for International Studies, and the Center for Economic Policy Research. Data have been gathered from 36 companies on a large number of product development projects and from 90 companies that have moved to (or considered) client/server data systems. The Center will continue to study product development of both hardware and software, the changing use of computers, and the organization and management of manufacturing and marketing. Analyses of the software industry and of the emerging network industry are planned.

There are now about twenty faculty and a like number of graduate students participating in the ***Program on the Pharmaceutical Industry*** at MIT. Studies have shown that although productivity of drug development in the U.S. and Europe is now declining, large opportunities exist to reduce development time by making changes in management practice and organization similar to those already used successfully in aerospace and other industries. Courses, seminars, and executive briefings continue and a series of public policy seminars in Washington is planned for June 1995.

Over 120 companies have been studied as part of the work of the ***Center for the Apparel and Textile Industry*** at Harvard University. An extensive data base on the apparel industry is nearing completion. Factors have been identified that can make it possible for the retention in the U.S. of manufacturing of products that need to respond quickly to fast-changing consumer demand. The Center has produced state-of-the-art marker software for clothing patterns and has arranged for its marketing to

the industry. It will turn next to examine the inflow of apparel from other regions and the range of competitive responses.

The University of Pennsylvania's Wharton School ***Center for the Financial Services Industry*** is continuing research on productivity in the retail functions of banks and on risk analysis and management. A survey of over 200 retail banks is now underway and a number of financial institutions have been visited and studied to provide a detailed examination of actual risk management practices.

The ***Center for the Powder Metal Industry*** at Worcester Polytechnic Institute is jointly funded by the Foundation and the industry. A survey of powder metal part producers is underway that deals with such issues as interfirm relationships and cost-pricing problems.

The newest of the industry studies is the ***Center for Study of the Food Service Industry*** at the University of Minnesota. Faculty and students from the Schools of Agriculture, Business, and Technology are participating. Contact with major retailers and producers has been established. Comparative analyses of productivity among U.S. retail food stores and between the U.S. and other countries are planned, as is an examination of jobs, skills, training, and careers in the industry.

The Foundation is considering support for the formation of centers for the study of additional industries, such as service sector and non-profit industries.

EDUCATION AND TRAINING FOR MANUFACTURING

The Foundation's past support of manufacturing education, from school apprenticeships to Ph.D. programs, was designed to increase the attention of academia to manufacturing. Most of these programs are being phased out because adequate funding appears now to be provided by the government. At the ***Ph.D. level***, the first graduates of the Stanford program to prepare professors of manufacturing will complete their degrees and seek placement in 1995.

ECONOMICS AND COMPETITIVENESS

The economics program is centered on the contribution economic analysis can make to understanding competitiveness. For example, support continues for research by William Baumol and colleagues on the determinants of ***long-term productivity growth.*** Four books reporting on this research have been published over the past several years, the latest being *Convergence of Productivity: Cross-National Studies & Historical Evidence*, edited by William J. Baumol, Edward N. Wolff, and Richard R. Nelson, Oxford University Press, 1994. Also, a 1994 grant to a team of economists at the National Bureau of Economic Research supports ongoing ***empirical industry research*** emphasizing direct observation and field work.

HUMAN RESOURCES MANAGEMENT

The Foundation believes that human resources management is one of the most important areas for improving U.S. industrial productivity. The ***Sloan Human Resources Network*** at MIT has become an effective community for academics working on human resources problems, including those arising as part of studies at Sloan industry centers.

A successfully-concluded pilot study led in December 1994 to a major grant to the Economic Policy Institute for a large three-year study of worker response to ***high performance workplace practices.*** The aim is to understand to what extent the new work and management systems depend on worker participation and contribution, as is widely represented, or whether the gains are mostly from reorganization of the work flow.

The Foundation is interested in pursuing the issue of the growing income gap between professional and highly skilled workers and those with less education or training. Reorganization, downsizing, automation, and other influences are changing the ***nature of work*** and are driving some out of work while others prosper. What lies behind these changes? Has the labor market changed permanently?

WORKPLACE AND FAMILY

Both the American family and workplace are in flux. More complete understanding is needed of how work is changing in time and space, and in terms of affiliations between workers and their employers, as well as of the consequences of these changes.

The Foundation's interest in this topic resulted in grants to conduct studies of alternate career paths, including part-time work arrangements. Recent grants for example, support research on part-time work and career paths for managers and professionals in private-sector firms and for workers in the legal profession and in public accounting.

During 1995 it is planned to fund a conference that will bring together leading researchers and policy makers to examine the challenges in developing a new ***work-family relationship*** and to evolve this subject into a major Foundation area.

ROLE OF THE CORPORATION

Several Sloan grants are now stimulating examination of the corporation as a central institution of American society.

A volume on the present day corporation, its place in our society, its changing nature, and the social consequences of its structure and operation, being prepared by a group of essayists organized by MIT's Carl Kaysen, is expected late in 1995. Other work, supported by 1994 grants, is underway at the business school of the University of Michigan, the law school of Columbia University, and at the Brookings Institution.

The Foundation wishes to stimulate research on the corporation, not just as a distributor of wages and dividends, but also in the many roles it plays affecting the quality of life of its employees, its customers, its community and the nation. How do corporate goals and behavior relate to profitability, long term growth, market share, and cultural impact? How do corporate governance in the U.S. and in other industrialized nations compare? What can be learned about the demography of corporations, the lifespan of enterprises? These are examples of questions of interest to the Foundation.

OTHER COMPETITIVENESS STUDIES

Past Foundation grants have supported completed projects and continue to support numerous ongoing research and other activities related to ***industrial competitiveness,*** such as the work of faculty and students at MIT's Industrial Performance Center and at the Consortium on Competitiveness, a combined effort at UC Berkeley, Columbia, Harvard, and Stanford. A study on product development in the engineering plastics industry is nearing completion by Clark and Bowen at the Harvard Business School. The Council on Competitiveness produced an influential report on the national information infrastructure. The National Academy of Engineering, based on a conference supported by a Foundation grant, has prepared a timely book, *Product Liability and Innovation: Managing Risk in an Uncertain Environment*, edited by Trevor O. Jones and Janet R. Hunziker, National Academy Press, 1994.

The term ***globalization*** has become commonplace and is applied to a broad range of international issues. The Foundation plans to support studies of some specific products or services in which design, development, manufacturing, and distribution are allocated internationally regardless of the home base of the corporation. The aim is to understand the determinants of location and how they are changing as technology and knowledge are transferred or as value-added measures change. Also of interest is the connection between these global location decisions and job quality and job growth.

EDUCATION AND CAREERS IN SCIENCE AND TECHNOLOGY

Programs designed to educate and interest people in scientific and engineering fields have long been of interest to the Foundation. One key area is ***career choice.*** Having chosen, there is the problem of ***retention.*** As the student population changes, opportunities for ***learning outside the classroom*** are increasingly important. There are issues relating to particular groups, such as immigrant scientists and engineers and their effect on the U.S. workforce, and ***women and minorities,*** whose underrepresentation in science and engineering professions demands attention. Related to and influencing all this is the ***public perception of science and technology.***

CAREER CHOICE

The Foundation's aim is to understand how American students develop interests in and then proceed toward careers in science and engineering. Supported by a major 1992 grant, work is progressing in a six-year University of Chicago project which is collecting data from ten ***junior and senior high school*** systems across the country. While this is proceeding at the high school level, the Foundation will consider proposals for research to understand better the year-by-year development of work notions leading to career choices by students who have arrived at college without having chosen a career path.

The Foundation made grants in 1994 to the American Institute of Physics and the American Mathematical Society (working with the Society for Industrial and Applied Mathematics) for the preparation of print material, videotape, and CD ROMs on ***"typical" careers*** of their members suitable for distribution to college and university departments and to college career offices. Other proposals that illuminate the day-to-day experiences on a job, what it is like to work at a job, will be considered.

RETENTION

A series of recent Foundation grants supported the work of Elaine Seymour and Nancy Hewitt of the University of Colorado on why capable college students switch out of science and engineering. Their results have been widely distributed and are now part of a basic understanding of retention. A book being prepared on this work is expected to be published in 1995. A study of the causes and consequences of early departure of graduate students from doctoral programs is now underway. Studies of entry and retention of students in science and engineering are significant aspects of the Foundation's program on minorities and women.

LEARNING OUTSIDE THE CLASSROOM

The Foundation seeks to help make available education outside the classroom in science, mathematics, engineering, and other disciplines required in the world of work. The advance of electronic technologies makes this possible today via asynchronous access to on-line course and library materials, fellow students and collaborators, and faculty. Asynchronous means that access to any remote resource is under the student's control and is, so to speak, available "on demand."

Grants in the past two years to establish asynchronous learning networks focus on one of three categories of learners: those living ***on or near campus;*** those within ***commuting distance;*** and those ***very far from campus.*** Projects at the University of Illinois, Drexel University, and Cornell University serve mainly students on or near campus. Those at New Jersey Institute of Technology, Rio Salado Community College, Northern Virginia Community College, State University of New York, and Vanderbilt University are intended for students living within commuting distance. New York University, Pennsylvania State University, and University of California at Berkeley are developing nationwide networks.

A major grant to Stanford University funds the development of a video-on-demand interactive education delivery system to serve ***working professionals*** at their work sites in Silicon Valley. Other opportunities to test asynchronous learning networks for training at work sites are of interest.

The Foundation is also interested in exploring the possibility of starting a university-sponsored asynchronously-delivered degree and certification program available to home learners across the country.

IMMIGRATION OF SCIENTISTS AND ENGINEERS

Research continues under past Foundation-funded projects on the impact of immigration of scientists and engineers on the U.S. economy and workforce. One study showed, for example, that 55% of foreign engineering students who received U.S. Ph.D.s in 1984 were working in the U.S. in 1992, but there were large variations by country of origin: 77% of engineers from India, but 20% from Korea and 12% from Japan.

Other topics relating to the population of immigrant scientists and engineers are being explored.

MINORITIES AND WOMEN IN SCIENCE AND ENGINEERING

The Foundation continues to support efforts to ameliorate the underrepresentation of minorities and women in mathematics, science, and engineering. Grants in this program are of three kinds: direct ***intervention; research*** on the nature of the problem; and for ***motivational*** projects.

A major focus for intervention grants is on increasing the number of ***minority Ph.D.s*** in mathematics, science, and engineering. Recent grants for this purpose have gone to Stanford University, Florida A&M University, Rice University, and MIT. The intention is to focus support on already proven successful producers of minority Ph.D.s so as to increase the number of minorities on faculties and in key technical positions in industry. Proposals will be considered that meet this criterion and that exhibit cost-effective means of adding to the minority Ph.D. pool.

The goal of the ***intervention program for women*** is to create a series of model projects at various colleges and universities. Two new projects were funded in 1994: to the School of Engineering at the University of Maryland in College Park to institutionalize a Women in Engineering Program, and to Cornell University for a variety of activities, all focused in one way or another on improving the climate for women in science and engineering. A 1994 grant to Kansas State University supports a mentoring program for untenured women and minority faculty in the sciences aimed

at improving their prospects for retention and tenure. Additional intervention grants are planned for 1995.

Among ***research grants***, there are ongoing studies of career paths of men and women in science and engineering professions, of factors that determine recruitment and retention of science students, and of comparative data on women and men in engineering. Two major research conferences, one on women and the other on minorities, have been held and their reports on the current state of knowledge and the need for additional research are expected to be published in book form.

The main ***motivational projects*** involve television productions: *Discovering Women*, a six-part series profiling women scientists; and *Breakthrough: People of Color in American Science*, six programs featuring minority scientists and engineers. Both series are planned for broadcast on PBS during 1995 or early 1996.

UNIVERSITY AS A SYSTEM

The Foundation is interested in the university as a system and the system of universities. This initiative has three components: (1) research on ways to analyze issues such as productivity and to model departments, other university components, and indeed the entire university as a complex system; (2) studies of actual universities to document how issues facing higher education play out and interact at the level of the individual institution; and (3) study of higher education as an industry. Proposals in this area will be considered.

PUBLIC UNDERSTANDING OF SCIENCE AND TECHNOLOGY

A major effort to increase the role of technology and innovation in the PBS historical documentary series, *The American Experience*, was funded in 1994. The aim is to give technology appropriate emphasis in discussions of the history of the nation.

A study supported by the Foundation and completed in 1994 examined the ***post-broadcast uses of television productions*** and identified products and assistance high

school teachers would find useful as follow-up to educational television programs. A report of this study is available from the Foundation.

The Foundation has continued to fund the ***reporting of technology*** as part of the news magazine programs on National Public Radio.

Preparation of the 22 books that form the new Sloan ***Technology Book Series*** is underway and the first manuscripts are expected to be published by the end of 1995.

Under a grant to the Harvard School of Public Health, a national conference will be held in 1995. Scientists, journalists, and public officials will meet to develop an agenda for research on the impact on public opinion of media coverage of science.

Additional Foundation-sponsored projects involving television, radio, books, and other activities are being explored as means to contribute to the public's perception and understanding of science and technology. This could also involve using these media to bring to the public's attention other issues from major Foundation programs, for example, the status of U.S. industries, work reorganization, human resource management, etc.

The Foundation attempts to contribute to other major issues of our time in a way appropriate to its expertise, interests, and size. A special approach to the study and understanding of broadly recognized national problems is a requirement for Foundation support.

The RAND Corporation study of legal options for U.S. ***drug policy*** is nearly complete. Issues involved in legalization or decriminalization of psychoactive drugs have been analyzed. A major focus has been the experiences with changes in the legal status of drugs in other industrial societies. The central result of the study is that harm reduction (to both users and society) should be more closely examined as a policy alternative to exclusive focus on use reduction. Outright legalization is not a recommended option. Efforts are underway to disseminate the results of this study as a means of informing public debate and policy.

A grant to Decision Research, Inc. funded a study led by Paul Slovic of what underlies the U.S. public's deeply negative ***attitude toward nuclear power.*** A large scale comparative survey of the U.S. and French populations disclosed that although fear of nuclear energy is about equal in the two countries, the French are far more accepting of the way their government manages nuclear electric power. The researchers' view is that nuclear energy will gain trust in the U.S. not through scientific demonstrations of safety, but rather through the development of new institutional arrangements and political processes for managing the technology. A book on this study will be completed in 1995.

A major grant to the American Academy of Arts and Sciences supports the development of improved indicators and analyses of the ***position of children in the United States.*** Work is progressing on indicators of children's living situations, of infant mortality, and on education indicators.

Assessment of government agency performance is a new interest of the Foundation. Proposals for evaluations or measurements that will be objective and useful to both performers and the citizenry will be considered. In 1995 the Foundation expects to develop a program of assessing the New York City government and possibly one aimed at a federal or state technical government function.

The Foundation is currently considering two other national issues: violent crime and disruptive race and ethnic relations. Funding of studies of these topics will proceed if and when proposals of a significantly novel nature are received.

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In addition to its four main areas of funding, the Foundation will continue its tradition of making *Civic grants* for projects aimed at benefiting the New York area.

A 1994 civic grant to New York Polytechnic University helped establish its new Center for Finance and Technology. The Center will teach and conduct research on both the technology of the finance industry and on the financial theory and applications required for new product development.

The Sloan Public Service Awards are part of an ongoing civic program that highlights outstanding performance by civil servants.

HOW TO APPLY FOR A GRANT

Applications can be made at any time for support of activities related to the range of interests indicated above. Grants of $30,000 or less are made throughout the year by officers of the Foundation. Officer grants enable the Foundation to respond quickly to proposals for many activities, such as workshops, symposia, and conferences, that fall within its program areas and interests, but require only moderate funding (at most $30,000). Officer grants can also be helpful for the preliminary planning and exploratory stages of major projects.

Grants over $30,000 are made by the Trustees who meet four times a year for that purpose. Letters of application are normally sent to the president or an officer of the Foundation and include, in addition to details about the applicant and the proposed project, information on the cost and duration of the work. Officer grants may not include any overhead charge; for trustee grants, at most fifteen percent of direct project costs can be budgeted for overhead. In the case of new applicants, the proof of tax-exempt status of the organization that would administer the grant should be included unless it is a recognized institution of higher education.

The Foundation's activities do not generally extend to religion, the creative or performing arts, elementary or secondary education, medical research or health care, the humanities or to activities outside the United States. Grants are not made for endowments or for buildings or equipment.

The Foundation has no deadlines or standard forms. Often a brief letter of inquiry, rather than a fully developed proposal, is an advisable first step for an applicant, conserving his or her time and allowing for a preliminary response regarding the possibility of support.

1994 GRANTS AND ACTIVITIES

SCIENCE AND TECHNOLOGY

Science and technology continue as major interests of the Foundation. Research and Doctoral Dissertation Fellowships accounted for expenditures of over $4 million in 1994. Trustee and officer grants for the direct support of research are part of this program. A $2 million trustee grant in 1994 was the third installment of support totaling $8 million for the Sloan Digital Sky Survey, a major astrophysics project involving the design and construction of a new telescope to be used for optical imaging and spectrographic measurements of most of the extra-galactic northern sky.

For major support of research the Foundation seeks to identify fields which, although significant and newly emerging, are not yet able to generate sufficient research resources and where Sloan funding can therefore have a substantial positive impact. Described in this report is a program in theoretical neurobiology initiated in 1994 with grants totaling almost $7 million to support five new research centers. The Foundation's long term support of research in molecular studies of evolution has now evolved into a jointly-funded and operated research program with the National Science Foundation. Details of the first eighteen NSF/Sloan research awards in molecular evolution, made in 1994, appear below.

The program also includes grants for many other research projects in mathematics, science, and technology and in science and technology policy. The history of science and technology is another topic of interest to the Foundation, as illustrated by a major grant in 1994 to support the work of a group of historians of science to prepare a new textbook in American history that will give proper emphasis to the role of science and technology in the history of the nation.

As in past years, a number of officer grants supported special studies and projects, scientific symposia, workshops, and conferences.

Sloan Research Fellowships **$3,000,000**

Initiated in 1955 and by far the oldest among active Foundation programs, the Sloan Research Fellowship Program aims to stimulate fundamental research by young scholars of outstanding promise at a time in their careers when their creative abilities are especially high and when federal or other support may be difficult to secure. Fellowships have gone to almost 3,000 scientists and have accounted for expenditures of about $66 million. Sloan Research Fellows continue to receive numerous prizes and awards in recognition of their major research accomplishments. Seventeen Fellows have received Nobel prizes and twelve have been awarded the prestigious Fields Medal in mathematics.

Fellowship awards in 1994 were made in six fields: chemistry, computer science, economics, mathematics, neuroscience, and physics. (Computer science was included in the program for the first time this year.) Each fellowship is administered by the fellow's institution and is designed to allow the greatest possible freedom and flexibility in its use. A brochure entitled "Sloan Research Fellowships," available from the Foundation, describes the program in detail.

Candidates for Sloan Research Fellowships are nominated by department heads or other senior scientists familiar with their work. Within each discipline, a committee composed of three distinguished scientists reviews all nomination documents and recommends the final selections. Committee members are asked to identify those nominees who show the most outstanding promise of making fundamental contributions to new knowledge. During 1994, the Foundation awarded Research Fellowships of $30,000 each, over a two-year term, to 100 scholars at 54 institutions. Nominations were reviewed by the following committees:

Chemistry: Dr. Jacqueline K. Barton, California Institute of Technology; Dr. Richard Bersohn, Columbia University; Dr. Samuel Danishefsky, Columbia University.

Computer Science: Dr. John L. Hennessy, Stanford University; Dr. John E. Hopcroft, Cornell University; Dr. Richard M. Karp, University of California, Berkeley.

Economics: Dr. Gary Chamberlain, Harvard University; Dr. Kenneth Rogoff, Princeton University; Dr. Jose Scheinkman, University of Chicago.

Mathematics: Dr. Spencer J. Bloch, University of Chicago; Dr. William P. Thurston, Mathematical Sciences Research Institute; Dr. Karen Uhlenbeck, University of Texas at Austin.

Neuroscience: Dr. Lily Jan, University of California, San Francisco; Dr. Bruce S. McEwen, Rockefeller University; Dr. Robert H. Wurtz, National Institutes of Health.

Physics: Dr. Robert C. Dynes, University of California, San Diego; Dr. Saul Teukolsky, Cornell University; Dr. Frank Wilczek, Institute for Advanced Study.

FELLOWSHIP RECIPIENTS

Arizona, University of
Neuroscience: Scott B. Selleck

Boston College
Chemistry: Amir H. Hoveyda

Brandeis University
Neuroscience: Leslie C. Griffith

British Columbia, University of
Neuroscience: Deborah Eileen Giaschi
Timothy Hugh Murphy

Brown University
Physics: John Bradley Marston

California Institute of Technology
Neuroscience: Erin Margaret Schuman

California, University of, Berkeley
Chemistry: Jonathan A. Ellman
Computer Science: Thomas E. Anderson
Mathematics: Fraydoun Rezakhanlou
Vera Sergonova
Neuroscience: Mark K. Bennett

California, University of, San Diego
Chemistry: Michael J. Sailor
Computer Science: Russell Impagliazzo
Economics: Valerie Ramey
Physics: Kim Griest

California, University of, Santa Barbara
Physics: Andreas Ludwig

Carnegie Mellon University
Computer Science: Avrim Blum

Chicago, University of
Mathematics: Robert F. Almgren
Physics: Edward C. Blucher

Colorado, University of
Neuroscience: Theresa D. Hernandez
Physics: Steven J. Pollock

Columbia University
Computer Science: Kenneth A. Ross

Cornell University
Physics: J. Ritchie Patterson

Dartmouth College
Physics: Geoffrey Nunes, Jr.

Duke University
Neuroscience: Donald C. Lo

Emory University
Neuroscience: Luis Fernan Jaramillo

Florida, University of
Physics: Fred Sharifi

Georgia Institute of Technology
Mathematics: Oscar P. Bruno

Harvard University
Computer Science: Margo Seltzer
Economics: John V. Leahy

Illinois, University of, Chicago
Chemistry: David Crich

Illinois, University of, Urbana-Champaign
Chemistry: Nancy Makri
Edmund Gerard Seebauer
Mathematics: Nigel Boston

Indiana University
Chemistry: Romualdo T. de Souza

Iowa, University of
Mathematics: Lihe Wang

Johns Hopkins University
Neuroscience: Min Li

Kentucky, University of
Physics: Herbert A. Fertig

Maryland, University of
Chemistry: Janice E. Reutt-Robey
Computer Science: Bonnie J. Dorr
Physics: Victor M. Yakovenko

Massachusetts Institute of Technology
Chemistry: Moungi G. Bawendi
Economics: Abhijit V. Banerjee
Jean-Luc Vila
Mathematics: Scott Axelrod
Alan Edelman
Physics: Raymond C. Ashoori
Charles C. Steidel

Minnesota, University of
Chemistry: William B. Tolman

Mt. Sinai Medical Center (CUNY)
Neuroscience: Thomas Lufkin

Northwestern University
Mathematics: Chun-Nip Lee
Physics: Venkat Chandrasekhar

Ohio State University
Computer Science: Feng Zhao
Physics: Andrew P. Gould

Oregon, University of
Neuroscience: Shawn R. Lockery

Pennsylvania State University
Chemistry: Patricia A. Bianconi

Pennsylvania, University of
Chemistry: Timothy M. Swager
Mathematics: Michael Larsen
Neuroscience: Rita Balice-Gordon

Pittsburgh, University of
Chemistry: Peter Wipf
Mathematics: Xiao-Jing Wang

Princeton University
Economics: Timothy J. Besley
Physics: Herman L. Verlinde

Puerto Rico, University of
Neuroscience: Fernando A. Gonzalez

Purdue University
Mathematics: Sai Kee Yeung
Physics: Daniela Bortoletto
Serguei Khlebnikov

Rice University
Chemistry: Marco A. Ciufolini
Mathematics: Richard A. Stong

Rochester, University of
Chemistry: Eric T. Kool
Economics: Bruce E. Hansen

Rutgers University
Chemistry: Jean Baum

Southern California, University of
Chemistry: Chi Ho Mak

Stanford University
Computer Science: Mendel Rosenblum
Economics: Ayman M. Hindy
Mathematics: Jun Li
Neuroscience: David J. Heeger
Physics: Constance J. Chang-Hasnain
Mark Kasevich
Charles M. Marcus

State University of New York, Buffalo
Chemistry: Janet R. Morrow
Computer Science: Jin-Yi Cai

State University of New York, Stony Brook
Physics: Terence Tai-Li Hwa

Texas, University of, Austin
Chemistry: Eric V. Anslyn
Mathematics: Jose Felipe Voloch

Toronto, University of
Chemistry: Ian Manners

Utah, University of
Mathematics: Aaron Bertram
Mark A. Lewis

Virginia, University of
Chemistry: W. Dean Harman
Physics: Julia W. P. Hsu

Wake Forest University
Neuroscience: Timothy Philip Pons

Washington, University of
Computer Science: Eve A. Riskin
Mathematics: Hart F. Smith

Wisconsin, University of
Chemistry: Robert J. McMahon
Economics: Blake D. LeBaron
Mathematics: Claudia Neuhauser
Physics: Wlodzimierz Kluzniak

Yale University
Chemistry: Alanna Schepartz
Mathematics: Jay Jorgenson

1994 DOCTORAL DISSERTATION FELLOWSHIPS

Doctoral Dissertation Fellowships **$1,280,000**

The Sloan Dissertation Program, established in 1984, is designed to assist doctoral candidates in two fields of traditional interest to the Foundation: economics and mathematics. These awards allow Fellows to concentrate on completing their doctoral research and writing the dissertation.

Fellowships have been received by 540 graduate students and have accounted for expenditures of over $10 million. In 1994, awards covering full tuition plus a stipend of $14,000 were made to 25 doctoral candidates in each field. Nominations were solicited from the heads of leading graduate departments of economics and mathematics. They were reviewed and final selections made by the following committees:

Economics: Dr. Bengt Holmstrom, Yale University; Dr. Sherwin Rosen, University of Chicago; Dr. John B. Taylor, Stanford University.

Mathematics: Dr. Richard W. Beals, Yale University; Dr. William Fulton, University of Chicago; Dr. John Morgan, Columbia University.

FELLOWSHIP RECIPIENTS

Boston University
Economics: Alicia Adsera

Brandeis University
Mathematics: Irena V. Peeva

Brown University
Economics: Minseong Kim

California Institute of Technology
Economics: Szilvia Papai
Mathematics: Slawomir J. Solecki

California, University of, Berkeley
Economics: Paolo Ghirardato
Mathematics: Jeremy David Avigad

California, University of, Los Angeles
Economics: Andreas Matthias Ramsauer

California, University of, San Diego
Mathematics: Vjacheslav Krushkal

Chicago, University of
Economics: Pascal Courty
Hao Li

City University of New York
Mathematics: Ilia Kapovitch

Columbia University
Economics: Vivek Dehejia

Cornell University
Economics: Elizabeth M. Huybens

Duke University
Mathematics: Alexander Kabanov

Harvard University
Economics: Rebecca Menes
Ilya R. Segal

Illinois, University of
Mathematics: James Ellis Colliander

Massachusetts Institute of Technology
Economics: Lucia A. Nixon
Jonathan A. Parker
Mathematics: Tom Braden
Brooke E. Shipley
Shinya Watanabe

Michigan, University of
Economics: David Hummels
Mathematics: Catherine Kriloff
Robert E. Thurman

Minnesota, University of
Economics: Zhenyu Wang
Mathematics: Yuan Lou

New York University
Mathematics: Uri Keich
Antonio Paras

Northwestern University
Economics: Martin Pesendorfer
Mathematics: Michael P. O'Leary

Pennsylvania, University of
Economics: Juuso Tapani Valimaki
Mathematics: Liming Ge
Ludmil Katzarkov

Princeton University
Economics: Kenneth Chay
Dan Sasaki
Mathematics: Alexandru Zaharescu

Stanford University
Economics: Thomas Nathaniel Hubbard
Hugh Roderic Pill
Michael Gerald Smart
Mathematics: Andrei Paraschivescu

State University of New York, Stony Brook
Mathematics: Jaroslaw Kwapisz
David M. Saltz

Washington University
Economics: Janice Rye Kinghorn

Yale University
Economics: Gautam Gowrisankaran
Douglas James Hodgson
Mathematics: Ehud Moshe Baruch
Jintai Ding
Alexander A. Kirillov

THEORETICAL NEUROBIOLOGY

For the past twenty-five years, the Sloan Foundation has supported research in those parts of the life sciences that deal with information, communication, and cognition. Over this period, the neurosciences have progressed swiftly, moving "upward" from studies of single nerve cells to the connections between cells and to connected systems of cells, and also moving "downward" to understand the molecular genetic basis for the development and structure of neuron components and neural systems. This progress has been hastened by the advance of sophisticated instruments for sensing electrical and chemical behavior and for imaging anatomical and sub-cellular structures.

For the neurosciences, however, theoretical concepts and principles intrinsic to the science have in the main been absent. To be sure, theory exists; realistic biophysical models of neuron and neural functions have been developed and applied. But these are helpful only in cases where simplicity allows a meaningful reduction to principles of physics and generally make little use of the detailed neurophysiology.

The Foundation has discussed this situation with an advisory committee of eminent neuroscientists. We and they believe that the rapid and extensive growth of knowledge in this field signals a special opportunity for theory. The Foundation, in initiating this new program, wishes to help create a corps of scientists who will bring theory into neurobiology. It was decided to establish a number of Centers for Theoretical Neurobiology as adjuncts to leading experimental neurobiology research centers. Here interested young mathematicians, computer scientists, theoretical physicists, and other theorists can be trained in the laboratory to understand both the capabilities and the limitations of experiment. Senior neuroscientists can take a direct hand in this training, mentoring, and research guidance. In this way a new generation of theoretical neurobiologists will be developed to help produce advances toward a sound theoretical basis for neurobiology.

Proposals for the support of such Centers were invited from leading university research groups. The ten proposals submitted were carefully reviewed by members of the advisory committee and other referees. Grants were subsequently approved by the Trustees to establish the following five Centers for Theoretical Neurobiology.

(In each case, the grant period is October 1, 1994-March 31, 1998.) These grants provide funds that will reach over 70 young people in training and research in the next three years and will influence the research of 30 to 40 neuroscientists. Research topics from molecular neuroscience to human speech, vision, hearing, perception, memory, and learning will be covered, with different Centers concentrating on topics of special interest to them. But all Centers will emphasize the active participation of leading senior scientists and carefully formulated graduate and postdoctoral training programs to draw together theoreticians and experimenters.

Brandeis University **$1,266,050**
Waltham, MA 02254

(Project Director: Professor Eve Marder, Department of Biology.)

California Institute of Technology **$1,437,040**
Pasadena, CA 91125

(Project Director: Professor Richard A. Andersen, Division of Biology.)

New York University **$1,199,117**
New York, NY 10011

(Project Director: Professor Robert Shapley, Center for Neural Science.)

The Salk Institute **$1,387,453**
La Jolla, CA 92037

(Project Director: Professor Thomas D. Albright, Vision Center Laboratory.)

University of California, San Francisco **$1,518,530**
San Francisco, CA 94143

(Project Director: Professor Steven Lisberger, Department of Neurobiology.)

The following Trustee grant was approved after the creation of these Centers for Theoretical Neurobiology.

Santa Fe Institute **$142,310**
Santa Fe, NM 87501

This grant supports a set of summer workshops whose purpose is to draw together the senior faculty from the Sloan Centers for Theoretical Neurobiology and the newly recruited junior theoretical members for two weeks of intensive joint activity. The aim is to begin forming a community of these neuroscientists and young theoreticians. The overall goal of the new Centers and of these summer programs is to create a new generation of theoreticians for neurobiology and thereby to facilitate the production of theoretically supported knowledge of higher neural function.

The workshops will be led by the directors and other senior members of the Centers. In the second and third years, a portion of each summer workshop will be devoted to special topic sessions to which neuroscientists from outside the new Centers will also be invited. (Project Director: Professor Charles F. Stevens, The Salk Institute; Grant Period: January 1, 1995-June 30, 1998.)

Foundation support for research in molecular evolution dates from 1986. A nascent field at the time, it has since seen rapid progress and development. New insights into the process of evolution have been produced and evolutionary perspectives have now entered into the mainstream of molecular biology. As reported last year, this research support has now entered a new phase involving an expanded program of postdoctoral research fellowships, jointly funded and operated by the National Science Foundation and the Sloan Foundation. A jointly-managed program of support for young investigators in molecular studies of evolution has also been put in place.

NSF/Sloan Postdoctoral Research Fellowships in Molecular Evolution

This competitive program is intended for young scientists who can benefit from the freedom to define and pursue their own research programs while developing relevant interdisciplinary knowledge and skills in a host laboratory or field station. The amount of the Fellowship award is $80,000 for a two-year period, which includes a stipend of $28,000 per year, an allowance of $8,000 per year to defray costs associated with the research and training plan, and an institutional allowance of $4,000 per year.

In this first year of the fellowship program, 93 complete submissions were received. After a careful process of review, the following 18 awards were made. Citations are given in the form: name and affiliation of the Fellow; sponsoring scientist and host institution; research topic.

Delynne R. Barnhisel, Michigan Technological Institute; Mitchell Sogin, Woods Hole Marine Biological Laboratory; *Molecular Phylogeny of the Polyphemoidea: Testing Ecological Hypotheses.*

David J. Begun, Cornell University; Charles Langley, University of California, Davis; *Evolutionary Genetics of Sperm Competition in Drosophila.*

Joseph Bernardo, Duke University; David Hillis, University of Texas at Austin; *MtDNA RFLP Analysis of Genetic Structure in Allopatric Isolates of a Salamander.*

Jessica A. Bolker, University of California, Berkeley; Rudolf A. Raff, Indiana University; *Evolutionary Change in Regulatory Maternal mRNA.*

Alison E. L. Colwell, Washington University; Richard G. Olmstead, University of Colorado at Boulder; *Evolution of the Small Subunit of Rubisco in the Solanaceae.*

James T. Costa, University of Georgia; Naomi E. Pierce, Harvard University; *Phylogenetic Systematics and Social Evolution of Tent Caterpillars.*

Peter L. Kuhlman, University of California, San Diego; Jeffrey D. Palmer, Indiana University; *Accelerated Evolution of RNA Polymerase Genes in Pelargonium.*

Bennett Levitan, University of Pennsylvania; Stuart A. Kauffman, Santa Fe Institute; *Molecular Evolution of Proteins Using Contact Map-Based Protein Folding Landscapes.*

Craig R. Linder, Brown University; Loren Rieseberg, Indiana University; *Evolution and Adaptive Significance of Seed Oil Composition in the Viguiera Complex and the Tribe Cyclantherae.*

Damhnait McHugh, University of California, Santa Cruz; Richard Harrison, Cornell University; *Phylogenetic Relationships of the Annelida: An Analysis Using Mitochondrial and Nuclear DNA Sequences.*

Benjamin Normark, Cornell University; Nancy A. Moran, University of Arizona; *Molecular-Evolutionary Consequences of Asexuality in the Aphid Tribe Tramini.*

Grace Panganiban, University of Wisconsin, Madison; Sean B. Carroll, University of Wisconsin, Madison; *Molecular Analysis of the Development and Evolution of Arthropod Limbs.*

Kenneth A. Rice, Harvard University; Michael Donoghue, Harvard University; *Advanced Methods of Tree Reconstruction with Application to Chlorophyll A/B Binding Proteins.*

Judy L. Stone, State University of New York at Stony Brook; Marcy Venoyama, Duke University; *Molecular Evolution of Self-Incompatability in the Solanaceae.*

Michael D. Thompson, University of Minnesota; Richard B. Hallick, University of Arizona; *Characterization of Nucleus-Encoded Chloroplant Ribosomal Protein and Chaperonin Genes.*

Paul B. Vrana, Columbia University; Roger Pederson, University of California, San Francisco; *Phylogenetic Approach to Genetic Imprinting.*

Anne H. Walton, Southern Methodist University; Rodney Honeycutt, Texas A & M University; *Phylogeny of the Caviomorpha.*

Michael F. Whiting, Cornell University; Rob DeSalle, American Museum of Natural History; *Thoracic Transformation and Ultrabithorax Expression in Strepsiptera.*

Young Investigators Awards in Molecular Studies of Evolution

The intent of these awards is to provide early funds in support of the research careers of newly-independent researchers. Applicants must hold a position on the regular faculty of a U.S. or Canadian non-profit public or private institution of higher education and research. They must be within the first few years of their research careers and genuinely independent of scientific mentors such as postdoctoral supervisors. Up to five awards per year will be made, each with a total budget of $100,000 over a period of three years. Since the first awards in this new program were made in 1995, full details will appear in next year's annual report.

MOLECULAR EVOLUTION, TRUSTEE GRANT

University of Pennsylvania $50,000
Philadelphia, PA 19104

In 1993, an officer grant enabled Professor Mair to obtain tissue specimens (and to assess their suitability for DNA analysis) from a spectacular find of well-preserved ancient corpses in the western Chinese desert. If the initial indication that these corpses are of European rather than Asian origin proves to be true, it may contribute significantly to understanding the ancient history of Asian populations. This grant provides support for two years of intensive research on these corpses, with special emphasis on the use of molecular biological techniques to identify their origins. Joining in this work are Professor Luigi Cavalli-Sforza, a molecular geneticist at Stanford University, and his former student, Dr. Paolo Francalacci of the University of Sassari in Italy. (Project Director: Professor Victor H. Mair, Department of Asian and Middle Eastern Studies; Grant Period: July 1, 1994-June 30, 1996.)

MOLECULAR EVOLUTION, OFFICER GRANTS

American Society of Zoologists $18,000
Chicago, IL 60611

Support for a three-day symposium on molecular approaches to zoology and evolution. (Project Director: Dr. Joan D. Ferraris, Laboratory of Kidney and Electrolyte Metabolism, National Institutes of Health; Grant Period: December 15, 1994-March 15, 1995.)

American Society for Biochemistry and Molecular Biology $25,200
Bethesda, MD 20814

For a meeting on directed molecular evolution. (Project Director: Professor Jack D. Keene, Department of Microbiology, Duke University; Grant Period: June 1, 1994-December 31, 1994.)

Carnegie Institution of Washington $25,000
Washington, DC 20005

Partial support for a symposium on evolution. (Project Director: Dr. Maxine F. Singer, President; Grant Period: June 1, 1994-December 31, 1994.)

Cold Spring Harbor Laboratory $18,000
Cold Spring Harbor, NY 11724

Support for a meeting on the evolution of gene and protein families. (Project Director: Dr. Jan A. Witkowski, Director, The Banbury Center; Grant Period: August 1, 1994-January 31, 1995.)

Dalhousie University $6,000
Halifax, Nova Scotia B3H 3J5

For a symposium on the evolution of unusual molecular processes in Protists. (Project Director: Dr. Mark A. Ragan, NRC Institute for Marine Biosciences; Grant Period: February 1, 1994-October 31, 1994.)

Wayne State University $11,000
Detroit, MI 48202

Partial support for a conference, "Molecular Anthropology: Toward a New Evolutionary Paradigm." (Project Director: Morris Goodman, Professor of Anatomy and Cell Biology; Grant Period: June 1, 1994-May 31, 1995.)

ASTROPHYSICS, TRUSTEE GRANT

Astrophysical Research Consortium $2,000,000
Seattle, WA 98195

In both 1992 and 1993, the Foundation made grants of $3 million to this consortium for the development of what is now known as the Sloan Digital Sky Survey. These grants were part of a planned $8 million contribution to the total cost of construction and operation of the survey. The project involves building a specially designed telescope system and developing complex new software to survey much of the northern sky. One million galaxies and 100,000 quasars are expected to be photometrically and spectroscopically identified.

The scientific goals of the project are to produce a very substantial increase in knowledge about quasars, galaxy structure, and the evolution of structure; to understand more about other major structures of the universe; to yield a long-standing map of a large portion of the sky; and to allow for the kind of serendipitous discoveries that are likely to occur in such a large observational program.

The project will be conducted over a ten-year period and involves support, scientific and financial, from many contributors. It has progressed well during its first two years and systematic observations are planned to start in 1996. The current grant is the final installment of Sloan support. (Project Director: Dr. Donald G. York, Director, Apache Point Observatory; Grant Period: April 1, 1994-December 31, 1996.)

ASTROPHYSICS, OFFICER GRANT

Institute for Advanced Study $25,000
Princeton, NJ 08540

Support for a conference on unsolved problems in astronomy and astrophysics. (Project Director: Phillip A. Griffiths, Director; Grant Period: December 1, 1994-November 30, 1995.)

MATHEMATICS, OFFICER GRANTS

Massachusetts Institute of Technology **$30,000**
Cambridge, MA 02139

Partial support for a conference on mathematical analysis and its applications. (Project Director: Professor Isadore M. Singer, Department of Mathematics; Grant Period: February 15, 1994-December 31, 1994.)

Yale University **$10,000**
New Haven, CT 06520

Partial support for a conference on fractal geometry and self-similar phenomena. (Project Director: Dr. Richard F. Voss, International Business Machines Corporation; Grant Period: July 15, 1994-June 30, 1995.)

OTHER SCIENCE AND TECHNOLOGY, OFFICER GRANTS

Institute for Advanced Study **$30,000**
Princeton, NJ 08540

To support an approach to limits of knowledge through an examination of the mind-world relationship. (Project Director: Piet Hut, Professor of Astronomy; Grant Period: September 1, 1994-October 31, 1995.)

National Academy of Sciences **$30,000**
Washington, DC 20418

To support work on an updated version of *On Being A Scientist*. (Project Director: Lawrence E. McCray, Executive Director, Committee on Science, Engineering and Public Policy; Grant Period: June 1, 1994-May 31, 1995.)

National Bureau of Economic Research, Inc. **$30,000**
Cambridge, MA 02138

For a conference on cost-saving health care technologies. (Project Director: Dr. Alan Garber, Director, Health Care Program; Grant Period: March 1, 1994-December 31, 1994.)

TRUSTEE GRANT

Massachusetts Institute of Technology **$1,509,257**
Cambridge, MA 02139

A 1992 Foundation grant supported the work of a task force headed by Professor Merritt Roe Smith to prepare a detailed prospectus of a new American History textbook which would remedy the inadequate attention to science and technology in present textbooks. The task force includes, in addition to Smith, Professor Daniel Kevles of California Institute of Technology, Professor Alex Keyssar of Duke University, and Professor Pauline Maier of MIT. With the initial planning completed, the present grant funds the writing of the new book. It will treat the broad range of subjects conventionally found in standard texts; incorporate the most recent interpretive scholarship in the field of U.S. history; move the history of science and technology closer to the center of the historical stage; and, in some cases, put forward new and original interpretations of significant developments and periods in American history. The text will be structured as a narrative and will be targeted at both college students and a general audience. It is expected that the publisher will provide technical and financial support for the preparation of a CD-ROM version of the text. (Project Director: Professor Merritt Roe Smith, Director, Program in Science, Technology and Society; Grant Period: April 1, 1994-May 30, 1999.)

OFFICER GRANTS

American Institute of Physics **$27,500**
College Park, MD 20740

Support for preparation of the autobiography of John A. Wheeler. (Project Director: John A. Wheeler, Emeritus Professor of Physics, Princeton University; Grant Period: May 1, 1994-January 31, 1996.)

California Institute of Technology **$12,170**
Pasadena, CA 91125

For a partial assessment of the impact on society of instruments originally developed for physics and chemistry. (Project Director: Daniel J. Kevles, Professor of Humanities; Grant Period: February 15, 1994-September 15, 1994.)

Western Consortium for Public Health **$7,070**
Berkeley, CA 94704

Support for a conference on the history and philosophy of science. (Project Director: Professor Ernest B. Hook, School of Public Health; Grant Period: March 1, 1994-August 31, 1994.)

TRUSTEE GRANT

American Association for the Advancement of Science **$209,886**
Washington, DC 20005

In 1990, a four-year grant to the AAAS supported the creation of a new fellowship to be held at the Office of Science and Technology (OSTP) by scientists and engineers with substantial experience in industry. Such fellows had just been eliminated due to a new interpretation of conflict-of-interest policy at the White House. Eight AAAS/Sloan Executive Branch Science and Technology Fellows have served, most with extensive experience within industry or in the technology side of national laboratories. Since it seems appropriate that this program be supported by industry associations or the government itself, this grant provides for the transition period during which continuing funding can be obtained. (Project Director: Dr. Albert H. Teich, Director; Grant Period: January 1, 1995-August 31, 1996.)

OFFICER GRANT

Sigma Xi, The Scientific Research Society **$30,000**
Research Triangle Park, NC 27709

Support for a conference on the federal role in the support of science and technology. (Project Director: John F. Ahearne, Executive Director; Grant Period: December 20, 1994-December 31, 1995.)

STANDARD OF LIVING, COMPETITIVENESS, AND ECONOMICS

The goal of this program is to contribute to the understanding of the basic forces that will maintain and improve a high American standard of living in an increasingly competitive global economy. The program spans a broad range of areas which affect the ability of U.S. industry to compete in world markets: the vitality of manufacturing and service sector industries; technology and productivity; management of product innovation and development; human resource issues; and so forth.

In 1990, the Foundation launched a major effort within this program by establishing interdisciplinary centers at leading research universities to study selected U.S. industries. The objective is to support the growth of an academic community involving scholars, mainly in engineering, management, and economics, who will develop close contacts with industry and provide realistic research and education on the American industrial sector.

In 1994, renewal grants were approved for continued operation of industry centers studying the apparel and textile industry (at Harvard), the pharmaceutical industry (at MIT), and the computer industry (at Stanford). A new center for study of the food retail and service industry (at Minnesota) was established. Activities continued at the other established centers: steel (Carnegie-Mellon), motor vehicles (MIT), semiconductors (Berkeley), financial services (Wharton), and powder metallurgy (Worcester Polytech).

Other major 1994 grants, all reported in this section, supported research on technology and industrial productivity, the management of innovation within established industries, the nature and role of the corporation, comparative corporate governance, human resource management, and workplace and family issues.

TRUSTEE GRANTS

Harvard University **$1,656,570**
Cambridge, MA 02138

Since its initial grant in 1990, the Harvard Center for Textile and Apparel Research, with the participation of Harvard and Boston University faculty and students, has developed close contact with companies of the industry, produced new data on retail-manufacturing interactions, and also contributed to the technology and logistics of apparel manufacturing. Data gathered on manufacturing processes and relations to retailers have led to a comparative characterization of the textile-apparel-retail channel. Results show that if demanding lean retailers provide continuous and adequately detailed point-of-sale data directly to manufacturers, then products can be produced quickly enough to be able to compete successfully with imports. Cost reductions due to avoiding oversupply and stockouts (not having the right size or color) are important enough to the new lean retailers that overseas shipment time may be too long compared to the quickened response of domestic producers. The Center has also developed a new automated pattern-making system through the use of computational geometry and optimization methods. This technique and its software have been licensed and are now in practical use. In other work, a new kind of forecasting for style-dependent and seasonal clothes has been formulated and applied to the ski clothes industry.

With this renewal grant, the Center will continue work on the retail-manufacturing-textile-fiber channel of the industry, with greater emphasis on lean retailing and on textiles. Human resource management issues will be explored. New work will be started on the fashion sector of the industry. The Center will also study the production of apparel in the Far East, China and Hong Kong, Europe, and Latin America and its flow towards the U.S. (Project Director: Professor Frederick H. Abernathy, Division of Applied Sciences; Grant Period: October 1, 1994-March 31, 1998.)

Massachusetts Institute of Technology **$2,050,000**
Cambridge, MA 02139

A 1991 Foundation grant supported the establishment of The MIT Program on the Pharmaceutical Industry. Since then, 25 faculty members have done research and taught in the program and 26 students, including 12 doctoral students currently working on theses, have participated. Special courses and seminars have been offered, over 50 companies have been studied, and research materials produced are in use in chemical engineering, technology management, economics, and marketing courses. The research program has included a comparative study of the discovery process in U.S. and European pharmaceutical company laboratories and projects on manufacturing and drug pricing. The manufacturing project studied similar processes at plants of different companies and countries, and found large variations in inventory (both raw material and work in progress), test times, and on-time delivery. Quality, as a regulated outcome, showed little or no variation. The pricing project produced comparative analyses of drug pricing regulatory regimes in a number of European countries and in Japan. A book on this subject is forthcoming.

This renewal grant supports continued work of the Center. The group studying research productivity will focus on the development and trial phase and will include the effects of public research funding and regulatory requirements in each country. The studies of R&D management and manufacturing will expand to a much larger set of companies and plants, across countries and product groups. The marketing group will seek to quantify the effects of expenditures on market share and to understand whether current industry marketing practices will be effective in a new environment expected to include more direct sales to hospitals and suppliers other than the end customer. A new study will be undertaken of company behavior at patent expiration and the switch to generic or over-the-counter distribution. The education program will continue to offer courses, seminars, and workshops on the industry. A book tentatively titled *Economics of Pharmaceuticals: A Global Perspective* is in preparation. (Project Director: Professor Charles L. Cooney, Department of Chemical Engineering; Grant Period: April 1, 1994-December 31, 1997.)

Stanford University **$2,300,000**
Stanford, CA 94305

A major Foundation grant to Stanford University in 1991 supported the establishment of a center for the study of the computer industry. Faculty participants have come from the business and engineering schools, the computer science department, the Institute for International Studies, and the Center for Economic Policy Research. A large number of students, including MBA and Ph.D. candidates, have been involved in various industry-related activities and projects, including company interviews to obtain information on computer usage. Hundreds of companies, both producers and users, have been contacted over the past years and much data accumulated. For example, data gathered from 72 product development projects in 36 companies showed that, for major computer product development projects, the conventional rigidly scheduled process is often inferior to a more flexible, improvisational, experimental process that allows for contingencies arising from competition. In another study, involving the design of the assembly process for printers, the advantages of delaying product differentiation until virtually the point of sale were exhibited.

With this renewal funding, the Center will continue to study product development of both hardware and software, the changing use of computers, and the organization and management of manufacturing and marketing. Analyses of the broad software industry and of the emerging network industry will be additional topics of study. (Project Directors: Professor William F. Miller, Graduate School of Business, and Professor Timothy Bresnahan, Department of Economics; Grant Period: January 1, 1995-June 30, 1998.)

Columbia University **$1,500,000**
New York, NY 10027

Faculty members and students from economics, finance, human resources, organization management, and computer science plan to study business units of a number of companies and to do econometric analysis in order to understand the detailed mechanisms of productivity in service businesses. This research builds on two pilot projects supported with earlier officer grants. One developed case studies of business units of four companies (Salomon, Connecticut Mutual, Nynex, Citibank); the other analyzed econometrically a large set of firm-level data for the effects of computer capital and labor on firm productivity. The latter showed that returns to computer hardware and software were large and returns to computer associated labor were even larger. The pilot case studies also found large gains could be obtained but that it was far from automatic. Crucial aspects were the organization of work, management attention to productivity goals, and financial and accounting systems that took account of productivity objectives. A critical issue was how well labor reduction was managed.

Research under this grant will enlarge the project by adding six case studies at the business unit level in at least two companies of each of the following service industries: telecommunications; financial services; insurance; food and general discount retail; and banking. Half of these studies will be retrospective and half prospective. There will also be an extension of the econometric analysis to make use of Census Bureau data on supporting services. (Project Director: Professor Michael van Biema, Graduate School of Business; Grant Period: July 15, 1994-December 31, 1997.)

University of Minnesota **$1,633,000**
Minneapolis, MN 55455

This grant supports the establishment of a Center for the study of the food service industry. The service sector of the U.S. food industry is 8.5% of gross domestic

product and employs 9% of the work force. The initial objective of the Center is to thoroughly inform the academic participants of the key issues of the industry. This will be done by direct contact with companies of the industry. Faculty from the schools of agriculture, business, and technology will participate, along with their students. Disciplines represented include marketing, food nutrition and safety, economics, industrial engineering, organization theory, and law.

The initial projects to be undertaken are comparative analyses of productivity among U.S. retail food stores and between the U.S. and other countries, and an examination of jobs, skills, training, and careers in the industry. Initial contacts with a number of major retailers and producers have already been made. The Center is located near the headquarters of such firms as Cargill, General Mills, Pillsbury, and Supervalu. Officials from these and other companies and from some of the industry associations have agreed to give their cooperation and advice. (Project Director: Professor James P. Houck, Department of Agricultural and Applied Economics; Grant Period: January 1, 1995-June 30, 1998.)

SERVICE SECTOR, OFFICER GRANT

Diebold Institute for Public Policy Studies **$25,000**
Bedford Hills, NY 10507

To support the publication of a book on public-private information systems. (Project Director: John Diebold, President; Grant Period: June 1, 1994-June 30, 1995.)

TRUSTEE GRANT

Rensselaer Polytechnic Institute **$821,100**
Troy, NY 12180

This grant supports a study of the management of discontinuous innovation, the introduction of new products by firms that already have successful lines of technologies, products, and markets. Having learned during the past decade how to practice incremental improvement for existing products so as to maintain their place in the market, American companies must also be able to manage products with new technologies or new products for which no markets exist. Management practices will be studied at four firms, two large and two mid-sized, in three industries (electronics, medical equipment, and chemical). Comparisons across firms and industries will be made. The research will focus on management and other issues faced by companies when they venture into new markets with products that perform new functions or introduce new technologies. (Project Director: Joseph G. Morone, Dean, School of Management; Grant Period: October 1, 1994-March 31, 1998.)

TRUSTEE GRANTS

Brookings Institution **$250,000**
Washington, DC 20036

The microeconomics journal of the Brookings Papers on Economic Activity (Micro-BPEA) has been publishing research reports using detailed empirical analysis and newly developed economic data to illuminate policy issues. With this grant, a special issue of the journal will be published with papers drawn from the research produced as part of the work of the Sloan-supported industry centers. The publication, scheduled to appear in the fall of 1995, will be preceded by two conferences during which drafts of proposed papers will be presented and discussed. As a result, the industry studies will be brought into the mainstream of economics literature. (Project Directors: Clifford Winston, Senior Fellow, Brookings Economic Studies Program, and Peter Reiss, Associate Professor of Economics, Graduate School of Business, Stanford University; Grant Period: July 1, 1994-December 31, 1995.)

National Academy of Sciences **$400,000**
Washington, DC 20418

A 1991 Foundation grant provided the initial funding for the National Research Council's Board on Science, Technology and Economic Policy (STEP), whose charter is to bring forward the relationships between technology and the economy. STEP has completed a report, *Investing for Productivity and Prosperity*, which recommends targets for savings, investment, and changes in the tax system to encourage productivity. Another study describes the complex provisions for standards in the U.S., compares them with those of our trading partners, and discusses impediments to U.S. international trade caused by our own standards and product regulation systems as well as by barriers imposed by other countries. This grant supplies renewal support for the Board which will continue with a program that deals with the effects of government involvement in technology industries in various countries. (Project Director: Dr. Stephen A. Merrill, Executive Director, National Research Council; Grant Period: January 1, 1995-June 30, 1997.)

National Bureau of Economic Research **$2,424,000**
Cambridge, MA 02138

The NBER proposes to launch a major new research program that will involve extensive field research at industrial locations. The program will feature three main themes. The first, the nature and sources of productivity change in manufacturing industries, will involve studies of productivity differences among firms in several specific industries and will combine on-site interviews and measurements with analysis of longitudinal data on changes in establishment productivity. The second, the process of product innovation, including the development of new products in existing firms and the creation of new firms, will extend work already begun in which company founders, research scientists, and venture capital firms have been interviewed to study links between new science and the establishment of biotechnology firms. A parallel project focused on a sector of the electronics industry will be carried out to test whether the findings in the biotechnology industry apply in this other domain. This part of the NBER project will also study the process of product innovation in established firms, particularly in the pharmaceutical and computing industries. The third theme of the program will bring together NBER researchers, academic experts from other disciplines, government officials, and industry representatives concerned with technology policy. The purpose of this Technology Policy Working Group will not be to make policy but rather to stimulate research that could help resolve disputes about policy recommendations. At the start of the project, a preliminary conference will be held to give NBER researchers an opportunity to interact with a group of economists and others who have been active in the Sloan industry studies about empirical industry research and methods for direct observation and field work at industrial locations. (Project Director: Martin Feldstein, President; Grant Period: April 1, 1994-June 30, 1997.)

ECONOMICS AND COMPETITIVENESS, OFFICER GRANTS

Johns Hopkins University **$30,000**
Baltimore, MD 21218

Support for the first phase of a sequel to the TV series *Challenge to America*. (Project Director: Hedrick L. Smith, Editor-in-Residence, Foreign Policy Institute; Grant Period: September 1, 1994-February 28, 1995.)

Mississippi Community College **$27,246**
Raymond, MS 39154

Support for a community college-based experiment in foreign marketing. (Project Director: George E. Wynne, President; Grant Period: February 1, 1994-January 31, 1995.)

Rennselaer Polytechnic Institute **$30,000**
Troy, NY 12180

To support an exploratory study of a forum on science and technology in the Western Hemisphere. (Project Director: Herbert I. Fusfeld, Chairman, Advisory Board, School of Management; Grant Period: December 1, 1994-November 30, 1995.)

TRUSTEE GRANTS

Brookings Institution **$150,000**
Washington, DC 20036

One of the important factors in the functioning of a corporation is the interrelationship between firms and their employees, and between firms and their suppliers. These interrelationships depend upon a set of social norms and values which supplement legal and market constraints. This grant supports work by Brookings economist Charles Schultze which will result in a book that will examine the role of social norms in promoting or hindering economic efficiency. He will discuss how social norms develop, how they influence the operation of corporations, and will examine the hypothesis that the past decade or so has seen an unusually sharp clash between traditional social norms and large economic adjustments. (Project Director: Charles L. Schultze, Senior Fellow; Grant Period: April 1, 1994-November 30, 1995.)

Columbia University **$1,500,000**
New York, NY 10027

The success of the American economy over the years has fostered the belief that the separation of ownership and control characteristic of the large corporation in the U.S. is the optimal governance structure for large-scale economic institutions. But the recent competitive challenge to American prosperity from abroad has led many to question that belief in fundamental ways: can the troubling performance of some American firms be traced, even if only in part, to a governance structure that is ill-suited to contemporary economic challenges? Can the influence of corporate governance be untangled from the many other influences on economic performance so as to shed light on when and how governance matters?

With this grant, these questions will be addressed in a research program organized by the Columbia Law School. The principal approach will be comparative in recognition of the fact that every country has its own distinct brand of corporate governance, reflecting its legal, regulatory, and tax regimes. Previous work undertaken by

Columbia faculty examined other environmental influences, cultural and political, on the evolution of corporate governance. Academics from disciplines other than law, including economics and political science, will participate in the research program. Many individual studies, seminars, and conferences are planned. Research topics include: The Trade-off Between Flexibility and Commitment: Codetermination in Germany and Lifetime Employment in Japan; Corporate Ownership, Board Structure and Corporate Performance; and Corporate Governance and the Transition Costs of Capitalism. Seminar topics include: Industrial Organization and Competitive Performance; Employees, Corporate Governance and Technological Change; and Comparative Corporate Governance and Technological Change. A major conference on employees and corporate governance will be held to deal with three themes: 1) how the firm's ownership and governance structure can affect employee commitment; 2) the nature and comparative effects of German and Japanese pension systems, firm governance structures, and ownership arrangements; and 3) suggested changes in American pension law aimed at improving employee commitment and firm flexibility. (Project Director: Lance Liebman, Dean, Law School; Grant Period: April 1, 1994-June 30, 1997.)

Educational Broadcasting Corporation **$600,000**
New York, NY 10019

The television program *Profits and Promises*, a Socratic dialogue seminar exploring the role of the corporation in American society, supported with a 1993 grant, was broadcast over PBS in March of 1994 and viewed in about one million households. The current grant funds the production of two more programs. The first will continue the exploration of the tensions associated with conflicting notions of business success in a domestic setting. The second program will explore international issues, such as the differences in defining business success in Japan, Germany, and the United States. The Socratic dialogue format, with its challenging hypotheticals, a provocative moderator, and prominent participants from many different walks of life, has proved successful and will be used in the new programs. (Project Director: Marc Morgenstern, Producer, Seminars, Inc.; Grant Period: July 1, 1994-August 31, 1995.)

University of Michigan **$234,600**
Ann Arbor, MI 48109

This grant supports a workshop that will focus on issues related to the nature of the corporation: the influence of profit and owners' wealth on corporate decision making and performance assessment; the management of priorities and tradeoffs among "stakeholder" interests; the mechanisms by which corporate managers are motivated, disciplined, and bounded in making judgments; and the way these issues have changed over time and the directions in which they are evolving. Comparisons among U.S. and other countries will be part of the workshop's approach. Approximately thirty sessions are planned during the year. Guests from other schools, as well as corporate officials and visitors from other countries in Europe and Asia, will join participants from the University. (Project Director: B. Joseph White, Dean, School of Business Administration; Grant Period: July 1, 1994-June 30, 1996.)

ROLE OF THE CORPORATION, OFFICER GRANTS

Boston College **$29,602**
Chestnut Hill, MA 02167

Support for a pilot study to examine the "Employee Assessment of Corporate Image and Organizational Commitment." (Project Director: Edmund M. Burke, Director, Center for Corporate Community Relations; Grant Period: April 1, 1994-October 31, 1994.)

Brookings Institution **$30,000**
Washington, DC 20036

Support for a book on the future of Europe. (Project Director, John Newhouse, Writer; Grant Period: January 1, 1994-December 31, 1996.)

Cine Information, Inc. **$25,000**
New York, NY 10024

Support for the planning of two possible sequels to *Profits and Promises*, the first Socratic dialogue on the role of the corporation. (Project Director: Marcie Setlow, Producer, Setlow Media, Inc.; Grant Period: May 1, 1994-December 31, 1994.)

Educational Broadcasting Corporation **$10,447**
New York, NY 10019

Support for dissemination of the TV program *Profits and Promises*. (Project Director: Marcie Setlow, Producer, Setlow Media, Inc.; Grant Period: April 1, 1994-June 30, 1994.)

University of California, Irvine **$30,000**
Irvine, CA 92717

For a comparative study of U.S. and Japanese adjustment processes in declining industries. (Project Director: Professor Richard Brahm, Graduate School of Management; Grant Period: September 1, 1994-August 31, 1995.)

TRUSTEE GRANT

Economic Policy Institute **$1,922,085**
Washington, DC 20036

A pilot study funded in 1993 has been completed by the EPI on the relationship between worker attitudes and performance in companies that were changing work organization and human resource management towards the high performance workplace. Matched pairs of apparel manufacturing factories were observed. One plant used the traditional bundling work process, which resembles an assembly line. The other used the modular process, which involves teams and cross training, is equipment intensive, and requires a change in compensation calculations. At each plant, production results were collected (units produced, quality, cycle time, labor costs, etc.) and workers and managers were interviewed. This pilot study included six factories and 500 workers. The results showed that the new modular manufacturing method produced better clothing and in greater variety, did so faster, and in the one case where detailed processing step costs could be compared, involved lower costs with greater profit margins. However, although workers themselves believed that modules led to better performance, they thought this method led to greater stress. Contrary to expectations, the greater worker autonomy did not produce greater worker commitment to their jobs or to their companies.

Under the current grant, EPI will go beyond the pilot study and test worker attitude-performance relationships in three industries, apparel, steel, and electronic instruments. Matched pairs of plants in 16-18 companies in each industry will be studied and 100 workers in each plant will be interviewed. As in the pilot study, one of each pair will be a plant that has moved to new organizational and human resource practices and the other a plant that has remained in the traditional state. This project is expected to lead to greater understanding of the extent to which new work and management systems depend on worker participation and contribution, as is widely represented, or whether the gains observed are mostly from reorganization of the work flow. (Project Director: Dr. Eileen Appelbaum, Associate Research Director; Grant Period: January 1, 1995-June 30, 1998.)

HUMAN RESOURCE MANAGEMENT, OFFICER GRANTS

Carnegie Mellon University **$30,000**
Pittsburgh, PA 15213

Support for an exploration of an artificial intelligence-based job skills census. (Project Director: Professor Stuart W. Elliott, Department of Psychology; Grant Period: September 1, 1994-December 31, 1995.)

University of California, Berkeley **$29,300**
Berkeley, CA 94720

For a conference on the effects of human resource policies. (Project Director: Professor Clair Brown, National Center for the Workplace; Grant Period: September 1, 1994-August 31, 1995.)

WORKPLACE AND FAMILY ISSUES, TRUSTEE GRANTS

Bentley College **$152,251**
Waltham, MA 02154

Accounting has been one of the fastest growing occupations in the U.S. since World War II. Part-time and temporary workers, many voluntarily employed less than a full year, have always played an important role in the accounting field. Yet no research has been done that systematically examines career paths for accountants who choose to deviate from the full-time, full-year model. As part of a two-year study supported by this grant, in-depth interviews will be conducted with 65-80 accountants, with senior personnel at 20-25 public accounting firms, with partners or other persons responsible for recruiting or career development, and with directors at 5 temporary and part-time help agencies specializing in providing temporary accountants. In addition, a survey will be mailed to 10,000 Bentley accounting graduates to examine their career histories, their use and satisfaction with voluntary part-time, part-year work arrangements, and the impacts of these arrangements on their careers and families. (Project Director: Patricia M. Flynn, Dean and Professor of Economics; Grant Period: March 1, 1995-February 28, 1997.)

Catalyst for Women **$403,000**
New York, NY 10003

Many studies of part-time work focus on the adjustments made by workers and their families. Less studied is the question of whether work itself can be reconfigured to take advantage of the skills and training of those who prefer part-time work. These employees are typically women with young children, older women seeking to re-enter the work force, and men who want to reduce their work load as they near retirement. With this grant, Catalyst will study four private sector firms that are attempting to implement part-time career paths. How work is changed under these circumstances and whether benefits to firms result from including part-time professional workers will be considered. A series of focus groups will be conducted with part-time employees, their managers, colleagues, and clients. The career experiences of these part-timers will be compared to the experiences of their counterparts working traditional full-time schedules. The results of this study are expected to be brought to the attention of a large audience of both individuals and firms. (Project Director: Dr. Marcia Brumit Kropf, Vice President, Research and Advisory Services; Grant Period: January 1, 1995-December 31, 1996.)

Cleveland State University **$223,050**
Cleveland, OH 44115

Two faculty members, one at Cleveland State and the other at Loyola of Chicago, will study voluntary part-time work in engineering, computer programming, and technical writing. They will not only try to understand the employees' experiences with part-time work, but will also learn what changes have been required in the companies to allow for part-timers. Some key questions to be studied include: Do companies see the need for this kind of employee? If so, do they provide suitable salary and benefits? Do part-time arrangements work best when the employee has very special

skills or knowledge? Can a part-timer enter or return to the full-time work force? From an employee perspective, how are family obligations balanced with work, are part-time jobs satisfying, and are relations to full-time employees and managers satisfactory? Intensive interviews will be held with part-time employees and employers in both Cleveland and Chicago. There will be 150 employees and a number of managers and co-workers in the study. The aim is to establish a basic picture of voluntary part-time work in the selected occupations and to suggest hypotheses for further analysis. (Project Director: Professor Peter Meiksins, Department of Sociology; Grant Period: April 1, 1994-December 31, 1996.)

The City University of New York **$225,895**
New York, NY 10003

The substantial increase in the proportion of women in entry level positions in the legal profession has not been matched by their numbers at senior levels, particularly at the partnership level. Among the difficulties faced by women, as well as men, in their career ascent is the tremendous time demands posed by the traditional career path for partnership. Early stages of this path coincide with child-bearing and rearing ages, prompting many women and some men to drop out of firms. In the study supported by this grant, an examination will be undertaken of how career paths for lawyers can be reconfigured to accommodate the needs of both work and family. Also to be assessed is how well the realities of part-time careers match both the professional and personal expectations of lawyers. Lawyers serving part-time with large firms and self-employed lawyers in private practice in their homes will be surveyed. The study will rely on in-depth interviews and focus groups conducted with attorneys and managers from large and small firms, industry, and government. (Project Director: Cynthia Fuchs Epstein, Distinguished Professor; Grant Period: January 1, 1995-December 31, 1996.)

EDUCATION AND CAREERS IN SCIENCE AND TECHNOLOGY

The Foundation has a wide-ranging program in this traditional area of support. In science and engineering education, grants described in this section have addressed such issues as the entry and retention of students, the nature of work in science and engineering and ways to bring this knowledge to those making career choices, the forecasting of scientific and engineering manpower, and studies of the university as a system.

The underrepresentation of women and minorities in mathematics, science, and engineering is an important issue of continuing interest. Grants made in 1994 include motivational projects to interest more women and minorities in these fields, research studies to improve understanding of the nature of the underrepresentation problem, and intervention programs designed to influence outcomes. A major emphasis is on increasing the number of minority Ph.D.s in mathematics, science, and engineering.

Making education available outside the classroom is another component of the Foundation's program. The effort is aimed at independent learning in science and technology by means of electronic technologies that make possible asynchronous access to on-line course and library materials, fellow students, and faculty. Asynchronous means that access to any remote resource is under the learner's control and is, so to speak, available "on demand." One focus is the use of such learning networks for training at work sites.

Enhancing public understanding and interest in science and technology is the subject of a number of grants described in this section. Several multi-program television series are in production as a result of grants of past years. A major 1994 grant supports bringing technology into a central role in public television's popular history series, *The American Experience*. Another renews funding for the broadcasting of technology news items and features on National Public Radio. The first books in the Sloan Technology Book Series are expected to be published in 1995. This series focuses on some of the major technologies of the twentieth century and treats their emergence, development, and role in our society.

ENTRY AND RETENTION, OFFICER GRANT

University of Colorado **$20,400**
Boulder, CO 80306

Support for the publication of a book based on studies of retention. (Project Directors: Drs. Elaine Seymour and Nancy M. Hewitt, Bureau of Sociological Research; Grant Period: August 1, 1994-June 30, 1995.)

CAREER INFORMATION, TRUSTEE GRANTS

American Institute of Physics **$302,100**
College Park, MD 20740

The American Institute of Physics (AIP), as a service to college and university physics departments and career centers, will develop and distribute information on possible careers for college physics majors in the form of specially developed media and services. From data on non-academic careers actually pursued by significant numbers of physics graduates, several specific career choices will be identified (along with individuals who pursued such careers), and featured in an interactive CD ROM, a videotape, and a print report. The AIP will also start to provide an electronic bulletin board accessible through the Internet. At least six physicists, mainly from non-academic careers, will be made available for interaction with students. Students may in this way ask questions about how a typical work day is spent, how starting employees are treated and what is expected of them, how much work is performed in groups, etc. Statistical information, such as salary ranges for particular careers, will be separately available on the bulletin board. (Project Director: Dr. John S. Rigden, Director of Physics Programs; Grant Period: July 1, 1994-December 31, 1995.)

American Mathematical Society **$345,000**
Providence, RI 02940

Little career information is currently available to help graduate students of mathematics learn about the range of job opportunities in business, industry, and government open to those with mathematical training. These students have good access to advice about academic careers from the faculty, but more information is needed about non-academic career possibilities. The American Mathematical Society (AMS) and the Society for Industrial and Applied Mathematics (SIAM) will work together to strengthen the links between academic mathematical sciences programs and business, industry, and government. A database will be created of persons in nonacademic settings who use mathematics in a substantive way in their work. A network of such individuals will be made available to assist academic faculties in advising, preparing, and mentoring graduate students. Case studies will be developed on the career experiences of such persons and the Internet will be used to distribute these case studies and to provide detailed career information to students. A bulletin board will provide a forum for a group of nonacademic mathematicians to provide career information and to answer questions about the nature of their work experiences. (Project Directors: Samuel M. Rankin, III, Associate Executive Director, AMS, and James M. Crowley, Executive Director, SIAM; Grant Period: November 1, 1994-October 31, 1996.)

CAREER INFORMATION, OFFICER GRANTS

American Society of Mechanical Engineers **$28,900**
New York, NY 10017

For a survey on mechanical engineering careers. (Project Director: Chor W. Tan, Managing Director, Education; Grant Period: December 15, 1994-June 30, 1995.)

Fund for the City of New York **$2,000**
New York, NY 10013

For studies of science careers likely to be attractive to public high school students. (Project Director: Kenneth G. Vaughn; Grant Period: June 1, 1994-December 31, 1994.)

WOMEN, TRUSTEE GRANTS

Association for Women in Science **$195,400**
Washington, DC 20005

This grant supports a pilot project designed to improve the climate for women faculty in mathematics, science, and engineering. Three colleges or universities will cooperate with AWIS in this project, initially limited to the departments of chemistry, biology, and mathematics or computer science. AWIS will evaluate data about institutional practices and policies, will survey faculty and staff, and, joined by distinguished women scientists of the appropriate professional societies, will make a site visit to interview administrators, faculty, and students. Specific programs will then be suggested to address the climate issues identified. AWIS will also collect information on effective institutional policies and practices from around the country and make them available to colleges and universities. (Project Director: Catherine Jay Didion, Executive Director; Grant Period: May 1, 1994-June 30, 1996.)

Cornell University **$300,000**
Ithaca, NY 14853

This grant supports the strengthening of programs for recruiting and retaining women students in the School of Engineering. Study will be undertaken of why women engineering students tend to prefer chemistry-based over physics-based fields. Engineering physics courses will be redesigned. Use of women upper-class students as teaching assistants will be expanded. Recruitment of women students will be strengthened. Seminars for faculty, focusing on issues related to improving the climate for women in engineering, will be sponsored. (Project Director: Michele D. Fish, Director, Women's Programs in Engineering, College of Engineering; Grant Period: August 1, 1994-July 31, 1997.)

University of Maryland **$349,950**
College Park, MD 20742

The Engineering School wishes to create a Women in Engineering Program and to address climate issues more fully for women. The following plans will be supported with this grant: (1) workshops on gender, ethnic, and racial diversity will be held for faculty and teaching assistants; (2) courses will be revised to take greater account of different learning styles; (3) a Women in Engineering Program office will be created, with a full-time Director; (4) mentoring and advising of women undergraduates will be improved; (5) a new program will allow the best women undergraduate students to begin graduate-level courses and research during the senior year, to receive an M.S. degree in the first year after graduation, and to complete all course work and qualifying exams for the Ph.D. one year later; (6) a women's graduate student society will be created; and (7) efforts will be made to ensure that a higher percentage of women students transfer from community colleges in order to study engineering at the University and that they succeed once enrolled. By the sixth year, the full program is expected to be financed by the university. (Project Director: Dr. Marilyn R. Berman, Associate Dean; Grant Period: June 1, 1994-May 31, 1999.)

WOMEN, OFFICER GRANTS

Carnegie Mellon University **$29,750**
Pittsburgh, PA 15213

For partial support of the preparation of *A Field Guide to Women in the Sciences and Technical Fields*. (Project Director: Dr. Barbara B. Lazarus, Associate Provost for Academic Projects; Grant Period: July 1, 1994-August 31, 1995.)

National Society of Professional Engineers **$25,000**
Alexandria, VA 22314

Partial support of the Women in Engineering Program. (Project Director: Lynn E. Bertuglia, P.E., Governor of Professional Engineers in Industry; Grant Period: October 1, 1994-December 31, 1995.)

Rose-Hulman Institute of Technology **$25,000**
Terre Haute, IN 47803

For creating a supportive environment for women students as the Institute becomes co-educational. (Project Director: Dr. Gloria J. Rogers, Dean of Academic Services; Grant Period: December 1, 1994-November 30, 1995.)

University of California, Davis **$3,000**
Davis, CA 95616

To support the production and distribution of additional copies of the video and handbook on gender bias in the classroom. (Project Director: M. S. Ghausi, Dean, College of Engineering; Grant Period: August 1, 1994-July 31, 1995.)

University of Michigan **$28,559**
Ann Arbor, MI 48109

To fund preparation of a book and dissemination of the research and policy agenda arising from the May 1994 Sloan-CURIES conference. (Project Director: Dr. Carol Hollenshead, Director, Center for Education of Women; Grant Period: August 1, 1994-July 31, 1995.)

California State University, Dominguez Hills **$325,000**
Carson, CA 90747

The California Academy of Mathematics and Science (CAMS) is a specialized high school situated on the campus of the University. Its 500 students include over 300 underrepresented minorities. With this grant, CAMS will strengthen and expand programs known to be effective in motivating students to continue their education and pursue scientific careers. A four-week summer bridge program focused on mathematics and science will be created for all incoming freshmen. A summer research program for 30 students will be available at Cal Tech's Jet Propulsion Laboratory. Science enrichment activities, a corporate mentoring program, and courses for CAMS students offered by faculty from Cal State are all part of the project. CAMS will monitor the development and results of the project. (Project Director: Kathy Clark, Principal, CAMS; Grant Period: July 1, 1994-June 30, 1998.)

Florida A & M University **$429,870**
Tallahassee, FL 32307

Florida A & M University (FAMU) has an excellent record in attracting highly qualified African American science and pre-engineering students and in encouraging them to go on to graduate school. This grant will enable FAMU to expand these efforts and thereby have a positive effect on the number of minorities earning the Ph.D. degree. For three years starting with 1995-96, full scholarships will be awarded to three promising rising juniors in each of the departments of biology, chemistry, physics, and computer science. These Sloan scholars and their mentors will be provided funding to attend professional conferences. To renew the award, each student will have to maintain at least a 3.5 grade point average and pledge to go on for a Ph.D. Faculty members who have very successful records of sending students on for doctoral degrees will serve as mentors to the Sloan scholars. The grant is supplemented by university funds during the initial years, but FAMU will cover all costs of the program starting in 1998-99. (Project Director: Dr. Frederick S. Humphries, President; Grant Period: January 1, 1995-July 31, 1998.)

Georgia Institute of Technology $365,000
Atlanta, GA 30332

In recent years, partly with the help of an earlier Foundation grant, Georgia Tech's Office of Minority Educational Development (OMED) has provided tutoring, support services, and a social network that have led to a dramatic improvement in the retention and performance of minority students. This new grant will support additional initiatives: designing programs to reverse a fall of academic grades experienced by minority sophomores; bringing the dual degree option to the attention of students at nearby Atlanta University Center and thus increasing the number of minority students graduating from Georgia Tech with dual degrees; and expanding OMED's capability to serve students by hiring additional counseling staff and creating a terminal-based communications system. (Project Director: Gavin Samms, Managing Partner, OMED; Grant Period: May 1, 1994-April 30, 1997.)

Illinois Mathematics and Science Academy $240,000
Aurora, IL 60506

The Illinois Mathematics and Science Academy (IMSA), a specialized residential high school serving students throughout Illinois, has proposed to increase its enrollment of African American and Hispanic students from the current 17 percent to 25 percent by 1998. This grant supports the following means to help achieve this goal: (1) Exploration Weekends, in which eighth graders from various regions in the state will be brought to IMSA's campus to experience its special living and learning environment; (2) expansion of the Early Development Program for ninth grade students into new regions of the state; (3) development of a program to bring minority junior high school students from Chicago and surrounding suburbs to the campus for a day; and (4) a day for prospective minority students and their parents to visit the Academy. In addition, an opportunity to attend a special two-week program before moving into their sophomore year will be provided minority students as a means to promote retention. (Project Director: LuAnn Smith, Director of Admissions; Grant Period: October 1, 1994-December 31, 1997.)

Massachusetts Institute of Technology $375,000
Cambridge, MA 02139

Since 1986, MIT's Minority Summer Research Program has been bringing minority science and engineering students to MIT for an intensive ten-week program of research and mentoring. Students are recruited from undergraduate institutions that serve large numbers of African American and Hispanic students. The program's purpose is to encourage these highly qualified students to go on for Ph.D.s in science or engineering. Historically, 74 percent have done so. This grant partly funds an expansion of the program, involving Sloan support for 20 science students and other support for 20 engineering students. (Project Director: Dr. Isaac Colbert, Associate Dean of the Graduate School; Grant Period: April 1, 1995-November 30, 1997.)

Mississippi School for Mathematics and Science $52,187
Columbus, MS 39701

This specialized high school, with a 1991 Foundation grant, has succeeded in developing a summer recruiting program for talented African American students and increasing their number attending the school. Support of the state's Department of Education has been obtained to include full funding for the program in the school's regular budget starting in the 1995-96 academic year. This grant funds the actual cost of the summer program for the 1995 transitional year. (Project Director: Brenda Jones, Administrator of Special Projects; Grant Period: November 1, 1994-September 30, 1995.)

Rice University $292,520
Houston, TX 77251

Richard Tapia, Professor of Mathematical Sciences, Associate Director of Minority Affairs in the Office of Graduate Studies, and Director of Education and Human Resources in the Center for Research on Parallel Computation, is recognized for his outstanding work with minority students, especially from the Departments of Computational and Applied Mathematics, Computer Science, Chemical Engineering,

and Electrical Engineering. This grant will enable him to devote more time to mentoring these students; provide an assistant to help him organize outreach activities; supply funds to allow him to take his graduate students to professional meetings; and fund graduate stipends for two first-year minority students in these departments annually. These efforts to improve recruitment and retention are aimed at increasing substantially the number of minority students receiving Ph.D.s each year. (Project Director: Professor Richard Tapia, Department of Mathematical Sciences; Grant Period: January 1, 1995-August 30, 1998.)

Stanford University **$690,590**
Stanford, CA 94305

Stanford's Mechanical and Electrical Engineering Departments have produced a disproportionately large fraction of minority Ph.D.s, mainly as a result of the dedicated efforts of approximately 20 faculty in these departments. This grant makes available to each of these faculty members funds for two one-year fellowships and four one-year research assistantships annually, to be used to attract and retain excellent minority students into their research groups and to mentor them until they receive the Ph.D. degree. (Beyond the first year, these minority students will be supported out of faculty research grants, just as other students are in the Engineering School.) This grant also provides smaller amounts for travel to recruit minority students, for the creation of a support network of minority graduate students and faculty, and for stipends to allow two outstanding minority upper class undergraduates to participate in summer research projects with the faculty as a means of encouraging them to continue on for Ph.D. degrees. Stanford University will assume a greater share of funding for these programs each year and will have full responsibility at the conclusion of this grant. (Project Director: Dr. Noe Lozano, Associate Dean of Students; Grant Period: November 1, 1994-October 30, 2000.)

Arizona State University **$30,000**
Tempe, AZ 85287

Support for preparation of the *Directory of Hispanic Experts*. (Project Director: Dr. Gary D. Keller, Executive Director, Project 1000; Grant Period: June 1, 1994-March 31, 1995.)

Brown University **$29,000**
Providence, RI 02912

For a study of campus climate for minority graduate students in the sciences at research university members of the Leadership Alliance. (Project Director: Dr. James Wyche, Associate Provost; Grant Period: October 1, 1994-December 31, 1995.)

National Action Council for Minorities in Engineering **$29,400**
New York, NY 10001

Support for the planning phase of a comparative longitudinal study of programs to improve retention of minority students in engineering. (Project Director: Catherine Morrison, Director of Research; Grant Period: September 1, 1994-February 28, 1995.)

National Society for Black Engineers **$28,775**
Alexandria, VA 22314

To help the Society motivate their undergraduate members to continue study at the graduate level. (Project Director: Charles Walker, Executive Director; Grant Period: August 1, 1994-July 31, 1995.)

WOMEN AND MINORITIES, TRUSTEE GRANT

Kansas State University **$172,500**
Manhattan, KS 66056

A 1993 officer grant supported a pilot mentoring program at Kansas State for untenured women and minority faculty in the sciences. Junior faculty were linked with senior colleagues who assisted them in collecting data and writing applications for research grants. Of the six participants, three have received funding as a direct result of the help received from their mentors. Several of the young faculty members have published or submitted papers emerging from the work performed as part of the mentoring relationship. This grant supports an extension of the program to include eight untenured faculty per year for three years. (Project Director: John Lankford, Assistant to the President; Grant Period: January 1, 1995-June 30, 1998.)

WOMEN AND MINORITIES, OFFICER GRANT

American Society for Engineering Education **$30,000**
Washington, DC 20036

For a pilot project to bring engineering deans and department heads to the five-day Dupont Multicultural Awareness Workshops. (Project Director: Dr. Woodrow W. Leake, Deputy Executive Director; Grant Period: May 1, 1994-May 31, 1995.)

EDUCATION OUTSIDE THE CLASSROOM, TRUSTEE GRANTS

Cornell University **$153,700**
Ithaca, NY 14853

The Cornell Physics Department has undertaken a restructuring of selected upper division courses into a self-paced format. It is also depending on asynchronous networked computer communications to reduce the emphasis on lectures, increase student-to-student learning, and allow a greater role for teaching assistants and faculty in helping students learn. This grant supplements initial 1993 funding and supports continuation of the work for another year. The Department will further explore course modification and electronic conferencing and get substantially more teaching experience with the restructured courses. (Project Director: Professor Kurt Gottfried, Chairman, Department of Physics; Grant Period: July 1, 1994-August 31, 1995.)

Drexel University **$75,000**
Philadelphia, PA 19104

With this grant, Drexel will organize a conference to bring together faculty and administrators with an interest in asynchronous learning in higher education. The projects in this area supported by Foundation grants will be represented and some will be featured at the invited workshops. Others will also attend and be given an opportunity to make presentations. The conference is expected to involve about 150 people. One aim is to provide a forum for the exchange of concepts, methods, and tools for those actively working in the area. Another, given that this is the first such gathering devoted to asynchronous learning networks, is to provide a baseline for the state of the art. It is expected that a proceedings volume or other book on this technology and its role in higher education will be published. (Project Director: Dr. Stephen J. Andriole, Director, Center for Multidisciplinary Information Systems Engineering; Grant Period: November 1, 1994-February 29, 1996.)

New York University **$380,660**
New York, NY 10011

As a direct result of a 1993 officer grant, home learners across the U.S. and Canada can now earn certification in Information Technology at NYU's School of Continuing Education. Four required courses have been made available through software running on PCs. Also, the combination of the communication protocol ISDN and new versions of the Notes software has been identified as the most cost-effective means to deliver interactive video to home PCs in this environment. The current grant will support the addition of asynchronous video capability to the course sequence and allow for the experimental testing of this enhancement. Video, text, and messages between students and faculty will all be coordinated by the software, enabling a home learner to attend classes through a simple networked PC and eliminating the need for a TV and VCR. The experimental courses will initially be available only to students in the New York metropolitan area. Since the older text and still graphics version of the courses will also be offered, it will be possible to assess the degree of enhancement that interactive video actually provides. (Project Director: Dr. Richard R. Vigilante, Director, Information Technologies Institute, School of Continuing Education; Grant Period: April 1, 1994-September 30, 1995.)

Research Foundation of State University of New York **$536,300**
Albany, NY 12246

The office of the SUNY Chancellor in Albany is interested in coordinating the establishment of a computer network that will permit any person in the mid-Hudson region who has completed a two-year associate degree at a community college to earn a bachelor's degree through video lectures and networked computer interaction without having to leave his or her home community. The goal is to make the bachelor's degree more accessible and economical for learners in the region. A partnership linking six community colleges and two four-year colleges is envisaged. Initially, six required courses for a degree in business administration will be converted into a video and computer conferencing format, making them able to be taken by students

at home. Student interaction, homework assignments, and discussions with faculty will all be handled asynchronously and interactively by modem-equipped computers running commercially available software. Needed academic, administrative, and student support services will be established at local community college sites. Coordination will be essential since the project involves not only 38 faculty, but also presidents and deans of the eight participating colleges. (Project Director: Richard B. Dressner, Assistant to the Chancellor; Grant Period: July 1, 1994-August 30, 1995.)

Rio Salado Community College **$256,483**
Phoenix, AZ 84003

The General Educational Development (GED) test is intended for those who did not graduate from high school. Passing this test is regarded as equivalent to receiving a high school diploma. A 1993 officer grant enabled Rio Salado Community College to offer two courses in their computer applications program to GED graduates. Students were able to do most of their work at home and interact with other students and the instructor by means of an electronic bulletin board. This grant supports an expansion and modification of the project. A new degree program in Computer Usage and Technology will be introduced and it will be possible for GED graduates, by home study and using asynchronous interaction, to earn two certification levels along the way to the full degree. Those judged not prepared for the home study part of the program will use computer laboratories maintained by the college around the city and will be able to schedule time with an instructor. (Project Director: Karen L. Mills, Associate Dean; Grant Period: November 1, 1994-October 30, 1996.)

Stanford University **$509,000**
Stanford, CA 94305

Stanford has been a pioneer in providing televised degree education to the workplace. Over 250 graduate engineering courses are now so offered. Over the years, 3,000 workplace-earned degrees have been granted. One constraint of the televised classroom model, and often a problem for working professionals, is the need to assemble in a designated "classroom" at a specified time in order to view live or

taped lectures as a group. This grant will enable Stanford to test the feasibility of a new approach for delivering degree education to learners at various companies in the Silicon Valley region: the use of high speed experimental networks available in the region to provide video lectures and asynchronous interactivity with students and faculty through computers and on demand at the desktop. (A somewhat degraded video over the Internet will also be available for worksites without the high speed service.) The text, graphics, and possibly audio portions will be available from home or from a hotel room, adding even more flexibility for working professionals. The grant provides partial support for the early exploratory stage of the project and for a pilot offering of 14 courses. Included in the assessment of the project will be a comparison of learning effectiveness for students in the on-campus mode, the traditional televised classroom, and the new asynchronous environment. (Project Director: Dr. Dale Harris, Executive Director, Center for Telecommunications; Grant Period: January 1, 1995-September 30, 1996.)

Stanford University **$65,940**
Stanford, CA 94305

This project will provide real laboratory experience to remotely-located high school students taking college-level physics through computer-based instruction. The Stanford group has tried to use a lab kit developed jointly by MIT and Cal Tech, but there have been problems. With this grant Stanford will create an instructional videotape on how to use the various tools in the kit. A CD ROM will be produced with a set of high resolution digitized photographs of each component involved in the experiments, together with essential information about these components and their use. Also provided on the CD will be very good photographs of the experimental assembly at each stage. Students will be able to communicate with an instructor or with each other by using a simultaneous voice/data connection which will allow discussion and the use of a shared screen. (Project Director: Professor Patrick Suppes, Department of Philosophy; Grant Period: July 1, 1994-September 30, 1995.)

University of California, Berkeley **$560,000**
Berkeley, CA 94720

This grant supports the creation and delivery nationally by means of videotape and networked computers of a certificate program (Hazardous Waste Management) consisting of seven courses. Most of the effort will go into converting the existing very successful on-campus Extension program into a form suitable for delivery at home to interested students who cannot make any visits to the campus. In addition to course development and implementation for electronic delivery, the project involves a special effort to attract displaced workers. Students will be enrolled several times each year. Class discussion, student-faculty dialogue, special student group projects, and homework submissions will be handled through computers running a commercial groupware package and modem-connected to a central server at Berkeley. The final course in the sequence is expected to come on-line in January 1996. Evaluation of the new delivery system is part of the project. (Project Director: Professor Mary S. Metz, Dean, University Extension; Grant Period: August 1, 1994-July 31, 1996.)

Vanderbilt University **$399,910**
Nashville, TN 37240

The Vanderbilt Department of Electrical Engineering has developed an innovative computer simulation of a one-semester sophomore electrical engineering laboratory course. This grant will permit them to carry out field tests of this simulation with students from Vanderbilt, California Polytechnic University, Northern Virginia Community College, and several other institutions. These tests will aid in understanding how much of a laboratory course can be done through computer simulation and what parts require use of an actual laboratory on campus. The Vanderbilt software is called Electronic Laboratory of the Future (ELF). The major goal of this project is to determine if software such as ELF is of value in helping off-campus learners partially complete laboratory requirements at home. A secondary goal is to find out if a reduction in time and cost can be effected through use of a

simulated laboratory for all students, including those on campus. Project assessment will involve comparing cohorts of students at the participating institutions in three categories: those in a traditional laboratory; those using ELF as a precursor to a traditional laboratory; and those using ELF alone. (Project Director: Professor John Bourne, Director, Center for Intelligent Systems; Grant Period: October 1, 1994-December 31, 1996.)

EDUCATION OUTSIDE THE CLASSROOM, OFFICER GRANTS

Brown University **$28,800**
Providence, RI 02912

To introduce asynchronous interactive learning tools for use by students in a chemistry honors course, "Chemical Structure, Kinetics and Equilibrium." (Project Directors: Professors Jim Doll and Peter Weber, Department of Chemistry; Grant Period: October 1, 1994-March 31, 1995.)

Research Foundation of State University of New York **$28,000**
Albany, NY 12246

Planning grant to develop a home-based two-year curriculum administered through six campuses in the mid-Hudson Valley. (Project Director: Dr. Richard B. Dressner, Assistant to the Chancellor; Grant Period: April 1, 1994-May 31, 1995.)

University of California, Irvine **$30,000**
Irvine, CA 92717

To complete and document software for electronically advising and coaching vector calculus students. (Project Director: Professor Michael D. Fried, Department of Mathematics; Grant Period: July 1, 1994-June 30, 1995.)

University of Illinois at Urbana-Champaign **$29,947**
Urbana, IL 61820

To create a network to promote collaboration among individuals involved in asynchronous learning network projects. (Project Director: Burks Oakley II, Professor and Assistant Head, Department of Electrical and Computer Engineering; Grant Period: August 1, 1994-July 31, 1995.)

Westchester Community College **$29,775**
Valhalla, NY 10595

Support to implement a distance learning project. (Project Director: Dr. Amy J. Geffen, Assistant Dean, Community Services, Adult and Continuing Education; Grant Period: June 1, 1994-August 31, 1995.)

OTHER EDUCATION, OFFICER GRANTS

Harvey Mudd College **$23,500**
Claremont, CA 91711

For a symposium on engineering clinics. (Project Director: J. Richard Phillips, Professor of Engineering; Grant Period: January 15, 1994-December 31, 1994.)

National Academy of Sciences **$30,000**
Washington, DC 20418

Support for a conference on mathematics for the new school-to-work transition programs. (Project Director: Dr. Lynn A. Steen, Executive Director, Mathematical Sciences Education Board; Grant Period: October 1, 1994-December 31, 1995.)

SCIENCE AND ENGINEERING MANPOWER

TRUSTEE GRANT

National Research Council **$100,000**
Washington, DC 20418

Efforts to look ahead to future labor markets for scientific and technical personnel often founder because of the poorly developed art of projecting supply and demand. A special NRC Study Committee on "Human Resources for American Science and Technology: Projecting the Future" will undertake a review of the state of the art of making such supply-demand projections. It will assess the strengths and limitations of current models, specify where their use is appropriate, and clarify the concepts that are central to assessing current and prospective supply and demand. It will also recommend a research agenda to improve forecasting techniques. (Project Director: Alan Fechter, Executive Director, Office of Scientific and Engineering Personnel; Grant Period: September 1, 1994-September 30, 1996.)

OFFICER GRANTS

Center for Immigration Studies **$29,400**
Washington, DC 20006

For analysis of the 1990 Census data on foreign-born professionals in engineering and science. (Project Director: Dr.Leon Bouvier, Adjunct Professor of Demography, Tulane University; Grant Period: September 1, 1994-September 30, 1995.)

Wake Forest University **$6,650**
Winston-Salem, NC 27109

Travel expenses for participants in a panel entitled "Who Will Do Science: Educating the Next Generation" at the annual meeting of the AAAS. (Project Director: Professor Willie Pearson, Jr., Department of Sociology; Grant Period: September 1, 1994-August 30, 1995.)

UNIVERSITY AS A SYSTEM

OFFICER GRANTS

University of California, Los Angeles **$25,000**
Los Angeles, CA 90024

For the symposium, "Reinventing the Research University." (Project Director: Dr. C. Kumar N. Patel, Vice Chancellor, Research; Grant Period: May 1, 1994-October 31, 1994.)

University of Texas **$30,000**
Austin, TX 78712

For research to explore new approaches to analyze the university as a system. (Project Director: Robert Herman, Civil Engineer; Grant Period: December 20, 1994-December 31, 1995.)

TRUSTEE GRANTS

Harvard University **$200,000**
Cambridge, MA 02138

This grant will support an inquiry into whether and how communicating about science in the mass media matters, and what the implications are for how it should be done. It will include medicine and health but go beyond these areas to science more generally. Some fundamental questions about science communication directed at the public will be studied: As science becomes increasingly arcane, does "public understanding" have any real meaning? What is the validity of the "informed citizen" argument that science policy decisions are somehow improved through more science in the media? What about the "informed consumer" argument that knowing more science affects decisions individuals make in their personal lives? Does knowing more science somehow enrich life, thereby supplying an aesthetic justification for scientific literacy? A national conference is planned for the spring of 1995 and a volume including background papers and an analytic report of the proceedings will be prepared. (Project Director: Jay A. Winsten, Associate Dean and Director of the Center for Health Communications, Harvard School of Public Health; Grant Period: April 1, 1994-June 30, 1995.)

The Keystone Center **$150,000**
Keystone, CO 80435

The Keystone Center, a convener of scientific meetings, plans to bring together about 100 leading scientists for five days to promote and facilitate interaction and communication. Two successful such gatherings have already been held. This grant supports these "Scientist to Scientist" colloquia and will allow Theodore Bogosian, a veteran science radio producer, to tape, edit, produce, and broadcast nationwide public radio programming based on the scientific sessions. In this way others will have an opportunity to share in the Keystone experience. (Project Director: Robert W. Craig, President; Grant Period: April 1, 1994-December 31, 1996.)

National Public Radio **$595,000**
Washington, DC 20001

A 1992 Foundation grant supported an effort by National Public Radio to develop regular coverage of technology issues in its three news magazine programs, *Morning Edition, All Things Considered,* and *Weekend Edition.* Two reporters for its new technology beat were hired and they prepared reports on a wide variety of technology subjects. Examples include new technologies to control counterfeiting of the U.S. dollar, Sprint's new voice-recognizing telephone credit card, how antilock brakes work, and new approaches to human resource management in the auto industry. This effort has also had the effect of increasing the level and sophistication of technology coverage by other NPR program staff. The current grant renews support for this project. (Project Director: Anne Gudenkauf, Senior Editor, Science Desk; Grant Period: October 1, 1994-September 30, 1997.)

WGBH Educational Foundation **$3,500,000**
Boston, MA 02134

Winner of numerous prestigious awards, *The American Experience* is the only history series on television. Audience response to the series has been overwhelmingly positive. Unfortunately, the series, as most history textbooks, has in the main left technology and its influence on the country out of the story. The executive producer of the series, convinced that it would be greatly strengthened by including the role of technology, will take a number of steps: five special programs will be produced on technology topics drawn in part from the Sloan Technology Book Series; a heightened sensibility about the importance of technology will be brought to each program of the series; and the interplay between technological development and political and social change will be recognized as an element of the series. To achieve these goals, the advisory committee for the series will be expanded, a "school" for producers on the history of technology will be organized, and programs in production will be strengthened by adding new elements involving technology. (Project Director: Judy Crichton, Executive Producer; Grant Period: July 1, 1994-June 30, 1996.)

PUBLIC UNDERSTANDING OF SCIENCE AND TECHNOLOGY, OFFICER GRANTS

American Statistical Association **$25,000**
Alexandria, VA 22314

Support for a rewrite and expansion of the book *News & Numbers.* (Project Director: Victor Cohn, author; Grant Period: October 1, 1994-September 30, 1996.)

Cine Information, Inc. **$18,000**
New York, NY 10024

Support to conduct a study of post-broadcast use of public television series in schools. (Project Director: Marcie Setlow, Setlow Media, Inc.; Grant Period: February 1, 1994-July 31, 1994.)

Geological Society of America **$30,000**
Boulder, CO 80301

To publish a one-volume version of several books by John McPhee, entitled *Annals of the Former World.* (Project Director: John McPhee, Fellow; Grant Period: September 1, 1994-August 31, 1995.)

Polytechnic University **$4,900**
Brooklyn, NY 11201

Support for a study of the image of scientists in Hollywood films of the last decade. (Project Director: Professor Anne Eisenberg, Humanities Department; Grant Period: August 1, 1994-December 31, 1994.)

Princeton University **$28,200**
Princeton, NJ 08544

Support for a book on rain forest viruses. (Project Director: Richard Preston, author; Grant Period: February 1, 1994-February 28, 1995.)

Raven Radio Foundation, Inc. **$15,000**
Sitka, AK 99835

To produce a five-part radio series profiling Arctic women in the sciences. (Project Director: Lisa Busch, Science Reporter, KCAW; Grant Period: September 1, 1994-February 29, 1996.)

WGBH Educational Foundation **$15,000**
Boston, MA 02134

Support to explore the possibilities for TV programming related to the Technology Book Series. (Project Director: Judy Crichton, Executive Producer; Grant Period: February 15, 1994-June 30, 1994.)

TECHNOLOGY BOOK SERIES

As reported in last year's Annual Report, the Alfred P. Sloan Foundation is sponsoring a series of books intended to broaden public understanding of important modern technologies. Books in the series will describe the development of specific technologies, including the circumstances of their emergence, their early development and use, their applications, and their actual and potential impacts on society.

Unlike the Foundation's earlier Science Book Series, which consisted of memoirs written by scientists, mainly about their own lives in science, most of the books in the Technology Book Series will be the work of professional writers. The authors and their subjects under consideration for the Series are as follows:

William Aspray and Martin Campbell-Kelly; the computer

Robert Buderi; radar

John Cairns, M.D.; public health

Craig Canine; American agriculture

Gary Dorsey; Orbital Sciences Corporation

Susan J. Douglas; commercial radio in America

David E. Fisher; television

Helen Gavaghan; civilian space satellites

Stephen S. Hall; immunotherapy

Jeff Hecht; fiber optics

Thomas A. Heppenheimer; commercial jet aviation

Lillian Hoddeson and Michael Riordan; the transistor

Horace Freeland Judson; biotechnology

Robert Kanigel; biography of Frederick Winslow Taylor

Bettyann Kevles; medical imaging technology from x-rays to MRI

Charles C. Mann; birth-control technology

Victor McElheny; biography of Edwin Land

Elting E. Morison and Richard Rhodes; anthology of writings about technology

Robert Pool; nuclear power

Mark Reutter; dieselization of American railroads

Richard Rhodes; the hydrogen bomb

M. Mitchell Waldrop; computer software

The first books in the new Technology Book Series are expected to be published by the end of 1995.

SELECTED NATIONAL ISSUES

The Foundation is interested in contributing to the major issues of our time, but in a way appropriate to its expertise and limited size. Usually this requires a special approach in order that a meaningful new contribution can be made to widely-recognized issues and problems. The Foundation will support work in areas where such an approach can be developed, with the goal of enhancing understanding of complex issues of national importance.

Previous projects, some completed and others ongoing, as well as new topics of interest to the Foundation in this category, are very briefly described in the General Information section of this annual report. Projects approved in previous years include research on experiences with changes in the legal status of drugs in modern industrial societies, a study of the deep oceans as waste depositories, a large survey to study and understand the public perception of nuclear power, analysis of the long-term clean-up of radioactive waste at nuclear reactor facilities, and the development of a set of quantitative social indicators on the position of children in the United States.

OFFICER GRANTS

RAND Corporation **$30,000**
Santa Monica, CA 90407

Support to disseminate the findings of the drug legalization study. (Project Director: Peter Reuter, Co-Director, Drug Policy Research Center, University of Maryland; Grant Period: September 1, 1994-February 28, 1995.)

Center for Strategic and International Studies **$30,000**
Washington, DC 20006

To contribute to the planning phase of a new Commission on Enterprise for the Environment. (Project Director: Udi Helman, Assistant Director, Environmental Affairs; Grant Period: December 1, 1994-June 30, 1995.)

CIVIC PROJECTS

TRUSTEE GRANT

Polytechnic University **$1,551,000**
Brooklyn, NY 11201

Over the past 15 years, the Polytechnic University has developed its campus in Brooklyn into a center for company financial operations. The operations departments of a number of major banks, insurance, and investment companies are part of, or nearby, this center, called Metrotech. Also located at Metrotech is the New York State Center for Advanced Technology in Telecommunications.

This grant will support the establishment by the Polytechnic University of a new Center for Technology and Financial Services. The Center will provide education and conduct research in three main areas: computer and communication technologies that enable financial operations of all types to be carried out at high speed and volume with accuracy, reliability, and security; development and testing of new financial products; and management in these areas. New faculty appointments, research projects, and courses and curricula, are planned. Recognizing that finance is one of New York City's leading industries, Polytech plans to provide technically trained professionals, as well as new ideas and services, for that industry. (Project Director: George Bugliarello, President; Grant Period: April 1, 1994-December 31, 1998.)

OFFICER GRANTS

Fund for the City of New York **$30,000**
New York, NY 10013

Support for a conference on assessing city government. (Project Director: Barbara Cohn, Vice President; Grant Period: May 1, 1994-February 28, 1995.)

Municipal Art Society **$30,000**
New York, NY 10022

To support activities on behalf of manufacturing in New York City. (Project Director: Stephen C. Swid, Chairman; Grant Period: August 1, 1994-December 31, 1995.)

New School for Social Research **$30,000**
New York, NY 10011

To support a program for executives of New York City-based businesses. (Project Director: James A. Krauskopf, Dean, Graduate School of Management and Urban Policy; Grant Period: August 1, 1994-July 31, 1995.)

OFFICER GRANTS

National Cristina Foundation **$20,000**
Greenwich, CT 06830

To upgrade the Foundation's database on the use of computers and technology for benefit of the physically disadvantaged. (Project Director: Dr. Yvette Marrin, President; Grant Period: March 15, 1994-March 14, 1995.)

Princeton University **$30,000**
Princeton, NJ 08544

Support of research on race and politics. (Project Director: Carol Swain, Associate Professor of Politics and Public Affairs, Woodrow Wilson School; Grant Period: April 1, 1994-April 30, 1996.)

University of Colorado **$11,700**
Boulder, CO 80309

Support of research and preparation of a book on "unity in diversity." (Project Director: Eric B. Kraus, Fellow; Grant Period: August 1, 1994-September 30, 1996.)

Yale University **$15,000**
New Haven, CT 06520

Support for a conference on the Personal Communication Services license auction. (Project Director: Barry Nalebuff, Professor of Economics and Management, School of Organization and Management; Grant Period: January 1, 1994-February 28, 1994.)

TRUSTEE GRANTS

Council on Foundations $40,000
Washington, DC 20036

Independent Sector $7,500
Washington, DC 20036

New York Regional Association of Grantmakers $10,500
New York, NY 10018

The Council on Foundations (COF) is the foundation community's national organization, whose mission is to promote responsible and effective philanthropy. It provides publications and research reports, conducts workshops, seminars, and an annual conference, and maintains an active government relations staff.

Independent Sector (IS) is mainly concerned with government relations, not-for-profit research, and leadership and management in not-for-profit organizations.

The New York Regional Association of Grantmakers (NYRAG) is one of 24 regional associations of foundations affiliated with the COF. Concentrating on the greater New York area, it supplies programs and information focusing on local foundation activities. (Project Directors: James A. Joseph, President, COF; Sandra L. Pruitt, Program Associate, Membership, IS; Barbara Bryan, Executive Director, NYRAG; Grant Periods: all January 1, 1994-December 31, 1994.)

FINANCIAL REVIEW

The financial statements and schedules of the Foundation for 1994 and 1993, which have been audited by KPMG Peat Marwick LLP appear on pages 98 to 106. They include balance sheets, statements of activity and cash flows, and schedules of management and investment expenses.

Investment income for 1994 was $33,346,794, a decrease of $357,719 from $33,704,513 in 1993. After the deduction of investment expenses and provision for Federal excise tax, net investment income was $29,139,720 in 1994 as compared with $28,909,375 for the prior year. Investment expenses during 1994 totaled $3,411,074, of which $2,801,482 represented investment advisor fees. The provision for Federal excise tax amounted to $796,000. The total of these deductions from investment income in 1994 was $4,207,074 versus $4,795,138 in 1993.

Grants and appropriations authorized net of grant refunds and management expenses during 1994 was $52,513,204, which was $23,373,484 greater than 1994 net investment income. Of this total, grants and appropriations authorized net of refunds amounted to $49,158,177 while management expenses were $3,355,027. Since the Foundation's inception in 1934, the cumulative excess of grants and expenses over the Foundation's income has amounted to $43,960,532.

Grant and appropriation payments in 1994 were $37,631,096 compared with $31,509,970 for the prior year. Together with management expenses, investment expenses, Federal excise taxes paid and other charges, the total of cash expenditures net of grant refunds in 1994 was $45,663,157 while in 1993 the amount was $40,387,638.

Grants and appropriations authorized and payments made during the year ended December 31, 1994 are summarized in the following table:

Grants and appropriations unpaid at December 31, 1993	**$30,226,564**
Authorized during 1994	49,381,181
	79,607,745
Payments during 1994	37,631,096
Grants and appropriations unpaid at December 31, 1994	**$41,976,649**

The market value of the Foundation's total assets was $789,637,993 at December 31, 1994 including investments valued at $788,736,434 as compared with total assets of $849,741,304 at December 31, 1993.

AUDITORS' REPORT

Report of KPMG Peat Marwick LLP
Independent Auditors

The Board of Trustees
Alfred P. Sloan Foundation:

We have audited the accompanying balance sheets of the Alfred P. Sloan Foundation as of December 31, 1994 and 1993, and the related statements of activity and cash flows for the years then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. 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 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 Alfred P. Sloan Foundation as of December 31, 1994 and 1993, and the changes in its net assets and its cash flows for the years then ended in conformity with generally accepted accounting principles.

Our audits were made for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplementary information included in the schedules of management and investment expenses for the years ended December 31, 1994 and 1993 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audits of the basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

KPMG Peat Marwick LLP

February 8, 1995

BALANCE SHEETS
DECEMBER 31, 1994 AND 1993

	1994	1993
Assets		
CASH	$ 84,304	$ (85,486)
INVESTMENTS:		
Fixed income	197,668,122	226,281,755
Equity	564,284,799	499,543,557
Real Estate	21,436,844	21,813,124
TOTAL INVESTMENTS	783,389,765	747,638,436
OTHER	668,907	–
Total	**$784,142,976**	**$747,552,950**
Liabilities and Net Assets		
GRANTS AND APPROPRIATIONS UNPAID	$ 41,976,649	$ 30,226,564
OTHER	–	20,360
	41,976,649	30,246,924
NET ASSETS	742,166,327	717,306,026
Total	**$784,142,976**	**$747,552,950**

See accompanying notes to financial statements.

STATEMENTS OF ACTIVITY
YEARS ENDED DECEMBER 31, 1994 AND 1993

	1994	1993
INVESTMENT INCOME:		
Dividends	$ 12,461,952	$ 10,943,644
Interest	20,884,842	22,760,869
	33,346,794	33,704,513
LESS:		
Investment expenses	3,411,074	2,955,138
Provision for Federal excise tax	796,000	1,840,000
	4,207,074	4,795,138
Net investment income	29,139,720	28,909,375
GRANTS AND EXPENSES:		
Grants and appropriations authorized (net of refunds of $223,004 in 1994 and $211,400 in 1993)	49,158,177	31,016,702
Management expenses	3,355,027	3,041,356
Total	52,513,204	34,058,058
EXCESS OF GRANTS AND EXPENSES OVER NET INVESTMENT INCOME	(23,373,484)	(5,148,683)
NET GAIN ON DISPOSAL OF INVESTMENTS	48,233,785	63,582,035
INCREASE IN NET ASSETS	24,860,301	58,433,352
NET ASSETS AT BEGINNING OF YEAR	717,306,026	658,872,674
NET ASSETS AT END OF YEAR	$742,166,327	$717,306,026

See accompanying notes to financial statements.

STATEMENTS OF CASH FLOWS
YEARS ENDED DECEMBER 31, 1994 AND 1993

	1994	1993
Cash flows from operating activities:		
INCREASE IN NET ASSETS	$ 24,860,301	$ 58,433,352
ADJUSTMENTS TO RECONCILE INCREASE IN NET ASSETS TO NET CASH USED IN OPERATING ACTIVITIES:		
Net gain on disposal of investments	(48,233,785)	(63,582,035)
Increase in other assets	(668,907)	–
Increase (decrease) in grants and appropriations unpaid	11,750,085	(281,868)
Decrease in other liabilities	(20,360)	(190,177)
Net cash used in operating activities	(12,312,666)	(5,620,728)
Cash flows from investing activities:		
Proceeds from disposal of investments	972,819,480	1,189,085,817
Purchase of investments	(960,337,024)	(1,183,090,508)
Cash provided by investing activities	12,482,456	5,995,309
NET INCREASE IN CASH	169,790	374,581
CASH AT BEGINNING OF YEAR	(85,486)	(460,067)
CASH AT END OF YEAR	$ 84,304	$ (85,486)

See accompanying notes to financial statements.

NOTES TO FINANCIAL STATEMENTS

1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The accompanying financial statements have been prepared substantially on the accrual basis of accounting, and, accordingly, reflect all significant assets and liabilities. Investment income and investment and management expenses are recorded on the cash basis, the effect of which on the accompanying financial statements is not materially different from the accrual basis. Grants and appropriations are accrued when authorized by the Trustees.

2. INVESTMENTS

Investments purchased are recorded at cost. Investments received by gift or bequest are recorded at market value at date of such gift or bequest. Gains or losses on disposal of investments are determined generally on the first-in, first-out basis. Market value for traded securities is based on quoted market prices, and real estate investments are reported at estimated fair values based upon appraisals by the manager of the real estate interest.

Investments at December 31, 1994 are summarized as follows:

	Cost	Market	% of Total
FIXED INCOME:			
Government and agency	$131,693,070	$131,544,800	16.7
Corporate and other	65,975,052	63,111,841	8.0
	197,668,122	194,656,641	24.7
EQUITY:			
General Motors Corporation	17,244,708	26,960,000	3.4
Other	547,040,091	548,171,475	69.4
	564,284,799	575,131,475	72.8
REAL ESTATE	21,436,844	19,765,573	2.5
	$783,389,765	$789,553,689	100.0

At December 31, 1993 the market value of investments exceeded cost by $102,188,354.

3. FINANCIAL INSTRUMENTS WITH OFF-BALANCE SHEET CREDIT OR MARKET RISK

The Foundation's investment strategy incorporates certain financial instruments which involve, to varying degrees, elements of market risk and credit risk in excess of the amounts recorded in the financial statements. These instruments include financial futures, forward foreign currency contracts, loaned securities and securities sold, not yet purchased.

The Foundation is subject to market risk associated with the changes in the value of the futures contracts. The Foundation held long and short S&P 500 and U.S. Treasury futures contracts at December 31, 1994 and 1993 valued at approximately $232.2 million and $130.5 million, respectively. The amounts, however, may differ from the Foundation's future cash requirements as the Foundation may close out futures positions prior to settlement and thus be subject only to the change in value of the futures contracts since the contracts are valued daily using the mark-to-market method. The net appreciation in the market value is recognized as received. The margin requirements on deposit with a third party for futures contracts were approximately $9.4 million at December 31, 1994 and $4.8 million at December 31, 1993.

The Foundation purchases forward foreign currency contracts as a hedge against fluctuations in currency prices. Forward foreign currency buy and sell contracts held as of December 31, 1994 were valued at approximately $51.2 million and $50.5 million, respectively and as of December 31, 1993 at approximately $52.2 million and $51.1 million, respectively. Such contracts involve, to varying degrees, risk of loss arising from the possible inability of counterparties to meet the terms of the contract.

Through a securities lending program managed by its investment advisor, the Foundation loans certain stocks and bonds included in its investment portfolio. The Foundation's investment advisor has indemnified the program. The Foundation's gross securities loaned to certain borrowers at December 31, 1994 and 1993 amounted to $77 million and $63 million, respectively.

Securities sold, not yet purchased ($46.8 million and $44.7 million at December 31, 1994 and December 31, 1993, respectively) are recorded net in the Foundation's investment accounts. These securities have market risk to the extent that the Foundation, in satisfying its obligations, may have to purchase securities at a higher value than recorded. Required collateral is held by a third party.

Management does not anticipate that losses, if any, resulting from its market or credit risks would materially affect the financial position of the Foundation.

4. RETIREMENT PLAN

The Foundation has a defined contribution retirement plan covering substantially all employees under arrangements with Teachers Insurance and Annuity Association of America and College Retirement Equities Fund which provides for the purchase of annuities for employees. Retirement plan expense was $239,384 and $210,951 in 1994 and 1993, respectively.

In addition, the Foundation provides certain health care and life insurance benefits for retired employees. The Foundation recognizes the cost of providing nonpension benefits to retired employees ($63,212 in 1994 and $62,194 in 1993) on a pay-as-you-go basis because the provisions of FASB Statement 106, Employers' Accounting for Postretirement Benefits Other Than Pensions, are not material to the Foundation's financial position.

5. LEASE

The Foundation's lease for its office space expires December 31, 1998. The lease contains an escalation clause which provides for rental increases resulting from increases in real estate taxes and certain other operating expenses. Under the lease, rent expense amounted to $403,704 and $412,133 in 1994 and 1993, respectively. At December 31, 1994, base rent commitments aggregate approximately $1,617,200 and are payable at approximately $404,300 annually.

SCHEDULES OF MANAGEMENT AND INVESTMENT EXPENSES
YEARS ENDED DECEMBER 31, 1994 AND 1993

	1994	1993
Management Expenses		
Salaries and employee benefits:		
Salaries	$1,921,271	$1,766,325
Employees' retirement plan and other benefits	588,564	539,865
Total	2,509,835	2,306,190
Rent	403,704	412,133
Program expenses	508,133	433,451
Office expenses	444,764	331,588
Reports and publications	51,723	48,114
Professional fees	46,460	54,325
Total management expenses	3,964,619	3,585,801
Less management expenses applicable to investments	609,592	544,445
Management expenses applicable to grantmaking	$3,355,027	$3,041,356
Investment Expenses		
Investment fees	$2,801,482	$2,410,693
Management expenses applicable to investments	609,592	544,445
Total investment expenses	$3,411,074	$2,955,138

INDEX OF GRANTS

INDEX OF GRANTS