Alfred P. Sloan Foundation

ANNUAL REPORTS

Alfred P. Sloan Foundation

Founded in 1934 by Alfred P. Sloan, Jr.

Report for 1987

Alfred P. Sloan, Jr.
1875—1966

The Life of Alfred P. Sloan, Jr., in Brief

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 the Brooklyn Polytechnic Institute where he completed college-preparatory schooling. 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 a new, durable steel bearing 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 areas of the company's business: manufacturing, financing, engineering, and marketing. 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—Mr. Sloan's tenure as Chief Executive Officer of General Motors—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 judgment, 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.

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Policies and Procedures

The Alfred P. Sloan Foundation was established in 1934 by Alfred P. Sloan, Jr., and incorporated in the state of Delaware. Over the last three years the annual total of grants and appropriations authorized by the Foundation has averaged $21.2 million. Assets at market value at the end of 1987 were $482.9 million. An annual report, free on request, gives detailed information about all the programs and activities of the Foundation .

The main interests of the Foundation are in higher education, with an emphasis on science, technology, economics, management, and education for the public service, and on instructional programs and problems of society associated with these fields. The Foundation's activities do not extend to primary or secondary education, 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 very rarely made for general support or for activities outside the United States.

General and Particular Programs

In 1969 the Foundation adopted a mode of operation that distinguishes between the "general program," under which the established interests of the Foundation are pursued, and a set of "particular programs," which focus on sharply defined topics for more limited periods of time. Four particular programs were developed and carried to completion between 1969 and 1979: to increase the number of minority students in medicine and management; to support experimental work in educational technology; to help establish the new discipline of neuroscience; and to increase the number of minority students in engineering. Expenditures in these programs ranged from nine to fourteen million dollars over a period of five to seven years.

In 1987, final grants were made and the Cognitive Science Program came to an end. The New Liberal Arts Program completed its fifth full year of operation. The Minorities in Public Management Program continued its support of summer institutes and fellowships. Information about these three particular programs can be found at appropriate places in this report.

How to Apply for a Grant

The Foundation's funds are spent in two ways: on programs and activities developed by the Foundation's staff and for which grants are made, usually on a competitive basis, in support of individuals and institutions; and in response to proposals that come unsolicited to the Foundation and that are also judged competitively. In considering both types of proposals, the Foundation often seeks the advice of outside reviewers. The Foundation unfortunately is obliged to turn down many more proposals, often proposals of great merit, than its resources allow it to support.

Application can be made at any time for support of activities falling within the guidelines indicated above. Grants of $30,000 or less are made throughout the year by the officers of the Foundation; grants over that amount are made by the Trustees who meet five times a year for that purpose. Letters of application are normally sent to the president 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 has no deadlines or standard application 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 the Foundation to make a preliminary response as to the possibility of support.

President's Statement

Not long ago, I received an unusually thoughtful letter from a development officer at a leading private university. In it she raised some important questions for foundations that fund higher education. At a time when the greatest need of colleges and universities is unrestricted support, she wrote, foundations and corporate donors are increasingly making grants to higher education only for purposes that the donor specifies. She noted a rising resentment among administrators and faculty members, summarized in the question "Who are they to tell us how to educate?"

As a former university officer, I can appreciate these concerns. There are, however, compelling reasons why large private foundations seldom make unrestricted grants. Foundation grants are such a small part of the total revenues of colleges and universities that if all foundation grants were general support grants, they would have an imperceptible effect. Although higher education receives more than a third of all the funds granted by private foundations, these grants amount to less than one percent of the total current fund income of educational institutions. Like other people, those who establish foundations or serve as their trustees or staff want to feel that what they do makes a difference. They can make a perceptible difference only by reserving their support for identifiable programs or projects that might not be undertaken or completed without foundation assistance, and whose success can be evaluated in some way.

A second reason why large foundations seldom make general support grants is the difficulty of deciding which of very many excellent institutions to support. This is no problem for an individual donor, who can support his own alma mater or the institution his children attend. A corporation can have a matching gifts program, thus delegating the choice to its employees, or it can support institutions in the locations where it has facilities. These devices are not open to a professionally staffed national foundation. By selecting particular program areas to support, foundations do not solve the problem of choosing among institutions, but they make it more manageable.

Does this mean that foundations are trying to tell colleges and universities how to educate? I don't think so. We do not start new programs without extensive consultation with faculty members and administrators in higher education. If the people we consult do not perceive a need, the program never gets started. Once a program gets under way, not all institutions will want to participate in it. For example, the Sloan Foundation has a program in the New Liberal Arts designed to increase the understanding of quantitative reasoning and technology among humanities and social science majors in liberal arts colleges (see

p. 28 of this report). Some colleges originally invited to participate in this program have not been continuing participants because of the lack of sufficient interest in their faculties. Of course, we do not want to impose the Foundation's priorities on those colleges. However, for each such college there have been several others who have badly wanted to participate in the program and for whom we had no room. The colleges that do participate each emphasize different aspects of the program and adapt them in many ingenious ways to local talents and interests.

The relationship between private foundations and higher education is a continual effort to find important areas of mutual interest. A certain amount of game playing is inevitable in this process. We are occasionally amused by having our own words written back to us in grant proposals that seek to demonstrate that the potential grantee is thoroughly in tune with the Foundation's aims. Grants originally made for one purpose are sometimes redirected to another, fortunately in most cases with our prior consent. The process is not without its occasional frictions and irritations for both parties, but on the whole it seems to work well. It does so for two important reasons. First, there is no fundamental disagreement about the goals of higher education between educational institutions and foundations, even though there may be differences in priorities and emphasis from time to time. In part this is true because so many foundation officers (some would say too many) are former academics. Second, there are enough foundations and enough educational institutions so that the number of possible combinations is enormously large. Among these endless possibilities, good fits can usually be found with some effort on both sides. We are, thank goodness, far from the situation in which a Minister of Education can prescribe a curriculum or a research program for hundreds of institutions with a few strokes of the pen. The real source of the frustrations felt by my correspondent is, in my opinion, that there simply isn't enough foundation money to go around. This means, as we must often write, that excellent institutions and sound proposals may go unfunded. For this problem, alas, there is no solution.

Albert Rees

President

Grants and Activities in 1987

Cognitive Science

The Cognitive Science Program came to an end in 1987. It was the largest and longest of the seven "particular programs" the Foundation has undertaken. Its central purpose was to support the advancement and integration of those disciplines that attempt to understand the basis of intelligent behavior: cognitive psychology, neuroscience, linguistics, analytic philosophy, computer science, artificial intelligence, and cognitive anthropology. The final phase of this program concentrated on the establishment of nine university centers where long-term programs of training and research in cognitive science can be carried forward. These major center grants, as well as all others in the Cognitive Science Program, have been fully described in past annual reports.

Starting in 1984, a subdivision of the particular program in cognitive science was identified and a comparatively small program in this new field—computational neuroscience— was initiated. The broad purpose of this program has been to encourage a tighter linkage between theoretical models of nervous system function and experimental research on the anatomy and physiology of the nervous system. A natural capstone of our particular programs in cognitive science and neuroscience over the past fifteen years, the computational neuroscience program has aimed to tie together computer simulation, mathematical modeling, and other computational work deriving from artificial intelligence and robotics with experimental work in neuroscience.

During the first two years of this program, the Foundation funded a number of integrative activities, such as workshops and conferences for senior scientists, and a summer course introducing advanced students in neuroscience to the techniques of computational modeling. In 1986, we turned to direct support of collaborative research designed to test computational models of the functioning nervous system. Outstanding neuroscientists, each with a demonstrated interest in the computational approach, were invited to form collaborative research groups, select a particular computational model for study, and propose a program of tests.

Proposals submitted were reviewed by members of the following distinguished advisory committee:

Horace B. Barlow, Professor of Physiology, Cambridge University

Jack D. Cowan, Professor of Applied Mathematics and Theoretical Biology, University of Chicago

Michael S. Gazzaniga, Professor of Psychology and Neurology, Cornell Medical School

Stephen Kosslyn, Professor of Psychology, Harvard University

Gerald E. Loeb, Laboratory of Neural Control, National Institutes of Health

Gunther S. Stent, Professor of Molecular Biology, University of California at Berkeley

Five projects, approved for funding in the first round of competition, were described in last year's annual report. Here we report on six additional projects supported in 1987. These are our final grants in computational neuroscience. Together with a small number of officer grants, they conclude the particular program in cognitive science.

It is a pleasure to take this opportunity to acknowledge the contribution of Eric Wanner, now President of the Russell Sage Foundation, to the cognitive science program. Initially as Program Officer and then as Vice-President of the Sloan Foundation, he administered its final phase and also developed and oversaw the special program in computational neuroscience.

Trustee Grants in Computational Neuroscience

California Institute of Technology **$44,500**
Pasadena, California 91125

Massachusetts Institute of Technology **$53,000**
Cambridge, Massachusetts 02139

This collaboration of two neurophysiologists, Richard Anderson at MIT and John Allman at Caltech, and theoretician Shimon Ullman, at MIT, concerns the higher level analysis of visually perceived motion in the brain. Several years ago, Ullman proved that it was in principle possible to compute the three-dimensional structure of an object from successive two-dimensional views of the object in motion. This project aims to extend that work by localizing the hypothesized "structure-from-motion" system in the primate brain by means of neurophysiological recording techniques and in the human brain via PET scanning experiments. (Project director: Richard Anderson, Associate Professor of Brain and Cognitive Sciences, MIT; Grant period: March 1987-December 1988.)

Carnegie-Mellon University **$110,000**
Pittsburgh, Pennsylvania 15213

University of Toronto **$90,000**
Toronto, Canada M5S 1A4

A computational theorist, Geoffrey Hinton, and neuropsychologist Martha Farah will test a series of behavioral and psychophysiological predictions about the behavior of brain damaged patients which can be derived from Hinton's theory of representation of visual information in the brain. (Project director: Geoffrey Hinton, Associate Professor of Computer Science, University of Toronto; Grant period: March 1987-December 1989.)

Massachusetts Institute of Technology **$200,000**
Cambridge, Massachusetts 02139

Neuroscientist Emilio Bizzi and control theorist Neville Hogan will test Hogan's theory of the way multiple joints are coordinated to guide movement toward a target. Their research studies a reflexive leg movement in the frog that can be accurately guided to wipe an irritant off the surface of the body. A model of the wiping reflex will be developed and tested via the multiple embedded electrode technique. (Project director: Emilio Bizzi, Professor of Neurophysiology; Grant period: March 1987-December 1989.)

Massachusetts Institute of Technology **$140,000**
Cambridge, Massachusetts 02139

For this research project, a leading computational theorist in the area of vision (Tomaso Poggio) is teamed with a computer scientist (Ellen Hildreth) and neurophysiologist (Norberto Grzywacz). They will plan and carry out a series of neurophysiological tests of Poggio's models of motion detection and depth perception. (Project director: Tomaso Poggio, Professor of Brain and Cognitive Sciences; Grant period: March 1987-December 1988.)

Stanford University **$142,500**
Stanford, California 94305

University of Maryland **$56,500**
College Park, Maryland 20742

The nature of the feedback that enables an infant to learn to walk or a tennis player to perfect his serve is not yet understood. Professors Zajac and Levine

have collaborated in the development of a computational model of neural control of the legs. They will build on this work to address the question of how optimal control of skilled performance is attained with a multi-joint system. (Project directors: William S. Levine, Professor of Electrical Engineering, University of Maryland, and Felix E. Zajac, Professor of Mechanical Engineering, Stanford University; Grant period: March 1987-December 1988.)

University of Arizona **$57,000**
Tucson, Arizona 85721

University of Colorado **$143,000**
Boulder, Colorado 80309

Psychologists Lynn Nadel at Arizona and Bruce McNaughton at Colorado have teamed up with computer scientist Paul Smolensky at Colorado and neuroscientist John O'Keefe at University College, London for a series of behavioral and neurophysiological tests of how spatial information is learned and stored in the brain. When an animal learns a maze, for example, the information appears to be stored in a diffuse network of subcortical cells called the hippocampus. These investigators have proposed a network model of hippocampal structure and function. They now plan to test two distinct hypotheses about how spatial learning takes place. (Project director: Lynn Nadel, Professor of Psychology, University of Arizona; Grant period: March 1987-December 1989.)

Officer Grants in Cognitive Science and Computational Neuroscience

Society for Neuroscience **$10,000**
11 Dupont Circle, NW
Washington, D.C. 20036

Partial support for a course in computational neuroscience. (Project director: Stephen A. George, Professor, The Neuroscience Program, Amherst College; Grant period: January 1987-December 1987.)

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

Partial support for the 1987 Summer Linguistics Institute. (Project director: Ivan Sag, Professor of Linguistics; Grant period: January 1987-December 1987.)

United Engineering Trustees, Inc. **$20,000**
345 East 47th Street
New York, New York 10017

Support for a conference on biomechanical modeling. (Project director: Gerald E. Loeb, Laboratory of Neural Control, National Institutes of Health; Grant period: February 1987-December 1987.)

University of Washington **$10,000**
Seattle, Washington 98195

Partial support for the Ninth Annual Cognitive Science Meeting. (Project director: Earl Hunt, Professor of Psychology; Grant period: January 1987-December 1987.)

Economics

As in recent years, support for research and other activities in economics continued to be a significant part of the Foundation's program. Economists were among awardees of Sloan Research Fellowships and Dissertation Fellowships, as summarized elsewhere in this report. Two final grants supporting university workshops in economics were made, making eleven in all over a three-year period. Additional funding for projects in the behavioral economics program, begun in 1986, was authorized. A variety of other research projects and activities in economics received support by means of both trustee and officer grants.

Economics Workshops

In 1985, following a ten-year period during which two rounds of competition resulted in a series of grants to leading economics departments for graduate-level research workshops in applied microeconomics, a third round of competition was authorized for workshops on the general theme of the increased openness of the United States economy and the significance of that fact for understanding both the internal behavior of the economy and its role in the world.

Twenty-five leading economics departments were invited to apply for these new workshop grants. In establishing the workshop theme and reviewing proposals, the Foundation has been assisted by a distinguished advisory committee:

Robert Solow, Massachusetts Institute of Technology, Chairman

Alan Blinder, Princeton University

Richard Cooper, Harvard University

D. Gale Johnson, University of Chicago

Paul Joskow, Massachusetts Institute of Technology

Ann Krueger, Duke University

Charles Schultze, Brookings Institution

Five workshop grants were made in 1985, to Columbia, Minnesota, MIT, Princeton, and Wisconsin. Four more were approved in 1986, to Chicago, Duke,

Rochester, and Western Ontario. These grants were described in previous annual reports. This program of workshop grants was concluded in 1987 with two additional awards, as follows:

University of California, Los Angeles **$255,000**
Los Angeles, California 90024

This workshop will study the effect of U.S. economic policies on the distribution of income in the context of an integrated world economy. Recognizing that the world economy has become more dependent on foreign markets, workshop participants will consider the distributional effects, in both this country and abroad, of policies concerning the nature and restrictiveness of barriers to international exchanges of goods, capital, technology, and labor. (Project directors: Edward Leamer, Chairman, Department of Economics, and Sebastian Edwards, Assistant Professor of Economics; Grant period: July 1987-June 1990.)

University of Pennsylvania **$255,000**
Philadelphia, Pennsylvania 19104

This workshop will focus on three sets of open economy problems. First are those associated with macro characteristics of individual countries, such as growth and cyclical fluctuations of output, inflation, rates of interest, and stabilization policies. How these problems are affected by the openness of the economy is closely related to the exchange rate and the balance of payments. The second group of problems concerns somewhat more micro questions of comparative costs and competition within specific industries accompanied by tariffs and other trade policies. The third focuses on specific problems of factor markets and leads to questions of policies dealing with immigration and direct investment. (Project directors: Guillermo Calvo and Wilfred Ethier, Professors of Economics; Grant period: July 1987-June 1990.)

Behavioral Economics

In 1985, the Foundation initiated an exploratory program in the newly developing area of behavioral economics. The central premise underlying this nascent field is the belief that traditional economic analysis can be significantly enriched by making use of the results and techniques of the neighboring behavioral and social sciences. Modern economics employs a highly simplified set of assumptions about the nature of human rationality and human motivation. The

behavioral approach suggests that both the coverage and the empirical accuracy of economic theory might be improved by incorporating more empirically accurate assumptions about individual human behavior and about social processes into economic models. Four initial grants in behavioral economics were made in 1985.

In 1986, the Foundation held a competition for small grants of up to $50,000 in behavioral economics for efforts to develop and test behavioral models, for observational studies of economic decision making in real settings, and for experiments with simulated markets designed to examine the market consequences of psychological and social processes. The following Advisory Committee oversaw this first competition and continued to assist the Foundation on the program in 1987:

Robert Abelson, Professor of Psychology, Yale University

William J. Baumol, Professor of Economics, Princeton University

Leon Festinger, Professor of Psychology, New School for Social Research

Thomas C. Schelling, Professor of Economics, Harvard University

The thirteen one-year grants made in 1986 were described in that year's annual report. These and earlier grantees in the program were invited to request continued funding in 1987 based on the results achieved under the initial grants. (The program is now jointly funded and operated with the Russell Sage Foundation.) Based on recommendations of the advisory committee, four grants were made, as follows:

Harvard University **$75,000**
Cambridge, Massachusetts 02138

For continued studies of "noise traders," those who trade on tips or on incomplete or incorrect information, in stock markets. (Project director: Lawrence H. Summers, Professor of Economics; Grant period: January 1988-December 1990.)

University of California, Berkeley **$70,000**
Berkeley, California 94720

For further work on the effect on macroeconomic equilibrium of the concern for fair wages by employers and employees, on the role of fairness in economic

discrimination, and on the relation of fairness to taxes and debt. (Project director: George A. Akerlof, Professor of Economics; Grant period: January 1988-December 1989.)

University of Chicago **$90,000**
Chicago, Illinois 60637

For continued research on intertemporal choice, including studies of savings behavior and attitudes toward long-term risks. (Project director: George F. Loewenstein, Assistant Professor of Behavioral Science, Graduate School of Business; Grant period: January 1988-December 1990.)

University of Houston **$75,000**
Houston, Texas 77004

For testing on construction contractors the so-called winner's curse in auctions, a theory which alleges that a successful bidder must bid too high (above real value) to buy an auctioned item whose true value is unknown or too low (below cost) to win a contract where the true cost of performance is unknown. (Project director: John H. Kagel, Professor of Economics; Grant period: January 1988-December 1990.)

Other Trustee Grants in Economics

California Institute of Technology **$250,000**
Pasadena, California 91125

Since the early 1970's Caltech researchers have pioneered the use of experimental methods in economics and political science. Their work demonstrated that economic and political phenomena can be studied by application of laboratory methodology and that laboratory-generated data can be important for policy decisions. The methodology has evolved to include combinations of laboratory and field experiments. To carry forward this research requires more sophisticated equipment, administrative support, a new approach to subject pools, and greater communication between experimental scientists and theorists. This grant supports the creation and operation of the Laboratory for Experiments in Economics and Political Science, a center where a broad range of research in the development and application of experimental methods in the social sciences will be carried out. (Project director: Charles R. Plott, Professor of Economics; Grant period: April 1987-June 1991.)

Cornell University **$200,000**
Ithaca, New York 14853

In recent years, increasing numbers of employers have been paying employees at various levels of skill and authority by compensation plans that explicitly relate pay to performance. There has been surprisingly little recent research on how these incentive schemes actually affect the performance of individuals and firms. This grant will support a group of empirical research projects on this theme to be conducted by leading academic economists and industrial relations experts from around the country. The project includes a small initial working conference, a final public conference, and publication of a set of papers in *Industrial and Labor Relations Review*. (Project director: Ronald G. Ehrenberg, Professor of Industrial and Labor Relations and Economics; Grant period: January 1988-March 1990.)

Harvard University **$150,000**
Cambridge, Massachusetts 02138

Janos Kornai is generally considered to be the most distinguished economist in the socialist world and is thoroughly familiar with both Marxist and Western economics. He has a half-year faculty position at Harvard and spends the other half of the year as head of the Institute of Economics of the Hungarian Academy of Sciences. This grant supports his writing of a book to be titled *The Political Economy of Socialism* which will analyze the economies of the Soviet Union, Eastern Europe, and such other socialist countries as China and Cuba. It will draw on the work of both Western and East European scholars, will synthesize Kornai's previous writings, and is likely to be the definitive work in its field for many years. (Project director: Janos Kornai, Professor of Economics; Grant period: January 1988-December 1989.)

Institute for Research on Public Policy **$110,000**
275 Slater Street
Ottowa, Ontario, Canada KIP 5H9

This grant supports part of the costs of a two-phase project to help resolve those problems of international trade in agricultural products that are seriously affecting most industrial and developing countries. Over-production of many commodities, encouraged by government incentive programs and advances in technology, and reduced demand resulting from agricultural protectionism, trade barriers, and slow economic growth world-wide have exacerbated these problems. In Phase I, the IRPP and the Institute for International Economics (in

Washington, D.C.), working with a group of international experts and selected research institutes in OECD and developing countries, will jointly develop a consensus report proposing governmental policy actions to ease current agricultural trade difficulties and improve the prospects for multinational discussions and negotiations. The focus of Phase II will be on broadening the consensus among trade policy experts and government representatives by means of specialized seminars throughout the world. A concluding conference will be held in Canada prior to the 1988 Economic Summit. (Project directors: William M. Miner, Agricultural Trade Policy Advisor, IRPP, and Dale D. Hathaway, Agricultural Trade Negotiations Advisor, Institute for International Economics; Grant period: June 1987-August 1988.)

International Association for Research in Income and Wealth **$66,000**
Post Office Box 1962 - Yale Station
New Haven, Connecticut 06520

The findings of economic analyses are typically not subjected to the scientific discipline of reproducibility by other researchers, in part because the large-scale data on which such analyses are based are not easily accessible to others. With this grant the *Review of Income and Wealth* will publish one article per issue based upon a large data set that will itself be distributed with the journal on enclosed computer diskettes. The data will appear within a software "shell" that makes them easy to examine and manipulate and then to translate into a format usable for analysis by standard statistical software. The interest in and utility of this new data publication approach will be assessed, perhaps via a mail survey of journal subscribers, as part of this project. (Project director: Richard Ruggles, Executive Secretary; Grant period: January 1988-December 1990.)

Massachusetts Institute of Technology **$375,000**
Cambridge, Massachusetts 02139

In last year's annual report, a $375,000 grant to MIT was described as the first of two equal installments to support the work of an interdisciplinary group studying industrial productivity. Three principal components make up this study: analysis of the factors that have determined economic productivity in the United States relative to Europe and Japan; examination of the role of technology in determining industrial productivity, especially in the long run, relative to other economic variables; formulation of an appropriate educational and research agenda for scientists and engineers at MIT, directed toward problems of long-term industrial productivity in the U.S. The concluding phase of the study will be

devoted to distributing a final report and communicating findings and conclusions to a broad public audience within the U.S. research and development and university communities. This grant is the promised second installment in support of the work of the study group. (Project director: Michael L. Dertouzos, Director, Laboratory for Computer Science; Grant period: February 1987-December 1988.)

Massachusetts Institute of Technology **$250,000**
Cambridge, Massachusetts 02139

Robert M. Solow was awarded the 1987 Nobel Prize in economics for his seminal work on the role of technology in economic growth. He has been one of the most productive members of the economics profession and among the most frequently cited economists in the publications of others. For the past fifteen years, Solow has been the principal economics advisor of the Foundation. What success the economics program has had over this period is due in large measure to his constant advice. Although, as a matter of policy, the Foundation awards grants of endowment only in exceptional circumstances, we are pleased to join in the extraordinary admiration and affection with which Solow is regarded in the economics profession by making this grant to establish the Robert M. Solow Fellowship, income from which will provide a fellowship for one graduate student in economics each year.

Massachusetts Institute of Technology **$150,000**
Cambridge, Massachusetts 02139

Eric von Hippel has been engaged for a number of years in research and writing on the process of industrial innovation. He is embarked on a new research program on patterns of cooperation and competition in innovation, to be carried out in collaboration with graduate students and faculty colleagues. Preliminary investigation of modes of cooperative R & D behavior of innovating firms has unearthed significant cooperation by means of informal know-how trading networks in some industries. These involve systematic, informal trading of proprietary process know-how among engineers employed by rival and non-rival firms. This grant supports an empirical study of the nature and effectiveness of such informal know-how trading and its importance to the process of industrial innovation. (Project director: Eric von Hippel, Professor, Sloan School of Management; Grant period: June 1987-August 1990.)

National Bureau of Economic Research, Inc. **$430,000**
1050 Massachusetts Avenue
Cambridge, Massachusetts 02138

Economic analysis of many kinds requires accurate quantitative measures of national output in all sectors and all industries. Conceptual developments and a great increase in the availability of data should allow significant improvement to be made in methods and procedures for measuring the course of the economy. The NBER will pursue four areas of research: (1) auditing the output measurement for a number of standard industries, such as chemicals or textiles, to check on the available price indexes, the quality of "deflation," and the resultant productivity growth implications; (2) reviewing and advancing the state of measurement of product innovation and output quality change, with special attention to data from such high technology industries as communication equipment and electronics; (3) investigating the impact of the internationalization of the U.S. economy on our ability to measure its "domestic" output; and (4) broadening and revising the concept of "output" in such service sectors as education, health, transportation, and financial services. Summer institutes, meetings, and topical conferences will be held to bring together NBER and other researchers in this area. (Project directors: Zvi Griliches, Professor of Economics, Harvard University, and Ernst Berndt, Professor of Applied Economics, Sloan School of Management, Massachusetts Institute of Technology; Grant period: April 1987-June 1990.)

Northwestern University **$100,000**
Evanston, Illinois 60201

Poverty in the United States is not only an important public policy issue. It also raises theoretical and empirical questions for economists interested in the accurate measurement of income, consumer prices, and related variables. Christopher Jencks proposes to conduct research and write a book on the subject. He will focus on what actually happened to the level of poverty and material welfare among poor people in the U.S. after 1973 and what might be expected over the coming years. He plans to assess trends in consumption of "essentials" and how the very concept of such essentials as adequate diet and health care has changed over time. He will analyze available microdata from surveys and polls and explore such fundamental questions as: How much did a poor family's income need to increase in order to maintain a constant level of material welfare since the early 1970s? How do age, noncash benefits, race, and wealth affect a family's need for money income? This project was jointly reviewed by the Sloan Foundation and Russell Sage Foundation, and roughly equal grants from both will

support the proposed research and writing. (Project director: Christopher Jencks, Professor of Sociology and Urban Affairs; Grant period: August 1987-August 1988.)

Social Science Research Council **$185,000**
605 Third Avenue
New York, New York 10158

The Joint Committee on Soviet Studies (JCSS) of the American Council of Learned Societies and the Social Science Research Council has been concerned with the development of U.S. expertise on Soviet and East-European economics. Specialists on non-market economies trained at the relatively few university centers in the field have been dispersed to campuses throughout the country and have often found themselves professionally isolated. Three years ago, the JCSS developed a summer workshop series in order to provide young economists with the opportunity to interact with colleagues from other campuses. Under the guidance of leading senior specialists, they were able to present their own research and explore new sources and methods as well as important current issues in the field. This grant supplies partial support for another cycle of three summer workshops on the study of centrally planned economies. (Project director: Frederic Wakeman, President; Grant period: December 1987-December 1990.)

W. E. Upjohn Institute for Employment Research **$185,000**
300 South Westnedge Avenue
Kalamazoo, Michigan 49007

In 1986 the State of Illinois and the Upjohn Institute conducted an experiment in which $500 bonuses were offered to eligible unemployment insurance claimants who succeeded in getting full-time jobs within eleven weeks and holding these jobs for four months. Participants in the experiment were randomly assigned to treatment (bonus) and control (no bonus) groups. The experiment succeeded in saving the unemployment insurance system $2.30 for each dollar paid in bonuses because the treatment group did find jobs sooner. Upjohn and the U.S. Department of Labor will now conduct a new experiment to see if the Illinois results can be replicated in another state. The amount of the bonus and the length of time required to qualify for the bonus will be varied in order to identify an optimal bonus offer for possible general use. The administrative costs and bonuses (about $1 million) will be paid by the Department of Labor. The costs of design and analysis will be supported by Upjohn and, in somewhat larger share, by this grant. (Project director: Robert G. Spiegelman, Executive Director; Grant period: June 1987-December 1989.)

Officer Grants in Economics

Duke University **$10,000**
Durham, North Carolina 27706

Support of a workshop on economic thought and methodology. (Project directors: Craufurd D. Goodwin and E. Roy Weintraub, Professors of Economics; Grant period: May 1987-May 1988.)

National Bureau of Economic Research, Inc. **$20,000**
1050 Massachusetts Avenue
Cambridge, Massachusetts 02138

For preparation of a book titled *His or Hers: Women's Quest for Economic Equality*. (Project director: Victor R. Fuchs, Professor of Economics, Stanford University; Grant period: March 1987-September 1988.)

Social Science Research Council **$30,000**
605 Third Avenue
New York, New York 10158

Support for a conference on international productivity and competitiveness. (Project director: Bert G. Hickman, Chair, SSRC Committee on Economic Stability and Growth, and Professor of Economics, Stanford University; Grant period: July 1987-June 1988.)

University of California, Berkeley **$7,500**
Berkeley, California 94720

Support of a multicampus meeting on a national research program of competitiveness. (Project director: David J. Teece, Director, Center for Research in Management; Grant period: November 1987-June 1988.)

University of California, Davis **$30,000**
Davis, California 95616

Support for two research conferences on interpersonal comparability of welfare. (Project director: John Roemer, Professor of Economics; Grant period: January 1987-December 1988.)

University of Chicago **$29,600**
Chicago, Illinois 60637

For support of a special issue of the *American Journal of Sociology* on the interface between economics and sociology. (Project directors: Sherwin Rosen, Professor of Economics, and Christopher Winship, Associate Professor of Sociology at Northwestern University; Grant period: April 1987-March 1988.)

University of Chicago **$24,600**
Chicago, Illinois 60637

To support a review of farm-support and trade policies and for revision of a book on international agricultural trade. (Project director: D. Gale Johnson, Professor of Economics; Grant period: May 1987-September 1988.)

University of Michigan **$30,000**
Ann Arbor, Michigan 48109

For pretest of an instrument for the study of savings, asset accumulation, and consumption behavior. (Project director: F. Thomas Juster, Professor of Economics; Grant period: April 1987-December 1987.)

University of Minnesota **$10,000**
Minneapolis, Minnesota 55455

Partial support of a symposium titled "Knowledge and Institutional Change." (Project director: Vernon W. Ruttan, Professor of Agricultural and Applied Economics; Grant period: July 1987-December 1987.)

University of Wisconsin **$30,000**
Madison, Wisconsin 53706

To develop microcomputer access to the Survey of Income and Program Participation. (Project director: Martin H. David, Professor of Economics; Grant period: July 1987-June 1988.)

Fellowships

Sloan Research Fellowships **$2,250,000**

The Sloan Research Fellowship Program is the oldest active Foundation program. It continues to receive high praise and enjoy an enviable reputation in the academic world. Since 1955 research fellowships have accounted for expenditures of nearly $48 million and have assisted over 2300 young scientists at more than 180 colleges and universities in the United States and Canada. Sloan Research Fellows have received numerous prizes and awards in recognition of their major research accomplishments. Thirteen Fellows have received Nobel prizes and eleven have been awarded the prestigious Fields Medal in mathematics.

These fellowships are awarded annually to young scholars in chemistry, economics, mathematics, neuroscience, and physics, or in a related interdisciplinary field. Each award, currently $25,000 over a two-year term, is administered by the Fellow's institution and is designed to allow the greatest possible freedom and flexibility in its use. The Fellow need not pursue a specified research project and is free to change the direction of his research at any time. The award may be used for equipment, technical assistance, professional travel, or any other activity directly related to the Fellow's research. Former Fellows report that this flexibility gives the awards a value well beyond their dollar amount. A brochure entitled "Sloan Research Fellowships" gives details about this program and is available from the Foundation.

Candidates for Sloan Research Fellowships are nominated by department chairmen or other senior scientists, often themselves former Fellows. Within each discipline, a committee composed of three distinguished scientists reviews the nominations and makes the final selections. Committee members are asked, in reviewing nomination forms and supporting documents, to identify those nominees who show the most outstanding promise of making fundamental contributions to new knowledge.

During 1987, the Foundation awarded Research Fellowships to 90 scholars at 50 institutions. To arrive at the final selections, over 400 nominations were reviewed by the following committees:

Chemistry
Harry B. Gray, California Institute of Technology
Robin M. Hochstrasser, University of Pennsylvania
Jerrold Meinwald, Cornell University

Economics
David M. Kreps, Stanford University
Christopher A. Sims, University of Minnesota
James Tobin, Yale University

Mathematics
Peter D. Lax, New York University
Barry Mazur, Harvard University
John Milnor, The Institute for Advanced Study

Neuroscience
Gerald D. Fischbach, Washington University
Patricia S. Goldman-Rakic, Yale University
Solomon H. Snyder, The Johns Hopkins University

Physics
Roger Dashen, University of California, San Diego
Hans Frauenfelder, University of Illinois, Urbana-Champaign
William Press, Harvard University

The following scholars, listed by institution and field, received the 1987 awards:

Amherst College
Physics: Larry R. Hunter

Arizona, University of
Chemistry: Peter F. Bernath
Mathematics: Maciej P. Wojtkowski

Boston University
Economics: Kevin Lang
Mathematics: Joseph H. Silverman
Physics: Christopher L. Henley

Brown University
Mathematics: Thomas G. Goodwillie
Paris C. Kanellakis
Neuroscience: Mark F. Bear

Calgary, University of
Neuroscience: Thomas A. Reh

California Institute of Technology
Neuroscience: Christof Koch
Physics: Bradley W. Filippone
Ken G. Libbrecht

California, University of, Davis
Chemistry: Mark J. Kurth

California, University of, Los Angeles
Mathematics: Christopher R. Anderson

California, University of, Riverside
Mathematics: Ziv Ran

California, University of, San Diego
Economics: Joel Sobel

Carnegie Institution of Washington
Neuroscience: Philip A. Beachy

City University of New York, Brooklyn College
Mathematics: Lisa R. Goldberg

Chicago, University of
Chemistry: Jeffrey D. Winkler
Mathematics: Shmuel Weinberger
Neuroscience: Jonathan J. Art
Physics: Emil Martinec

Colorado State University
Chemistry: Steven H. Strauss

Colorado, University of
Chemistry: Gary A. Molander
David J. Nesbitt
Physics: Mitchell C. Begelman

Columbia University
Mathematics: Isaac Y. Efrat
Neuroscience: Gary Struhl
Physics: James H. Applegate
David Tytler

Connecticut, University of
Neuroscience: Jonathan Covault

Cornell University
Chemistry: Hector D. Abruna
Peter T. Wolczanski

Emory University
Chemistry: Michael C. Heaven

Florida State University
Physics: David Levinthal

Harvard University
Neuroscience: Kristen M. Harris
Physics: Jonathan A. Bagger
Timothy E. Chupp

Hawaii, University of
Chemistry: Marcus A. Tius

Illinois, University of, Urbana-Champaign
Chemistry: James M. Lisy
Physics: Nigel Goldenfeld
Norman H. Packard

Indiana University
Chemistry: George Christou

Johns Hopkins University
Neuroscience: Jay M. Baraban
Kevin R. McIntosh
Physics: Mark O. Robbins

Maryland, University of
Mathematics: William M. Goldman

Massachusetts Institute of Technology
Chemistry: Keith A. Nelson
Economics: Garth Saloner
Physics: Mehran Kardar
Aneesh V. Manohar
Janos Polonyi

McMaster University
Physics: Catherine Kallin

Michigan, University of
Chemistry: David M. Lubman
Economics: Gary Solon

New York University
Mathematics: Jalal M. I. Shatah

North Carolina, University of
Chemistry: Roger E. Miller
Physics: John H. Miller, Jr.

Northeastern University
Chemistry: Mary Jo Ondrechen

Northwestern University
Physics: Laurence D. Marks

Oregon, University of
Chemistry: Bruce P. Branchaud
Physics: Stephen D. Kevan

Pennsylvania State University
Mathematics: Adrian Ocneanu

Pennsylvania, University of
Chemistry: Marsha I. Lester
Neuroscience: Michael M. White

Pittsburgh, University of
Neuroscience: Anthony A. Grace

Princeton University
Chemistry: Robert A. Pascal, Jr.
Economics: Whitney K. Newey
Mathematics: Michael J. Hopkins

Purdue University
Chemistry: Clifford P. Kubiak
Robert R. Squires
Mathematics: Thomas M. Sellke

Rice University
Mathematics: L. Zhiyong Gao
Stephen W. Semmes

Rochester, University of
Neuroscience: Kathy W. Nordeen

Rutgers University
Mathematics: Helmut Hofer

State University of New York, Buffalo
Chemistry: Jerome B. Keister

State University of New York, Stony Brook
Physics: Jack J. Lissauer

Southern California, University of
Mathematics: Francis Bonahon

Stanford University
Chemistry: John W. Frost
Economics: Anat R. Admati
B. Douglas Bernheim
Neuroscience: Robert M. Sapolsky

Utah, University of
Mathematics: Aaron L. Fogelson
Physics: Mahito Kohmoto

Washington University
Neuroscience: Dennis D. M. O'Leary

Western Ontario, University of
Mathematics: J. F. Jardine

Yale University
Economics: David R. Weir
Neuroscience: Eric J. Nestler

Sloan Dissertation Fellowships — $888,372

The Sloan Dissertation Fellowship Program, established in 1984, is designed to assist doctoral candidates in two fields of traditional interest to the Foundation: economics and mathematics. Completing the dissertation is usually a time-consuming scholarly task that is performed with great difficulty amidst the candidate's teaching duties and other obligations. The Sloan awards give the Fellows the freedom they need to finish their degrees.

Informal reactions from the Fellow's graduate departments have been highly favorable. A large percentage of the Fellows either completed the dissertation or made substantial progress toward completion during the fellowship year. Almost all of these former fellows are now employed, many of them as junior faculty at major research universities.

In 1987, awards covering full tuition plus a stipend of $11,000 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

Alan J. Auerbach, University of Pennsylvania
Peter A. Diamond, Massachusetts Institute of Technology
Zvi Griliches, Harvard University

Mathematics

F. Thomas Farrell, Columbia University

Benedict Gross, Harvard University

Robert C. Gunning, Princeton University

The following scholars, listed by institution and field, received the 1987 awards:

Brandeis University
Mathematics: Paul A. Kirk

Brown University
Economics: Joshua N. Feinman
Michael P. Keane

California Institute of Technology
Economics: Jean-Laurent Rosenthal

California, University of, Berkeley
Economics: Alejandro Manelli
Joseph P. Mattey
Mathematics: Milos Arsenovic
Dino Lorenzini

California, University of, San Diego
Mathematics: Xiao-Song Lin

Chicago, University of
Economics: Jacob A. Klerman
Mathematics: James Lewis
Garrett Stuck

Columbia University
Economics: Daniel Berkowitz
Mathematics: Kenji Matsuki

Cornell University
Mathematics: Mark W. Brittenham

Harvard University
Economics: Richard S. Grossman
Bruno Jullien
Yingyi Qian
Mathematics: Alan Nadel
David Roberts
Boris Youssin

Indiana University
Mathematics: Alp Eden

Maryland, University of
Mathematics: Haiyan Cai

Massachusetts Institute of Technology
Economics: Bernard Caillaud
Ben Hermalin
Takeo Hoshi
Mathematics: Samuel Evens
Hisayosi Matumoto
Christopher R. Stover

Michigan, University of
Mathematics: Kenneth M. Boucher

Minnesota, University of
Economics: Clara Ponsati-Obiols
Mathematics: Bernard Le Stum

New York University
Mathematics: Yanyan Li

Northwestern University
Economics: Stephen T. R. Coate
Daniel P. O'Brien

Pennsylvania, University of
Economics: Roberto Chang
Bruce Fallick
Mathematics: Eric J. Schmutz

Princeton University
Economics: Melvyn G. Coles
Martin D. Richardson
Mathematics: Antonia W. Bluher
Hart F. Smith
Richard Taylor

Rochester, University of
Economics: Alejandro Hernandez
Sergio Rebelo

Rutgers University
Mathematics: Stefano Capparelli

Stanford University
Economics: Thomas A. Downes
Mathematics: Jeffrey E. Steif

Yale University
Economics: Morgan W. Kelly
Guillermo E. Mondino

New Liberal Arts

Annual reports since 1982 have chronicled the activities undertaken as part of the New Liberal Arts Program. This sixth "particular program" of the Foundation is based on our conviction that a liberal education in the last years of the twentieth century should develop student understanding of the problem-solving techniques and concepts which underlie modern technology. It also should offer students a substantial exposure to quantitative reasoning, computing, and mathematical modeling, all now so important for the analysis of problems encountered throughout the curriculum.

The program began in the spring of 1982 with small planning grants to 30 independent liberal arts colleges. These grants were followed later that year by major awards of $250,000 to 10 of the colleges, and presidential discretionary grants of $25,000 to the other 20 that had taken part in the first round of competition. Since that time, major grants have gone to a small number of universities, to many of the same 20 colleges that received discretionary grants, and to a number of historically black institutions. In 1985, the first renewal grants were made to colleges that won major awards three years earlier. However encouraged we are by the number of other institutions seriously interested in the program and anxious to enter it, we nevertheless continue the policy of restricting the program to those liberal arts colleges already participating. Our limited resources, we believe, are best used in order to develop at these colleges a body of experience and tested teaching materials to support the goals of the program. The preparation of textbooks and other materials based on successful new liberal arts courses and suitable for dissemination to interested faculty members, at participating colleges and elsewhere, is now an important priority within the program.

An outside advisory committee of the following persons continued to assist the Foundation in all phases of the New Liberal Arts Program:

Elting E. Morison, Professor Emeritus, Massachusetts Institute of Technology, Chairman of the Committee

David P. Billington, Professor of Civil Engineering, Princeton University

Nannerl O. Keohane, President, Wellesley College

William Kessen, Professor of Psychology, Yale University

C. Dwight Lahr, Dean of the Faculty, Dartmouth College

John G. Truxal, Distinguished Teaching Professor of Engineering and Applied Science, State University of New York, Stony Brook

Trustee Grants in the New Liberal Arts

We were aware from the beginning of the New Liberal Arts Program that the educational reform we were inviting colleges to undertake could only succeed if they had the patience and staying power necessary to effect a fundamental change in the undergraduate curriculum. That meant the Foundation, too, had to commit itself for the long term and had to be ready to continue its support of the colleges that entered the program, provided they were making good progress. Certain conditions for renewal grants were stipulated, including a careful evaluation of activities under the first grant, plans for further faculty and course development and exposure of students to topics in technology, and a commitment from the colleges (with the exception of the historically black institutions) for matching funds. The ceiling on renewal grants was the same as the amount of the initial grant. Each college receiving a renewal would thus have substantial resources with which to move ahead in phase two of the program.

Of the ten colleges that won major awards in 1982 in the first round of competition, eight have already received $250,000 renewal grants: Carleton, Davidson, Mount Holyoke, Vassar in 1985, and Grinnell, Lafayette, Union, Wellesley in 1986.

Among the eleven colleges awarded $150,000 grants in 1984, the following met the required conditions and received $150,000 renewal grants in 1987:

Bryn Mawr College
Bryn Mawr, Pennsylvania 19010
(Project director: Richard S. Davis, Associate Professor of Anthropology; Grant period: September 1987-November 1989.)

Colby College
Waterville, Maine 04901
(Project director: Henry A. Gemery, Professor of Economics; Grant period: September 1987-August 1990.)

Colgate University
Hamilton, New York 13346
(Project directors: Allen B. Tucker, Associate Dean of the Faculty, and Jane L. Pinchin, Associate Professor of English; Grant period: February 1988-January 1991.)

Spelman College
Atlanta, Georgia 30314
(Project director: Sylvia T. Bozeman, Professor of Mathematics;
Grant period: September 1987-November 1989.)

Tuskegee University
Tuskegee, Alabama 36088
(Project director: Francis A. Taylor, Professor of Social Work;
Grant period: September 1987-August 1990.)

A renewal grant was also approved in 1987 for Iona College. Iona received a curriculum development grant early in 1985. Its faculty had been active in the preparation of instructional materials in technology, science, and applied mathematics. It was felt that the extraordinary commitment of this college to the new liberal arts justified an exception to the policy of not extending the Program beyond the group of colleges with which we began. Iona's record of accomplishment and plans for development of additional technology-related course materials were deemed worthy of continued support.

Iona College **$75,000**
New Rochelle, New York 10801

(Project directors: Victor A. Stanionis, Associate Professor of Physics, and James J. Murphy, Director of Academic Development for Science and Technology and Professor of Physics; Grant period: June 1987-May 1989.)

Three grants to Georgia Institute of Technology (described in previous annual reports) supported a valuable program of workshops and consultations in technology, computing, and applied mathematics for faculty members from a consortium of historically black colleges. Late in 1985 we announced our intention to replace this program with a number of direct grants to some of the participating colleges. The new program was explained early in 1986 at a meeting of presidents of these colleges. That summer, a week-long workshop was held at Dartmouth College for teams of faculty members from the colleges. Proposals were then solicited for course and faculty development projects emphasizing mathematics, data analysis, and effective uses of the computer throughout the curriculum. Eight grants of $75,000 were subsequently authorized to the following historically black colleges. (The grant period in each case extends from February 1987 to August 1989.)

Albany State College
Albany, Georgia 31705
(Project director: Josephine D. Davis, Dean of
the Graduate School.)

Bennett College
Greensboro, North Carolina 27401
(Project director: R. Lee Ponting, Professor of Mathematics.)

Dillard University
New Orleans, Louisiana 70122
(Project director: Elton C. Harrison, Vice President
for Academic Affairs.)

Morehouse College
Atlanta, Georgia 30314
(Project director: Arthur M. Jones, Professor of Mathematics.)

Morris Brown College
Atlanta, Georgia 30314
(Project directors: Gloria L. Anderson, Dean of Academic Affairs, and Silas Bassey Edet, Professor of Mathematics and Computer Science.)

Paine College
Augusta, Georgia 30910
(Project director: Reuben Kesler, Jr., Associate Professor of Mathematics.)

Savannah State College
Savannah, Georgia 31404
(Project directors: Chukwudi Obi Emeh, Professor of Biology,
and Gaye H. Hewitt, Assistant Professor of History.)

South Carolina State College
Orangeburg, South Carolina 29117
(Project director: Manuel Keepler, Professor of Mathematics.)

Workshops for faculty members have been held each summer since the start of the New Liberal Arts Program. They have been among the most popular and valuable activities in the program. The workshop format allows college teachers to get sustained exposure for at least a full week to experienced and outstanding engineering educators or other specialists, and to work together to develop curriculum materials in technology and applied mathematics.

Grants were approved by the Trustees in 1987 for six workshops to be held at various times during the next year, as follows:

Brown University **$66,000**
Providence, Rhode Island 02912

This one-week workshop, to be held at Wellesley College in July of 1988, will be devoted to Appropriate Technology, i.e., technology that is "small scale, maintainable and controllable by the user, based on local materials, labor intensive, and insofar as possible, environmentally benign." Barrett Hazeltine and his colleague Christopher Bull, both in the Division of Engineering, have been involved in the teaching of successful courses in appropriate technology and are preparing text materials on that subject with the help of a small supplementary grant (described below). (Project director: Barrett Hazeltine, Professor of Engineering; Grant period: April 1988-December 1988.)

Princeton University **$84,000**
Princeton, New Jersey 08544

It is proposed to emphasize the preparation of teaching materials by faculty members who have attended previous Princeton workshops, have collaborated on NLA projects with one of the four Princeton mentors, have plans for developing teaching units or scholarly papers related to their courses, and who would benefit from repeated visits with the Princeton group throughout the 1988 calendar year. Three visits of several days are planned, at different times for different participants, except for the middle visit in August when all 16 faculty members are to come together to make presentations. Much of the work will be done by participating faculty throughout the year at their home institutions. The visits to Princeton are intended to supply needed consultations and support. Participants will work on the development of teaching units on such topics as the Los Angeles Freeway and a structural study of one of its major overpasses; Tesla and the electric motor; Vannevar Bush and the differential analyzer; a Turing machine simulator; and large-scale domes of the Renaissance. (Project directors: David P. Billington, Professor of Civil Engineering; Michael S. Mahoney, Professor of

History of Science; Robert Mark, Professor of Architecture; and John M. Mulvey, Professor of Engineering/Applied Science; Grant period: January 1988-March 1989.)

Research Foundation of the State University of New York **$84,000**
P. O. Box 9
Albany, New York 12201

This grant will support a workshop on Technological Change and Automation to be held at Wellesley College in August of 1988. During previous summers, Professor Truxal has directed very successful workshops, each intended to introduce topics in technology suitable for the liberal arts curriculum. This workshop will explore the nature and importance of automation in both manufacturing and service industries. Professor Henry Gemery, an economist and NLA project director at Colby College, has been consulted in preparing the workshop program and identifying other economists as possible participants. This grant also includes support for a one-day meeting of project directors from all colleges with major grants in the New Liberal Arts Program, to be held at Wellesley immediately following the workshop. This will be the fourth such annual event, the first having been held in 1985. (Project directors: John G. Truxal, Professor of Engineering and Applied Science, and Marian Visich, Jr., Associate Dean, College of Engineering and Applied Science, both at SUNY-Stony Brook; Grant period: April 1988-December 1988.)

Spelman College **$65,000**
Atlanta, Georgia 30314

This workshop, to be held in June of 1988 at Spelman College, is directed at special needs identified by the twelve historically black colleges and universities now participating in the NLA program. These institutions are already engaged in faculty and course development projects in mathematics, statistics, or quantitative reasoning. Faculty members from these HBCU's will discuss topics in mathematics and data analysis and interesting applications suitable for beginning students in mathematics and social science courses. There will be discussion of strategies for effectively introducing quantitative training into the curriculum and participants will be expected to develop plans to be tried out at their own colleges. (Project directors: Sylvia T. Bozeman, Professor of Mathematics, Spelman College and Arthur M. Jones, Professor of Mathematics, Morehouse College; Grant period: January 1988-September 1988.)

Union College **$65,000**
Schenectady, New York 12308

This grant will support a workshop on Voting, Elections, and Social Choice to be held at Union College July 31-August 6, 1988. It will be led by Steven J. Brams who conducted a very successful new liberal arts faculty workshop on game theory in 1987. Twenty participants from NLA colleges will be selected, mainly political scientists, economists, and mathematicians with an interest in social choice theory and its applications to voting and election processes. Topics to be considered include the properties of various voting methods, including plurality and approval voting; Arrow's Theorem on aggregating individual preferences into social choices; measures of voting power in decision-making bodies; paradoxes related to voting, vote trading in legislatures, and apportionment; and resource allocation models for analyzing candidate expenditures. These topics are especially appropriate for a presidential election year and it is expected that participants will be interested in introducing some workshop material into their fall semester courses. Alan Taylor, a Union mathematician developing a new course in mathematics for political scientists, will assist with workshop plans. (Project director: Steven J. Brams, Professor of Politics, New York University; Grant period: January 1988-October 1988.)

University of Michigan **$64,000**
Ann Arbor, Michigan 48106

One of the attractions of this workshop is that it will be conducted as part of the annual summer training program in the methods and technology of social research organized by the Inter-university Consortium for Political and Social Research. The workshop will be devoted to quantitative methods and reasoning for historians. Research methods will be the main focus, but pedagogical issues of how this quantitative methodology can be introduced into college history courses will also be discussed. A weekend conference will be held well before the summer of 1988 to make more detailed plans for the workshop program. Participants in this planning meeting will include the workshop co-directors and a small number of colleagues, some from NLA colleges, with experience in teaching quantitative history and developing undergraduate curriculum materials. (Project directors: Jerome Clubb, Professor of History and Executive Director of the Inter-university Consortium for Political and Social Research, and Maris Vinovskis, Professor of History; Grant period: November 1987-November 1988.)

Three additional trustee grants in the new liberal arts were authorized in 1987, as follows:

Brown University **$48,000**
Providence, Rhode Island 02912

Barrett Hazeltine's experiences as a visiting faculty member at universities in Malawi and Zambia have led him to study various low and intermediate rather than high technology approaches to problems in Africa. These turn out also to be appropriate for many other parts of the world. He has taught a very successful course in Appropriate Technology for liberal arts students. With this grant he will prepare a set of modules, on the technologies themselves and their implications, that could serve as a textbook for such a course. The material will be used for the faculty workshop in Appropriate Technology (described above) to be offered during the summer of 1988. Also supported with this grant is the preparation and distribution of two special issues of *The Weaver*, published by the Council for the Understanding of Technology (CUTHA). Professor Hazeltine is chairman of CUTHA's editorial committee. The subsidized issues of *The Weaver*, one each year, will be devoted entirely to the New Liberal Arts program. (Project director: Barrett Hazeltine, Professor of Engineering; Grant period: June 1987-November 1988.)

Research Foundation of the State University of New York **$160,000**
P. O. Box 9
Albany, New York 12201

Special-leave grants offer partial support for faculty members from colleges in the New Liberal Arts Program to spend an academic year or two summers on full-time curriculum development projects. The first four such $20,000 grants were made in 1985-86. Their popularity and effectiveness led us to double their number in subsequent years. The Stony Brook Resource Center for the New Liberal Arts Program serves as administrative agent for this project. Funds for individual grants are awarded to the colleges of the recipients, with no overhead charges at either Stony Brook or the home institutions. Guidelines for the competition stress the importance at this stage of the New Liberal Arts Program of the production of educational materials suitable for dissemination to other institutions. Eight special-leave awards for 1988-89 are made possible by this grant. (Project directors: John G. Truxal, Professor of Engineering and Applied Science, and Marian Visich, Jr., Associate Dean, College of Engineering and Applied Science, both at SUNY-Stony Brook; Grant period: June 1988-June 1989.)

University of Pennsylvania **$150,000**
Philadelphia, Pennsylvania 19104

Among university schools of engineering, the University of Pennsylvania has been among the leaders in development of successful courses in technology intended primarily for liberal arts students. Joseph Bordogna, Dean of the School of Engineering and Applied Science, has had a long-standing interest in this aspect of engineering education and he has an enthusiastic group of senior faculty members developing and teaching such courses. This grant will allow five engineering professors to prepare written materials for their courses. For four of the courses, manuscripts for textbooks will be prepared. For the fifth, a handbook of "kitchen experiments" and design exercises will be assembled. The course titles are: The World of Bioengineering; Interactive Computing and Creative Thinking; Capturing Engineering Knowledge in Expert Systems; Introduction to Forensic Engineering; and An Introduction to Technological Concepts. Matching funds have been received for this project from the University's Undergraduate Education Fund. (Project director: David P. Pope, Associate Dean for Undergraduate Education, School of Engineering and Applied Science; Grant period: March 1987-September 1988.)

Officer Grants in the New Liberal Arts

Centre College **$30,000**
Danville, Kentucky 40422

For the development of new general education courses in science and technology. (Project director: Richard L. Morrill, President; Grant period: November 1987-September 1989.)

Yale University **$19,000**
New Haven, Connecticut 06520

Support for the preparation of an introductory textbook on aerodynamics, suitable for liberal arts students. (Project director: Peter P. Wegener, Professor Emeritus of Engineering and Applied Science; Grant period: July 1987-December 1988.)

The computer is an instrument of enormous power for enriching instruction in quantitative reasoning, applied mathematics, and technology. As college administrators know all too well, the demand for more and up-to-date computer equipment appears to be insatiable. Although student use of the computer has become commonplace, there is yet much to be done to develop effective and innovative uses for teaching and learning.

The Foundation was therefore extremely pleased to receive a generous offer from Apple Computer, Inc. to support special projects at colleges in the New Liberal Arts Program by making grants of equipment to allow the establishment of Macintosh computer laboratories. Proposals were invited for projects that would have a substantial impact on the curriculum and on the way the computer is used by faculty and students, especially in introductory courses. Proposals from sixteen colleges were received and reviewed by both Apple and the Foundation.

Eight equipment grants were made in the spring of 1987 to the following colleges: Carleton, Claremont-McKenna (jointly with Pomona), Colby, Davidson, Grinnell, Mount Holyoke, Reed and Wellesley. Although the equipment received varied from college to college, an average grant included at least ten Macintosh Plus computers, LaserWriter Plus or Imagewriter II printers, systems connector kits, and some Apple software. Hard disks and a file server went to a few colleges whose proposed projects required this additional equipment. The colleges will submit periodic progress reports on their project activities and the uses to which they have put these Macintosh computer laboratories.

Four additional equipment grants were made available by Apple in a competition held among the historically black colleges and universities in the New Liberal Arts Program. The following institutions received these grants: Dillard University, Savannah State College, Spelman College, and Tuskegee University.

We take this opportunity to thank Apple Computer, Inc. and Dr. Barbara Bowen, Manager, External Research, for this very generous gift of equipment and software in furtherance of the goals of the New Liberal Arts Program.

Public Management

Support for education and research in the management of government has been a major activity of the Foundation since the mid-1970's. At the outset, our grants helped reshape the curriculum of many of the major professional and undergraduate schools in fields variously referred to as public policy, public management, or education for the public service. The new curriculum paid greater attention to economics, data analysis, applied mathematics, and use of the computer, all deemed increasingly important in the education of the designers and managers of public policy. After 1980, the curriculum goals having been substantially achieved, we concentrated on supporting the development of a strong research base in public management which would assist both practitioners in public service and scholars of the field. At the same time we began a systematic effort, in cooperation with the Association for Public Policy Analysis and Management (APPAM), to increase the flow of minority students into the high-quality programs we had helped establish.

By 1984, the minorities project had become so substantial that it was designated a "particular program." (See the Policies and Procedures section of this report for a description of our particular programs.) The proportion of our expenditures aimed at increasing the number of minorities in important public sector careers has steadily increased. Today, in substantial part because of our efforts, there are significant numbers of minority students in the major schools of public policy and management.

Particular Program for Minorities in Public Management

Post-Junior Year Summer Institutes **$920,000**

This is the seventh year of the Foundation's support for summer institutes for minority students between their junior and senior years in college. Our aim is to increase the number of minority students in graduate programs in public policy and management, as a step toward increasing the number of minorities in significant public sector careers. The institutes, jointly developed by APPAM and the Foundation, are eight-week residential programs of intensive study of management, economics, statistics, computing, and communication skills. As part of each institute, successful minority public managers are invited to discuss their careers with students. Careers in international affairs will be emphasized as one of the areas of public service where well-trained minority students are especially needed. Each student attending an institute is provided a summer stipend. Eight grants of $115,000 were made to support 1987 post-junior year institutes for a total of 225 students, at the following APPAM schools:

Carnegie-Mellon University
Pittsburgh, Pennsylvania 15213
(Project director: Alfred Blumstein,
Dean of the School of Urban and Public Affairs.)

Princeton University
Princeton, New Jersey 08544
(Project director: T. James Trussell, Professor,
Woodrow Wilson School of Public and International Affairs.)

State University of New York, Stony Brook
Stony Brook, New York 11794
(Project director: Harry Weiner, Professor,
Harriman College for Policy Analysis and Public Management.)

University of California, Berkeley
Berkeley, California 94720
(Project director: Phyllis Strong Green,
Associate Dean of the Graduate School of Public Policy.)

University of Michigan
Ann Arbor, Michigan 48109
(Project director: Paul N. Courant,
Director of the Institute of Public Policy Studies.)

University of Minnesota
Minneapolis, Minnesota 55455
(Project director: John Brandl, Professor,
Hubert H. Humphrey Institute of Public Affairs.)

University of Texas
Austin, Texas 78712
(Project director: Max Sherman, Dean of
the Lyndon B. Johnson School of Public Affairs.)

University of Washington
Seattle, Washington 98195
(Project director: Hubert Locke,
Dean of the Graduate School of Public Affairs.)

Post-Senior Year Summer Institutes **$506,000**

These intensive eight-week summer programs are restricted to students of high promise who have successfully completed one of the post-junior year institutes and who have been accepted by an APPAM school for enrollment in a graduate program the following fall. The subjects studied are again economics, mathematics, computing, and communication skills. APPAM minority students now in graduate school are emphatic in crediting the summer institutes with making it possible for them to compete in high-quality graduate programs. The two post-senior year institutes in 1987 were held, as in previous years, at Harvard ($384,000 grant for 80 students) and at the Rand Corporation ($122,000 grant for 18 students):

Harvard University
Cambridge, Massachusetts 02138
(Project director: Ronald F. Ferguson, Associate Professor, John F. Kennedy School of Government.)

Rand Corporation
1700 Main Street
Santa Monica, California 90406
(Project director: Charles Wolf, Jr., Dean of the Rand Graduate School.)

Duke University **$1,930,000**
Durham, North Carolina 27706

The third component of our particular program for minorities in public management is fellowship support for those students who successfully complete one of the summer institutes and enroll in an APPAM graduate program. The Foundation meets the cost of their first year of graduate school. In the student's second year (almost all are in two-year Master's programs) support is provided by the graduate institution. In 1987, the seventh year for this fellowship program, there were 120 fellows enrolled in 18 APPAM graduate schools. As in past years, this grant was administered by Duke University on behalf of the participating APPAM schools. (Project director: Robert D. Behn, Professor, Institute of Policy Sciences and Public Affairs, and Treasurer, APPAM; Grant period: September 1987-August 1988.)

Other Trustee Grants in Public Management

National Commission on the Public Service **$150,000**
1616 H Street, NW
Washington, D.C. 20006

A distinguished, bipartisan group of former high-level public officials have formed the National Commission on the Public Service. Its purpose is "to develop an action program designed to arrest and reverse the present deteriorating state of the career Federal service." Leaders from the private sector have also agreed to serve. The executive director is retired Ambassador Bruce Laingen, who was a hostage in Iran. The commission plans extensive public hearings. In addition to general image improvement for public service, it intends to focus on specific problems, such as the need for a balance between career and political appointees and the difficulty of motivating employees in a civil service system. This grant will support meetings of the Commission and its task forces, commissioned papers, and publication and dissemination of task force and Commission reports. (Project director: Elmer B. Staats, Chairman of the Board of Directors; Grant period: September 1987-August 1988.)

New School for Social Research **$75,000**
New York, New York 10011

New York University **$75,000**
New York, New York 10012

In New York City, the need for social services is so great that a large number of non-profit organizations have come into existence to supplement the work of agencies of the city government. Many are large and complex, commanding substantial budgets, large numbers of employees and a variety of programs. In such organizations, some middle managers, and upper-level managers as well, have come to their positions through training in social welfare; others have advanced based primarily on experience and effort. The work of these non-profits would benefit if their managerial corps could take advantage of educational programs in management. Both NYU and the New School have recently started training programs at the master's level specifically aimed at the managers of non-profit organizations. The curricula are similar to those of public management programs, but include courses concerned with such special aspects of non-profits as dealing with trustees, motivating volunteers, philanthropic law, and fund-raising. This grant covers tuition and related costs of in-place managers (we

expect many to be minorities and women) who would study half-time in the late afternoon and evening. (Project directors: Alan Altshuler, Dean, Graduate School of Public Administration, New York University, and Robert Curvin, Dean, Graduate School of Management and Urban Professions, New School for Social Research; Grant period: October 1987-September 1989.)

Officer Grants in Public Management

University of Michigan **$5,000**
Ann Arbor, Michigan 48109

Support for the third annual student-run policy conference which will focus on the United States' role in international economic development. (Project director: Paul N. Courant, Director, Institute of Public Policy Studies; Grant period: January 1987-June 1987.)

University of Washington **$9,000**
Seattle, Washington 98195

To develop a training program for managers from the public, private, and non-profit sectors. (Project director: Jonathan Brock, Professor, Graduate School of Public Affairs; Grant period: February 1988-January 1989.)

Science and Society

Advancing the public's understanding of science and technology has been a continuing interest of the Foundation. Scientists and engineers play an increasingly important role in our society. Their ability to communicate effectively with government policy makers and the wider general public, directly or through intermediaries, is vital for democratic decision making. Media able faithfully to present and a public able to understand the methods, results, and policy recommendations of scientists and engineers are also essential.

Here we report on the Science Book Program, on a series of grants in arms control and defense policy made primarily to assist college teachers and students understand the difficult issues involved in nuclear weaponry and strategic uses of defense, and on other trustee and officer grants that in one way or another are concerned with improving communication and understanding of science and technology.

Science Book Program

Under this program, initiated in 1975, the Foundation invites outstanding scientists to write about their experiences and lives in science. Our aim is to make the experience of doing scientific work less mysterious to nonscientists and to give laymen a better sense of what a life is like when it is dedicated to science.

Eleven books have already appeared in the series:

Disturbing the Universe by Freeman Dyson

Advice to a Young Scientist by Peter B. Medawar

The Youngest Science by Lewis Thomas

Haphazard Reality by Hendrik B. G. Casimir

In Search of Mind by Jerome Bruner

A Slot Machine, A Broken Test Tube by S. E. Luria

Enigmas of Chance by Marc Kac

Rabi: Scientist and Citizen by John S. Rigden

Alvarez: Adventures of a Physicist by Luis W. Alvarez

Making Weapons, Talking Peace by Herbert F. York

La Statue Intérieure by François Jacob

New books by Francis Crick, Rita Levi-Montalcini, and George Stigler, as well as an English edition of François Jacob's book, are scheduled for publication in 1988.

In all aspects of this book program, the Foundation was ably assisted during 1987 by an advisory committee of distinguished members:

Michael Bessie, Publisher, Cornelia & Michael Bessie Books, Chairman of the Committee

Howard H. Hiatt, Professor of Medicine, Harvard Medical School and Harvard School of Public Health

Eric R. Kandel, University Professor of Physiology and Psychology, Columbia University

Daniel Kevles, Professor of History, California Institute of Technology

Robert Merton, University Professor Emeritus and Special Service Professor, Columbia University

Paul Samuelson, Institute Professor of Economics, Massachusetts Institute of Technology

Robert Sinsheimer, Chancellor Emeritus, University of California at Santa Cruz

Steven Weinberg, Josey Regental Professor of Science, University of Texas at Austin

Stephen White, foundation officer (retired), writer

Trustee Grants in Arms Control and Defense Policy

The Foundation's activities in arms control, defense policy, and national security issues are quite limited. Almost all are designed to help teachers deal effectively with the growing interest of undergraduates in systematic instruction on issues of the nuclear age. Grants made in 1987 supported workshops for college faculty members, lectures by visiting experts, and special pre-and post-doctoral fellowships, all intended in one way or another to increase understanding of the technology of nuclear weapons, the history of arms control, and other issues of national security. These, as well as some grants involving larger international issues, are summarized below.

American Academy of Arts and Sciences **$50,000**
Norton's Woods, 136 Irving Street
Cambridge, Massachusetts 02138

Arms Control Association **$50,000**
11 Dupont Circle, NW
Washington, D.C. 20036

Early in 1986, officer grants were made to the American Academy of Arts and Sciences for the George Kistiakowsky Visiting Scholar Program and to The Arms Control Association for the Herbert Scoville Visiting Lectureship Program. Both institutions had requested funding for an experimental year of sending defense policy scholars and ex-government arms control officials to colleges and universities for two or three days of interaction with students and faculties. Distinguished visitors were enthusiastically received and were pleased to contribute to the enrichment of the educational programs on the campuses. These 1987 grants will support both projects for an additional two years. (Project directors: Frank A. Long, Chairman, Committee on International Security Studies (American Academy) and Spurgeon M. Keeny, Jr., President and Executive Director (Arms Control Association); Grant periods: July 1987-July 1989 (American Academy) and April 1987-June 1989 (Arms Control Association).)

American Committee on U.S.-Soviet Relations **$100,000**
109 Eleventh Street, SE
Washington, D.C. 20003

In 1985, the Foundation made a two-year grant in support of the American Specialists on the Soviet Union project, a consultative service designed to provide

American decision-makers with informed and disinterested analysis by specialists on the Soviet Union from many fields. The objective of the project is not to plead for any particular American policy, but rather to lay out a reasoned version of the Soviet reality on which U.S. policy must be based. The Committee brings experts together to meet first among themselves and then with representatives from Congress, many Executive branches, and also from the print and broadcast media. Some twenty-eight specialists have participated on a regular basis in over forty sessions during the past two years and the project has been well received by those involved. This grant will allow the project to continue for another two years. (Project director: Roland S. Homet, Jr., Director, American Specialists on the Soviet Union; Grant period: October 1987-October 1989.)

Harvard University **$500,000**
Cambridge, Massachusetts 02138

This grant supports a major research program on Dual-Use Technologies: Balancing Economic and Security Interests in Federal R & D Investment Strategies. It is hoped to build a base of analysis and insight that will contribute to the national debate over the rationale for such dual-use major projects as the Space Station, strategic defenses, and supercomputers; the organization of federal government agencies and laboratories to enhance commercial spinoffs without sacrificing security goals; the influence of military-funded research on the overall university research and training environment; and the net assessment of the burden on civil society resulting from a strong national defense. In addition to the central issues of maximizing synergy and minimizing conflict between the nation's commercial and military technology efforts, a variety of other questions of science, education, and defense policy, all arising from the fact that so many technologies are dual-use, will be studied. (Project director: Lewis M. Branscomb, Director of the Science, Technology and Public Policy Program, John F. Kennedy School of Government; Grant period: October 1987-October 1990.)

Harvard University **$100,000**
Cambridge, Massachusetts 02138

University of California, San Diego **$100,000**
La Jolla, California 92093

In March 1985, the Foundation made two-year grants to the Center for Science and International Affairs at Harvard and to the Institute on Global Conflict and Cooperation at the University of California to support post-doctoral and pre-doctoral fellowships, respectively, in arms control and international security

studies. The fellowships were specifically earmarked for scholars with technical backgrounds in science and engineering in recognition of the need to engage a new generation of physical scientists and engineers in such studies. The CSIA Fellows have been active in seminars, study groups, and public forums, and have conducted individual and collaborative research on such issues as Soviet arms control policy, the prevention of unauthorized use of nuclear weapons, the future of continental air defense in North America, and verification of nuclear test ban treaties. Examples of research topics that the IGCC foresees for its science and engineering fellows are: the Soviet civil defense program (by a civil engineer); the nuclear winter problem (by a meteorologist or geographer); and the role of high frequency seismic signals in monitoring a treaty banning the production of binary chemical warfare systems (by a chemist or chemical engineer). Continuation of both fellowship programs is supported by these renewal grants. (Project directors: Joseph S. Nye, Jr., Director, CSIA (Harvard) and Herbert F. York, Director, IGCC (UC, San Diego); Grant periods: June 1987-August 1988 (Harvard) and May 1987-May 1989 (UC, San Diego).)

University of Miami **$130,000**
Coral Gables, Florida 33124

University of Sussex **$130,000**
Falmer
Brighton, Sussex BN1 9RF England

Starting in 1983, we have made grants to MIT for annual summer workshops on issues of the nuclear age for faculty members from colleges and universities. In 1984, a second such workshop was organized in San Diego, mainly for participants from the West. Since few faculty members from the southern states attend these summer workshops, a third intensive workshop was first held in Miami early in 1986. Evaluations of all these workshops have been very positive. The goal in all has been to strengthen the capacity of participants to teach their own students about international security, nuclear weapons, and arms control issues. Given the differences in European and U.S. perspectives on these issues, it seemed useful to organize yet another workshop that would permit college teachers from Europe and the United States to hear from defense policy experts from both sides of the Atlantic. A second objective would be to introduce Americans to new European thinking about issues of global security and Europeans to the political culture in which decisions about weapons and arms control are made in the United States. These grants support a third workshop to be held in Miami during the winter of 1987-88 and the first Sussex workshop held during the summer of 1987. (Project directors: Behram N. Kursunoglu, Director of the Center for Theoretical Studies (University of Miami), J. P. Perry Robinson, Senior

Fellow, Science Policy Research Unit (University of Sussex); Grant period: May 1987-April 1988 (University of Miami), February 1987-December 1987 (University of Sussex).)

Officer Grants in Arms Control and Defense Policy

Brookings Institution **$4,500**
1775 Massachusetts Avenue, NW
Washington, D.C. 20036

Supplementary support for work on a book to accompany The Nuclear Age program for WGBH. (Project director: John Newhouse; Grant period: December 1987-June 1988.)

Brookings Institution **$12,000**
1775 Massachusetts Avenue, NW
Washington, D.C. 20036

Support for a book on the story of the TRIDENT submarine. (Project director: Jon Connell, Correspondent, *The Sunday Times* of London; Grant period: January 1987-December 1988.)

Catticus Corporation **$25,000**
2600 10th Street
Berkeley, California 94710

Support for a documentary film entitled "Super Bomb: The Decision to Build the Hydrogen Bomb." (Project directors: Peter Galison, Professor of History of Science, Stanford University, and Pamela Hogan, Producer, Philip Burton Productions, Inc.; Grant period: October 1987-April 1988.)

Center on Budget and Policy Priorities **$28,000**
236 Massachusetts Avenue, NE
Washington, D.C. 20002

Support for a research program of the Defense Budget Project on Defense Spending, Economic Growth and Technology. (Project director: Gordon Adams, Director, Defense Budget Project; Grant period: December 1987-December 1988.)

Center for Strategic and International Studies **$22,500**
1800 K Street, NW
Washington, D.C. 20006

To support the completion of a biography of Robert S. McNamara. (Project director: Deborah Shapley, Visiting Scholar; Grant period: May 1987-October 1987.)

George Mason University **$30,000**
Fairfax, Virginia 22030

Support for a second national conference on nuclear war and peace courses and their role in the general education of college students. (Project director: Robert Ehrlich, Professor of Physics; Grant period: January 1987-December 1987.)

Harvard University **$10,000**
Cambridge, Massachusetts 02138

A planning grant for research on Dual-Use Technologies: Balancing Economic and Security Interests in Federal Research and Development Investment Strategies. (Project director: Paul Doty, Director Emeritus, Center for Science and International Affairs, John F. Kennedy School of Government; Grant period: June 1987-September 1987.)

Tufts University **$26,600**
Medford, Massachusetts 02155

A planning grant for a USA/USSR joint course on the nuclear arms race. (Project director: Martin J. Sherwin, Director, Nuclear Age History and Humanities Center; Grant period: July 1987-June 1988.)

University of California, Los Angeles **$27,000**
Los Angeles, California 90024

Support for a conference in Bellagio, Italy on "Nuclear Supplier States and Non-Proliferation." (Project director: William C. Potter, Executive Director, Center for International and Strategic Affairs: Grant period: February 1987-December 1987.)

Other Trustee Grants in Science and Society

American Association for the Advancement of Science **$155,000**
1333 H Street, NW
Washington, D.C. 20005

An effective response to the existence of fraud and ethical misconduct associated with scientific research is fundamental to assuring a healthy scientific enterprise. The management of such conduct affects society's trust in and support of science. In addition, "quality control" in science depends on detection and elimination of fraudulent data and practices. A 1986 officer grant supported a successful exploratory workshop on these issues held by the National Conference of Lawyers and Scientists, a group with membership from the American Bar Association and the AAAS. This new grant allows the NCLS to address in greater detail questions of quality control in science. The project includes workshops and public symposia as well as the preparation of brochures on scientific publication practices and record keeping. Also planned is a book to summarize the entire project. (Project director: Albert Teich, Head, Office of Public Sector Programs; Grant period: January 1988-December 1989.)

Georgetown University **$94,000**
Washington, D.C. 20057

Application of modern technology in molecular biology now makes it feasible to map the entire human genome. But the undertaking would be extremely costly in terms of both labor and capital. The project thus raises numerous scientific, social, economic, and political questions. With this grant, Robert Cook-Deegan, a physician and policy analyst, will write a book for the general reader on the complex of issues surrounding the project to map and sequence the human genome. (Project director: Robert Cook-Deegan, Research Associate, Kennedy Institute for Ethics; Grant period: March 1988-April 1990.)

Harvard University **$375,000**
Cambridge, Massachusetts 02138

The Foundation has supported two fellowship programs for journalists: one in economics at Princeton and another in science and technology at MIT. Both provided valuable educational experiences for the journalist participants and we believe have led to some improvement of reporting in these fields. This grant will support the establishment at the Harvard School of Public Health, through its Center for Health Communication, of a fellowship program in public health for

mid-career journalists from the print and broadcast media. The proposed program will provide both structured and self-directed study, as well as collaborative research opportunities, on topics revolving around the interactions among science, public health, and the media. (Project director: Jay A. Winsten, Director, Center for Health Communication, Harvard School of Public Health; Grant period: February 1987-June 1990.)

Harvard University **$92,000**
Cambridge, Massachusetts 02138

The distinguished historian of science I. B. Cohen intends to explore the origin and process by which ideas and methods originating in one field are often transformed and adapted for use in other disciplines. He is particularly interested in analyzing such transformations, in both directions, between the natural and social sciences. This grant will support the completion of his research and the writing of a book on the subject. (Project director: I. Bernard Cohen, Professor of History of Science; Grant period: October 1987-June 1989.)

Institute of International Education **$100,000**
809 United Nations Plaza
New York, New York 10017

Doctoral study in engineering attracts a high percentage of foreigners, but appears to be a good deal less attractive to U.S. baccalaureate degree holders. An understanding of this phenomenon could help inform the development of new engineering education policy. In this project, two populations—senior and graduate students in engineering schools—will be surveyed and information gathered on such factors as educational and family background, career aspirations, perceptions of the engineering profession, job opportunities, and salary expectations. (Project director: Elinor Barber, Director of Research; Grant period: October 1987-September 1990.)

Rockefeller University **$45,000**
New York, New York 10021

Abraham Pais is a distinguished physicist, historian of science, and author. With this grant he proposes to write a book—part biography, part history, and part interpretation of how physics as a science has evolved—concerned with the development of twentieth century physics and intended for the general reader. The key role of Niels Bohr will be taken as an organizing device. Pais was Bohr's assistant and became a friend of the Bohr family. He plans to examine a variety of

themes, including scientific progress, the founding of scientific institutes, fund raising, the impact of physics on biology, the atomic nucleus and big weapons, and the role of scientists in the political sphere. (Project director: Abraham Pais, Professor; Grant period: June 1987-June 1990.)

Smithsonian Institution **$311,000**
Washington, D.C. 20560

A 1986 Trustee grant supplied start-up support for the Smithsonian in a major undertaking to employ video-history as an important component in its continuing efforts to document the character of science and technology and their impact on our times. Work has gone forward on early X-ray astronomy; the history of the Manhattan Project at facilities in Hanford, Washington and Oak Ridge, Tennessee; the development of the mini- and microcomputer industry; and the origins of the Rand Corporation and its contribution to space reconnaissance. All of these undertakings have involved a combination of ongoing historical research, oral history interviews, and individual and group discussions recorded on videotape. With this follow-up grant, work will continue on some of these projects and will be started on such new subjects as the conservation of endangered species, the Hubble space telescope and new telescope technology, robotics, small arms development, and the twenty-fifth anniversary of the Mariner 2. (Project director: David H. DeVorkin, National Air and Space Museum; Grant period: October 1987-October 1988.)

Officer Grants in Science and Society

Acadia Institute **$25,000**
118 West Street
Bar Harbor, Maine 04609

Support for an oral history of the Jackson Laboratory and its role in the development of modern genetics. (Project director: Susan Mehrtens, Associate Director; Grant period: February 1987-January 1989.)

American Academy of Arts and Sciences **$20,000**
Norton's Woods, 136 Irving Street
Cambridge, Massachusetts 02138

For a study entitled "An Illusion of Certainty: The Politics of Radiation Hazards in America, 1928-1970." (Project director: Gilbert Whittemore; Grant period: September 1987-September 1988.)

Brookings Institution **$25,000**
1775 Massachusetts Avenue, NW
Washington, D.C. 20036

For a conference on the policy implications of the 1986 Surgeon General's report on the health consequences of "involuntary smoking." (Project director: Thomas C. Schelling, Professor of Political Economy, John F. Kennedy School of Government, Harvard University; Grant period: January 1987-January 1988.)

Columbia University **$28,000**
New York, New York 10027

Partial support of *Social Science Quotations: Who Said What, When and Where.* (Project director: Robert K. Merton, Professor Emeritus of Sociology, and David L. Sills, Executive Associate, Social Science Research Council; Grant period: June 1987-December 1988.)

Laser Institute of America **$30,000**
5151 Monroe Street
Toledo, Ohio 43623

Support to write a book titled *The Laser in America.* (Project director: Lisa Bromberg, Director, The Laser History Project; Grant period: January 1988-December 1988.)

Marine Biological Laboratory **$6,000**
Woods Hole, Massachusetts 02543

Support for a mini-fellowship program for science writers. (Project director: James Shreeve, Director, Science Writing Fellowship Program; Grant period: February 1987-December 1987.)

Massachusetts Institute of Technology **$20,000**
Cambridge, Massachusetts 02139

Partial support of an experimental course on political and societal change and the development of national security policy objectives and strategies. (Project director: Eugene B. Skolnikoff, Director, Center for International Studies; Grant period: January 1987-August 1987.)

National Academy of Sciences **$15,000**
2101 Constitution Avenue, NW
Washington, D.C. 20418

For a symposium on the Role of Science and Technology in Development. (Project director: Victor Rabinowitch, Director, Office of International Affairs; Grant period: March 1987-December 1987.)

Scientists' Institute for Public Information **$28,900**
355 Lexington Avenue
New York, New York 10017

For a meeting of television executives and scientists to discuss how to improve and increase the coverage of science on commercial television. (Project director: Diane Jukofsky, Director of Media Programs; Grant period: August 1987-May 1988.)

Science, Technology, and Mathematics

Foundation support of research in science and mathematics continued this year in the cognitive science and fellowship programs. Some research in engineering, especially as it relates to the development of courses and teaching materials on various technological topics suitable for undergraduates, is funded within the particular program in the new liberal arts. As in past years, many projects involving public policy or public understanding of science and technology received our support. These programs and projects have been described elsewhere in this report.

In this section we bring together a number of grants supporting research in molecular studies of evolution and population sciences. As is to be expected, there are both trustee and officer grants that do not fit under these headings, yet also support various projects in science, technology, or mathematics. These are also listed and described here.

Molecular Studies of Evolution

Powerful techniques of molecular biology are making it possible to study the evolutionary history encoded in the genetic complement of living species. Research in evolution need no longer rely solely upon the incomplete fossil record and the often hard-to-interpret evidence from morphological comparisons. Each of these well-established approaches continues to have its own special strengths, but both can now be checked against wholly new scientific evidence arising from the rapidly developing methods of molecular biology.

Starting in 1985, we consulted widely with leading molecular and evolutionary biologists on an appropriate Foundation role in this area. A small number of exploratory grants were made. Described in previous annual reports, these supported various research projects, scientific conferences, and an intensive workshop designed to introduce the study of evolution into the research agendas of younger molecular biologists. During 1987, the following distinguished advisory committee was formed to assist the Foundation in all aspects of this program:

Wesley M. Brown, Associate Professor of Biology, University of Michigan

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 at Los Angeles

Philip J. Regal, Professor of Ecology, University of Minnesota

Allan C. Wilson, Professor of Biochemistry, University of California at Berkeley

The committee recommended that we start a postdoctoral fellowship program for young molecular and evolutionary biologists interested in developing the interdisciplinary skills necessary for molecular research on evolution. The new fellowship program was announced at mid-year. We received 101 applications, a number exceeding our expectations, with many of high quality. As a result, the trustees doubled the appropriation for the program. It was therefore possible to make as many as twelve two-year awards in this first round of competition. Applications were reviewed and final selections made by the advisory committee in December of 1987. (The actual grants were officially made in 1988. But as the culmination of a new initiative mainly carried out in 1987, they are included here for the record.) Each grant includes $25,000 per year in support of stipend and benefits for the postdoctoral fellow, $10,000 per year to the host laboratory for the fellow's research expenses, and up to 15 percent in overhead.

Postdoctoral Fellowships in Molecular Studies of Evolution **$966,000**

Awards are listed as follows: name and current affiliation of the fellow; name, department, and institution of the senior scientist in whose laboratory the postdoctoral research will be carried out.

Chris T. Amemiya, Showa University Research Institute; Professor G. W. Litman, Department of Molecular Genetics, Showa University Research Institute

Eldredge Bermingham, NOAA National Marine Fisheries Service; Professor C. F. Aquadro, Department of Genetics and Development, Cornell University

Teresa J. Crease, University of Illinois at Urbana-Champaign; Professor Michael Lynch, Department of Ecology, Ethology and Evolution, University of Illinois at Urbana-Champaign

H. Lisle Gibbs, University of Michigan; Professor B. N. White, Department of Biology, Queen's University

Michael F. Hammer, Princeton University; Professor Richard C. Lewontin, Museum of Comparative Zoology Laboratories, Harvard University

Amy F. MacRae, University of Georgia; Professor M.T. Clegg, Department of Botany and Plant Sciences, University of California at Riverside

Christopher H. Martin, California Institute of Technology; Professor Martin Chalfie, Department of Biological Sciences, Columbia University

Thomas W. Quinn, Queen's University; Professor Allan C. Wilson, Department of Biochemistry, University of California at Berkeley

Noel H. Smith, University of Rochester; Professor Robert K. Selander, Department of Biology, Pennsylvania State University

James M. Turbeville, Indiana University; Professor Rudolf A. Raff, Department of Biology, Indiana University

Ward C. Wheeler, Harvard University; Professor James A. Lake, Molecular Biology Institute, University of California at Los Angeles

Alan Whittemore, Missouri Botanical Garden; Professor Barbara A. Schaal, Department of Biology, Washington University

Officer Grants in Molecular Evolution

Cold Spring Harbor Laboratory **$25,000**
Post Office Box 100
Cold Spring Harbor, New York 11724

Partial support for a symposium on "The Evolution of Catalytic Function." (Project director: James D. Watson, Director; Grant period: March 1987-August 1987.)

Queens College Foundation **$30,000**
Flushing, New York 11367

Support of a symposium titled "Evolutionary Biology at the Crossroads." (Project director: Norman L. Goldman, Dean of Mathematics and the Natural Sciences; Grant period: September 1987-August 1988.)

San Francisco State University Foundation, Inc. **$30,000**
San Francisco, California 94132

Partial support of research on molecular clocks and phylogeny reconstruction in mammals. (Project director: Charles G. Sibley, Professor of Biology, Tiburon Center for Environmental Studies; Grant period: June 1987-May 1989.)

Officer Grants in Mathematics of Molecular Biology

We have been interested in encouraging attention by mathematicians to the analytic problems now facing molecular biology. The following grants suggest two possible approaches: symposia or conferences for statisticians and applied mathematicians on the nature and interpretation of the data being accumulated by molecular biologists, and support for mathematicians and statisticians interested in spending some time at one of the few centers where research in mathematics applied to molecular biology is under way.

Santa Fe Institute **$30,000**
Santa Fe, New Mexico 87504

Support for a workshop on "Computational Approaches to Evolutionary Biology." (Project directors: Marcus W. Feldman, Director, Stanford Center for Population and Resource Studies, Stanford University and John H. Holland, Professor of Computer Science, University of Michigan; Grant period: August 1987-December 1987.)

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

Partial support for postdoctoral research in the mathematics of molecular biology by Volker Brandel. (Project director: Samuel Karlin, Professor of Mathematics; Grant period: January 1987-December 1988.)

Population Sciences

In 1985, the Foundation initiated an exploratory program in cross-disciplinary population sciences. In each of the disciplines involved—demography, ecology, economics, epidemiology, genetics, mathematics, and population biology—there is research carried out applying quantitative techniques of various

kinds to the study of populations. Believing that much could be gained from joint work with these separate scientific approaches, our support was designed to facilitate interaction and collaborative research in the population sciences among faculty members from the different disciplines. By the end of 1987, awards had been made to ten universities. Most were officer grants aimed at initiating faculty seminars and other cross-disciplinary activities. Three universities have received larger trustee grants in support of research activities. We report here on the 1987 awards: a trustee grant to the University of California at Davis and officer grants to Johns Hopkins and Minnesota. Prior trustee grants (to Stanford and the University of California at Berkeley) and officer grants (to Duke, Michigan, Pennsylvania, Princeton and Texas) have been described in annual reports for 1985 and 1986. Other projects involving various activities in the population sciences are also described in this section.

Trustee Grants in Population Sciences

Committee for Economic Development **$150,000**
1700 K Street, NW
Washington, D.C. 20006

This grant will support a multi-year assessment of the economic, political, and social policy implications of demographic change in the United States. The goals of this project are to identify and analyze demographic trends and patterns, to offer a synthesis and assessment of forecasts of demographic change for the next century, and to develop specific policy recommendations for both public and private sectors aimed at dealing with such demographic change. (Project directors: R. Scott Fosler, Vice President, CED and Jack A. Meyer, President, New Directions for Policy; Grant period: July 1987-December 1987.)

University of California, Davis **$207,000**
Davis, California 95616

One of six universities provided seed grants in 1985 aimed at stimulating cross-disciplinary activities in the population sciences, UC Davis has now developed a set of research projects involving ten faculty members from the departments of mathematics, zoology, animal science, entomology, agronomy, range science, wildlife and fisheries biology, environmental studies, and anthropology. Research topics range from theoretical efforts focused upon population models incorporating age, size, spatial and genetic structure, to empirical studies of age structure in annual plants. Each project will involve two faculty members from

different departments working with a research assistant. Not only should this encourage collaboration in the research design and in the development and reporting of results, but the research student should also benefit from the cross-disciplinary supervision. Monthly research seminars will be held for all project participants. (Project director: Peter J. Richerson, Professor of Environmental Studies; Grant period: March 1987-February 1989.)

Officer Grants in Population Sciences

Johns Hopkins University **$25,000**
Baltimore, Maryland 21218

For support of cross-disciplinary activities in the population sciences. (Project director: Young J. Kim, Associate Professor of Population Dynamics; Grant period: January 1987-June 1988.)

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

Support for an inter-university faculty seminar on international migration. (Project director: Myron Weiner, Professor of Political Science and Director of the Center for International Studies; Grant period: February 1988-January 1990.)

Population Reference Bureau **$27,000**
777 14th Street, NW
Washington, D.C. 20005

Support for the preparation of a report on "The New World Labor Market." (Project director: Thomas W. Merrick, President; Grant period: October 1987-September 1988.)

University of Minnesota **$25,000**
Minneapolis, Minnesota 55455

For support of cross-disciplinary population research. (Project director: James W. Vaupel, Professor of Public Affairs and Planning, Humphrey Institute of Public Affairs; Grant period: July 1987-June 1988.)

Other Trustee Grants in Science, Technology, and Mathematics

American Academy of Arts and Sciences **$300,000**
Norton's Woods, 136 Irving Street
Cambridge, Massachusetts 02138

This grant supports research in the Biosphere Project and the Population Program at the International Institute for Applied Systems Analysis (IIASA), located in Laxenburg, Austria. Throughout most of history, interactions between human development and the environment have been relatively simple and local affairs. But the complexity and scale of these interactions are now vastly greater, often involving many nations, impacts on many generations, and complex linkages between economic and environmental factors. IIASA's Biosphere Project contributes research findings necessary for us to learn how long-term, large-scale interactions between the environment and development can be better managed. Our grant will continue Foundation support for this work. Also supported with this grant will be research on world-wide population aging conducted as part of IIASA's Population Program. To evaluate policies advocating a shift of the burden of support of the aged away from the state and back to the family, it is important to have good projections of the make-up of families in the future. The proposed research will generate projections for a range of countries, taking into account changing patterns of fertility, marriage, divorce, cohabitation, life expectancy, and other demographic characteristics. (Project directors: Allen M. Solomon, Leader, Biosphere Project and Douglas Wolf, Assistant Program Leader, Population Program; Grant period: October 1987-October 1989.)

American Society for Engineering Education **$75,000**
11 Dupont Circle
Washington, D.C. 20036

How to keep science and engineering faculties up-to-date in their fields is an important national problem. Louis Smullin and William Siebert, professors of electrical engineering and computer science at MIT, where there is experience with teaching continuing education faculty workshops, have enlisted the ASEE to initiate a larger nationwide faculty training program. This grant partially supported intensive two-week courses on a variety of special technical topics, held at five centers during the summer of 1987. Success of this pilot program, it is hoped, will lead to greater support from government and industry, as well as from engineering schools themselves, for an enlarged faculty continuing education program in future years. (Project director: F. Karl Willenbrock, Executive Director; Grant period: May 1987-April 1988.)

Institute for Advanced Study $90,000
Princeton, New Jersey 08540

The School of Mathematics at the Institute each year selects at least one topic suitable for special attention. Mathematicians are then brought together for extended periods, usually at least a quarter or semester, to develop and carry out a program of research in the selected topic. For 1987-88, the Institute planned a special program devoted to string theory, a topic of very substantial current interest to both mathematicians and theoretical physicists. String theory is viewed at the present time as one of the most promising avenues to make progress on a fundamental problem in theoretical physics: the unification of gravitation with electromagnetic and nuclear forces. Our grant will help support visits to the Institute of established leaders and also of a number of younger researchers, both mathematicians and physicists, active in this field of research. (Project director: Harry Woolf, Director; Grant period: August 1987-July 1988.)

National Academy of Sciences $170,000
2101 Constitution Avenue
Washington, D.C. 20418

This joint project of the National Research Council's Mathematical Sciences Education Board and Commission of Physical Sciences, Mathematics, and Resources, in cooperation with the Mathematical Association of America, includes a number of activities, all focusing on reform of the content and teaching of calculus in the nation's colleges and universities. A major national conference on calculus reform, held in October at the National Academy, and associated publications and meetings were supported by this grant. (Project directors: Raphael G. Kasper, Executive Director, Commission on Physical Sciences, Mathematics, and Resources, and Marcia P. Sward, Executive Director, Mathematical Sciences Education Board; Grant period: July 1987-March 1988.)

Officer Grants in Science, Technology, and Mathematics

American Mathematical Society $30,000
P. O. Box 6248
Providence, Rhode Island 02940

Partial support of a symposium on "The Legacy of John von Neumann." (Project director: James W. Maxwell, Associate Executive Director; Grant period: January 1988-September 1988.)

American Statistical Association $5,000
1429 Duke Street
Alexandria, Virginia 22314

Partial funding for a conference entitled "Federal Statistics on AIDS: Progress, Problems, Prognosis." (Project director: Katherine Wallman, Executive Director of the Council of Professional Associations on Federal Statistics; Grant period: December 1987-May 1988.)

Arkansas College $25,500
Batesville, Arkansas 72501

For support of collaborative student-faculty research in biology and chemistry. (Project director: Bert E. Holmes, Professor of Chemistry; Grant period: April 1987-September 1989.)

Dartmouth College $29,000
Hanover, New Hampshire 03755

For support of a conference titled "Technology in Education: The Management and Use of Real World Information." (Project director: C. Dwight Lahr, Dean of the Faculty of Arts and Sciences; Grant period: December 1987-March 1989.)

Harvard University $30,000
Cambridge, Massachusetts 02138

To develop an interdisciplinary program in technology assessment in health and medicine. (Project director: Federick Mosteller, Professor of Health Policy and Management, School of Public Health; Grant period: July 1987-December 1987.)

Hebrew University of Jerusalem $25,000
Jerusalem, Israel

Partial funding for the Jerusalem Winter School of Theoretical Physics. (Project director: Steven Weinberg, Professor of Physics, University of Texas at Austin; Grant period: January 1987-December 1987.)

Johns Hopkins University **$18,000**
Baltimore, Maryland 21218

Support for a conference to identify statistical and mathematical assumptions and problems in attempts to model the AIDS epidemic. (Project director: Ronald Brookmeyer, Associate Professor of Biostatistics, School of Hygiene and Public Health; Grant period: July 1987-December 1987.)

Lawrence University **$21,000**
Appleton, Wisconsin 54912

For a conference on the role of lasers and modern optics in the physics curriculum of liberal arts colleges. (Project director: John R. Brandenberger, Professor of Physics; Grant period: February 1987-November 1987.)

Media Alliance **$25,000**
Building D, Fort Mason
San Francisco, California 94123

Support of a documentary film on the Stanford Linear Accelerator Center's new linear collider. (Project director: Lauren E. Dunbar, President, Harbinger Films; Grant period: May 1987-April 1988.)

Northwestern University **$30,000**
Evanston, Illinois 60201

To support development of computing applications and exercises for students in the Integrated Science Program. (Project director: G. Edward Birchfield, Professor of Geological Science; Grant period: February 1987-August 1988.)

Ohio State University **$30,000**
Columbus, Ohio 43210

Support for an international conference on game theory and its applications. (Project director: Abraham Neyman, Professor of Mathematics, State University of New York at Stony Brook; Grant period: January 1987-December 1987.)

Santa Fe Institute **$23,500**
Post Office Box 9020
Santa Fe, New Mexico 87504

Seed funding for a workshop on "The Matrix of Biological Knowledge." (Project director: Harold J. Morowitz, Professor of Molecular Biophysics and Biochemistry, Yale University; Grant period: March 1987-December 1987.)

University of California, Berkeley **$20,000**
Berkeley, California 94720

Partial support of a conference on "The Nature of Mathematical Thinking and Problem Solving." (Project director: Alan H. Schoenfeld, Associate Professor of Education and Mathematics; Grant period: January 1988-December 1989.)

Other Trustee and Officer Grants

We report here first on a new competition held in 1987 that resulted in a collection of eight trustee grants supporting research in immigration. Also included in this section are some trustee grants that do not quite fit into any specific program of the Foundation and are thus not included in previous sections of this report. Finally, a number of officer grants for miscellaneous purposes are brought together here.

Trustee Grants in Immigration

Over the past several years, the Foundation has been providing support at a moderate level for research on immigration issues, principally those involving labor force impacts. In 1987, we held a competition for research grants on the economic causes and consequences of immigration to the United States. Of particular interest were the macroeconomic effects of immigration, both in the short-to-medium-term future and over the longer term. Included were possible effects on employment and unemployment, on labor productivity, on the structure and international competitiveness of American industry, and on incentives for technological and managerial innovation. We also hoped by this competition to encourage research on the recently-adopted reforms in U.S. immigration law. These reforms may have a significant impact on the country's low-wage labor markets. There is also need for objective assessment of the effects of the legislation's "legalization" or "amnesty" provisions, under which several million currently illegal aliens are expected to gain lawful status.

A distinguished outside advisory committee of the following persons assisted the Foundation in reviewing proposals and in all other aspects of this competition:

Leon Bouvier, Visiting Professor of Biostatistics and Epidemiology, Tulane University

Daniel Hamermesh, Professor of Economics, Michigan State University

Mark Killingsworth, Professor of Economics, Rutgers University

Eight projects were recommended and grants approved by the trustees, as follows:

Center for Cultural and Technical Interchange Between East and West, Inc. — **$74,000**
1777 East-West Road
Honolulu, Hawaii 96848

This grant will support a comparative study of entrepreneurial business activities among Koreans and Filipinos, the two largest groups of Asian immigrants. The project involves re-interviews, after a period of U.S. residence, of subjects in a just-completed study based on pre-departure interviews of new immigrants from Korea and the Philippines. The goal is to assess the significance for successful immigrant entrepreneurship of their characteristics (both before and after immigration), of the society of their origin, and of the U.S. setting into which their migration occurred. (Project director: James T. Fawcett, Research Associate, East-West Population Institute; Grant period: September 1987-June 1989.)

Johns Hopkins University — **$42,500**
Baltimore, Maryland 21218

This study will assess the economic and social adaptation of recent immigrants from Cuba (the 1980 Mariel Boatlift) and from Haiti (the 1980-81 "boatpeople"). Over the past four years, Portes and his associates have collected a unique longitudinal data set on representative samples of these two populations, who were interviewed first in 1983 and again in 1985-86. With this grant, they will analyze these survey data along with other contextual data concerning economic, political and sociocultural change in Miami, in order to better understand the factors affecting such immigrant groups' adaptation to residence in the United States. (Project director: Alejandro Portes, Professor of Sociology and International Relations; Grant period: July 1987-June 1988.)

Research Foundation of the City University of New York — **$29,000**
1515 Broadway
New York, New York 10036

This project is aimed at disentangling the actual labor market assimilation of immigrants from the effects of changes in the economic "quality" of immigrants and the changing conditions of the domestic economy over time. It also seeks to distinguish assimilation due to occupational mobility from that due to enhanced earnings within occupations. The study involves the development of random coefficients models for application to the 1970 and 1980 Census data. (Project director: Randall K. Filer, Associate Professor of Economics, Hunter College; Grant period: June 1987-December 1988.)

Research Foundation of State University of New York — **$62,500**
P. O. Box 9
Albany, New York 12201

This project focuses upon economic adjustment among Southeast Asian refugees resettled in the United States. Bach has access to a nationwide longitudinal survey covering 1983 through 1986, by means of which he plans to examine the temporal dimensions of economic adjustments, including the influence of public assistance on the rate of entry into the labor market and the number of hours worked, and the comparative benefits from early training as opposed to immediate immersion in the economy. He believes that the longitudinal nature of the data will allow him to sort out issues of cause and effect that are typically confounded in existing cross-sectional studies of the economic experience of refugees. (Project director: Robert L. Bach, Associate Professor of Sociology, State University of New York at Binghamton; Grant period: August 1987-July 1989.)

University of California, Santa Barbara — **$60,000**
Santa Barbara, California 93106

The role played by the family in the labor-market success of foreign-born persons will be examined. The centrality of the familial role has been assured by the 1965 amendments to the Immigration and Nationality Act, which gave overwhelming preference in the issuance of immigrant visas to immediate family members of U.S. citizens. This grant will support analysis of the role of family reunification in the self-selection of immigrants and its effects on the earnings of immigrants. A preliminary examination of how immigrant children perform in the U.S. labor market will also be carried out. (Project director: George J. Borjas, Professor of Economics; Grant period: July 1987-June 1989.)

University of Illinois at Chicago — **$50,000**
Chicago, Illinois 60680

This project aims to analyze the determinants and consequences of naturalization on the labor market experiences of immigrants in the United States. Although naturalization has long been seen as an important aspect of immigrant adaptation, surprisingly little is known about the large differentials among national groups in naturalization rates, and about what effects these may have on their economic advancement. It is proposed to address this interconnection with cross-sectional and time-series data drawn from the Censuses of Population from 1940 through 1980, and from annual data on the number of naturalizations for each year since 1907. (Project director: Barry R. Chiswick, Professor of Economics; Grant period: September 1987-September 1989.)

University of Michigan — **$67,000**
Ann Arbor, Michigan 48109

It is proposed to examine the economic effects of border control activities, one of the most important yet least studied elements of immigration policy. The research would examine the apprehension of undocumented immigrants, using migration history records drawn from a large Mexican survey of migrants conducted in 1978. The primary matters to be explored involve the dynamics of such labor migration and the extent to which apprehension acts as a deterrent to remigration. (Project directors: Sherrie A. Kossoudji, Adjunct Assistant Professor of Economics, and Susan I. Ranney, Assistant Professor of Economics, University of Washington; Grant period: June 1987-May 1989.)

University of Texas — **$61,200**
Austin, Texas 78712

This project will analyze the effects of the 1986 immigration reforms upon the hiring and employment practices of Mexican-origin entrepreneurs in Texas and California. The plan is to re-interview 908 such employers, located in six sites in Texas and California, who were interviewed before passage of the reforms. The aim is to identify any changes in their business practices and outcomes. In addition, the researchers plan to compare these data with large census-based samples of the self-employed, as a means of obtaining benchmarks regarding statistical bias and generalizability of their interview data. (Project director: Rodolfo O. de la Garza, Director, Center for Mexican American Studies; Grant period: June 1987-May 1988.)

Other Trustee Grants

Association of Governing Boards of Universities and Colleges — **$75,000**
One Dupont Circle - Suite 400
Washington, D.C. 20036

The Association of Governing Boards of Universities and Colleges is a nonprofit educational organization of governing, coordinating, and advisory boards of postsecondary education. It seeks through informational and educational programs to strengthen the governance of American higher education. In 1986 the AGB joined with The Brookings Institution to conduct several two-day public

policy seminars for trustees and chief executive officers of higher education institutions. The seminars, partially funded with a Foundation officer grant, were quite successful and well-received, so much so that three more are now planned. They are designed to acquaint trustees and managers with the various actors in the public policy arena, the process by which these actors shape higher education, and the role trustees can play in implementing public policy in their institutions. (Project director: Robert L. Gale, President; Grant period: October 1987-October 1990.)

Center for Advanced Study in the Behavioral Sciences — **$230,000**
202 Junipero Serra Boulevard
Stanford, California 94305

For a number of years, Foundation grants have supported the Center for Advanced Study in the Behavioral Sciences, where leading scholars can spend a sabbatical year working on their research, often in collaboration with other Center fellows. The Center provides a fertile environment for interdisciplinary scholarship. This grant will support research at the Center in such subjects as economics, statistics, decision theory, biological and behavioral aspects of evolution, and science and public policy problems. (Project director: Gardner Lindzey, Director; Grant period: October 1987-September 1989.)

Foundation Center — **$180,000**
79 Fifth Avenue
New York, New York 10003

The Foundation Center disseminates information about foundations and philanthropy to grantseekers and the public through libraries and publications. Libraries open to the public are operated in New York, Washington, Cleveland and San Francisco. Publications include *The Foundation Directory* and *Foundation Grants Index*. A computer database on foundation grants is accessible through DIALOG information services. This grant is for general support. (Project director: Thomas R. Buckman, President; Grant period: January 1988-December 1990.)

National Academy of Sciences — **$150,000**
2101 Constitution Avenue
Washington, D.C. 20418

In 1985, we provided a grant of $250,000 in partial support of the National Academy's Committee on the Status of Black Americans. The Committee's task is

to marshall, assess, and synthesize existing evidence from many different sources on the changes that have occurred in the status of black Americans over the 40-year period since World War II. As originally proposed, the NAS study was to produce reports on four topics: education; political participation; social and cultural integration; and income, employment and occupations. The Committee's work is going well, but supplemental funds are needed because of an expansion of activities beyond those originally envisaged, both in terms of the numbers of experts involved and in the scope of subjects to be examined. Two additional reports are planned on topics of significance to an assessment of the status of black Americans: health and demography; and the administration of justice. This supplementary grant will provide partial support for continued work on this important Academy project. (Project director: David A. Goslin, Executive Director, Commission on Behavioral and Social Sciences and Education; Grant period: April 1987-December 1988.)

Other Officer Grants

Citizens Network for Foreign Affairs — **$30,000**
1616 H Street, NW
Washington, D.C. 20006

For general support. (Project director: John H. Costello, Executive Vice President; Grant period: March 1987-March 1988.)

Council on Foundations, Inc. — **$24,700**
1828 L Street, NW
Washington, D.C. 20036

A membership contribution of the Sloan Foundation for 1987. (Project director: James A. Joseph, President.)

Harvard University — **$25,000**
Cambridge, Massachusetts 02138

Support for a book exploring how holding or experiencing power affects individuals. (Project director: Xandra Kayden, John F. Kennedy School of Government; Grant period: January 1987-June 1988.)

Independent Sector **$7,400**
1828 L Street, NW
Washington, D.C. 20036

A membership contribution of the Sloan Foundation for 1987. (Project director: Martin A. Paley, Treasurer.)

International Student Pugwash **$30,000**
505-B Second Street, NE
Washington, D.C. 20002

Support for the 5th Student Pugwash U.S.A. International Conference. (Project director: Patricia A. Rose, Executive Director, Student Pugwash U.S.A.; Grant period: May 1987-September 1987.)

Memorial Sloan-Kettering Cancer Center **$10,000**
1275 York Avenue
New York, New York 10021

Support of the General Motors Surgical Research Laboratory, in memory of Mr. Frederic G. Donner, former Chairman of the Board of the Sloan Foundation. (Project director: Paul A. Marks, President.)

National Charities Information Bureau **$10,000**
19 Union Square West
New York, New York 10003

For partial support of a review of the standards by which charitable organizations are evaluated. (Project director: Kenneth L. Albrecht, President; Grant period: January 1987- December 1987.)

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

A membership contribution of the Sloan Foundation for 1987. (Project director: Barbara Bryan, Executive Director.)

Princeton University **$30,000**
Princeton, New Jersey 08544

Support for research on college application patterns among high-ability students. (Project director: Richard R. Spies, Vice Provost; Grant period: August 1987-August 1988.)

Southport Institute for Policy Analysis **$20,000**
2425 Post Road
Southport, Connecticut 06490

Support for the writing of a book entitled *Federalism and the National Purpose.* (Project director: Forrest Chisman, Staff Director, Project on the Federal Social Role; Grant period: November 1987-November 1988.)

United Way of Tri-State **$3,500**
99 Park Avenue
New York, New York 10016

A civic grant made as a contribution to United Way's annual fund-raising drive. (Project director: Calvin Green, President.)

Financial Review

Financial Review

The financial statements and schedules of the Foundation, which have been audited by Ernst & Whinney, independent auditors, appear on pages 78 to 94. They include balance sheets, statements of income, expenses and changes in fund balance and of changes in financial position, and schedules of management and investment expenses, investments, and grants and appropriations.

Investment and other income for 1987 was $27,882,267, an increase of $270,835 from $27,611,432 in 1986. After the deduction of investment expenses and provision for Federal excise tax from investment and other income, net investment income was $25,162,002 in 1987 as compared with $24,713,090 for the prior year. Investment expenses during 1987 totaled $1,304,265 of which $893,340 represented investment counsel fees. Provision for Federal excise tax amounted to $1,416,000. The total of these deductions from income in 1987 was $2,720,265 versus $2,898,342 in 1986.

The total of grants and appropriations authorized, net of grant refunds, and management expenses during 1987 was $22,325,995. This sum was $2,836,007 under 1987 net investment income. Of this total, grants and appropriations authorized amounted to $20,389,457 while management expenses were $1,988,751. Since the Foundation's inception in 1934, the cumulative excess of grants and expenses over the Foundation's income has amounted to $32,702,681.

Grant and appropriation payments in 1987 were $20,758,106 compared with $18,721,037 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 1987 was $27,175,507, while in 1986 the amount was $22,952,625.

The market value of the Foundation's total assets was $482,920,715 at December 31, 1987, including investments valued at $481,991,407, as compared with total assets of $482,691,644 at December 31, 1986. A summary of the Foundation's investments at cost and market value at December 31, 1987 appears on page 83.

A listing of grants made during 1987, including grants and appropriations authorized and payments during the year, will be found on pages 90 to 94.

Report of Ernst & Whinney Independent Auditors

Board of Trustees
Alfred P. Sloan Foundation
New York, New York

We have examined the balance sheets of the Alfred P. Sloan Foundation as of December 31, 1987 and 1986 and the related statements of income, expenses and changes in fund balance and changes in financial position for the years then ended and the supplementary schedules of investments at December 31, 1987, grants and appropriations for the year then ended and management and investment expenses for the years ended December 31, 1987 and 1986. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the financial statements referred to above present fairly the financial position of the Alfred P. Sloan Foundation at December 31, 1987 and 1986, 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 applied on a consistent basis. Also, in our opinion, the supplementary schedules referred to above are fairly stated in all material respects in relation to the financial statements taken as a whole.

Ernst & Whinney

New York, New York
January 30, 1988

Balance Sheets

December 31, 1987 and 1986

	1987	1986
Assets		
Investments:		
Fixed income:		
Government and other U.S. agency	$ 96,968,861	$50,086,435
Corporate and other	140,110,894	110,217,207
	237,079,755	160,303,642
Equity:		
General Motors Corporation	37,220,358	38,759,483
Other	174,437,061	201,506,305
	211,657,419	240,265,788
Other	3,000,000	
Total investments (market value: $481,991,407 in 1987 and $482,495,299 in 1986)	451,737,174	400,569,430
Interest purchased	774,302	295,199
Other	185,316	
Cash	155,006	(98,854)
Total	$452,851,798	$400,765,775
Liabilities and Fund Balance		
Grants and appropriations unpaid	$ 21,754,154	$ 22,122,803
Federal excise tax and other liabilities	6,252	1,766,850
Fund balance	431,091,392	376,876,122
Total	$452,851,798	$400,765,775

See accompanying notes to financial statements.

Statements of Income, Expenses and Changes In Fund Balance

For the years ended December 31, 1987 and 1986

	1987	1986
Investment Income:		
Dividends	$ 10,886,242	$ 12,650,219
Interest	16,991,031	14,953,211
Other	4,994	8,002
	27,882,267	27,611,432
Less:		
Investment expenses	1,304,265	1,228,342
Provision for Federal excise tax	1,416,000	1,670,000
	2,720,265	2,898,342
Net investment income	25,162,002	24,713,090
Grants and management expenses:		
Grants and appropriations authorized (net of grant refunds of $52,213 in 1987 and $108,313 in 1986)	20,337,244	20,803,687
Management expenses	1,988,751	2,076,158
Total	22,325,995	22,879,845
Grants and expenses less than income for the year	2,836,007	1,833,245
Net gain on disposals of securities	51,379,263	59,156,612
Net change in fund balance for year	54,215,270	60,989,857
Fund balance January 1	376,876,122	315,886,265
Fund balance at end of year	$431,091,392	$376,876,122

See accompanying notes to financial statements.

Statements of Changes in Financial Position

For the years ended December 31, 1987 and 1986

	1987	1986
SOURCE OF FUNDS:		
Investment income	$ 27,882,267	$ 27,611,432
Net gain on disposals of securities	51,379,263	59,156,612
Other		96,628
	79,261,530	86,864,672
APPLICATION OF FUNDS:		
Grant and appropriation payments (net of grant refunds of $52,213 in 1987 and $108,313 in 1986)	20,705,893	18,612,726
Management expenses	1,988,751	2,076,158
Investment expenses	1,304,265	1,228,342
Federal excise taxes, net	3,086,222	1,035,399
Other	90,376	
	27,175,507	22,952,625
INCREASE (DECREASE) IN FUNDS CONSISTING OF:		
Cost of investments	51,167,744	63,945,743
Interest purchased	479,103	93,246
Cash balances	253,860	(126,942)
Other	185,316	
Net increase	$ 52,086,023	$ 63,912,047

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.

Investments purchased are carried at cost; for those received by gift or bequest, cost is market value at date of gift or bequest. Gain or loss on disposal of investments is determined generally on the basis of first-in, first-out cost, but in certain instances the identified lot basis is used. Net gain or loss on disposals is applied to the principal section of the fund balance.

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

2. 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 purchase of annuities for employees. Retirement plan expense was $137,397 and $158,464 for 1987 and 1986, respectively.

3. LEASE

The Foundation's lease for its office space expires April 30, 1993. 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 was $534,340 in 1987 and $525,369 in 1986.

4. FUND BALANCE

Fund balance, at year end, is comprised of the following:

	1987	1986
Principal	$463,794,073	$412,414,809
Income—cumulative excess of grants and expenses over income from inception of the Foundation	(32,702,681)	(35,538,687)
Fund balance	$431,091,392	$376,876,122

Schedules of Management and Investment Expenses

For the years ended December 31, 1987 and 1986

	1987	1986
MANAGEMENT EXPENSES		
Salaries and employee benefits:		
Salaries	$ 1,013,366	$ 1,026,144
Employees' retirement plan and other benefits	330,963	344,070
Total	1,344,329	1,370,214
Rent	534,340	525,369
Program expenses	261,614	279,566
Office expenses and services	191,711	237,598
Reports and publications	21,808	26,545
Professional fees	45,874	46,886
Total management expenses	2,399,676	2,486,178
Less management expenses applicable to investments	410,925	410,020
Management expenses applicable to grant making	$ 1,988,751	$ 2,076,158
INVESTMENT EXPENSES		
Investment counsel fees	$ 893,340	$818,322
Management expenses applicable to investments	410,925	410,020
Total investment expenses	$ 1,304,265	$ 1,228,342

Schedule of Investments

December 31, 1987

SUMMARY	Cost	Market Amount	Market Percent of Total Investment
Fixed income:			
Government and U.S. Agency	$ 96,968,861	$ 95,190,629	19.7%
Corporate and others	140,110,894	141,516,564	29.4
Total fixed income	237,079,755	236,707,193	49.1
Equity:			
General Motors Corporation	37,220,358	54,010,000	11.2
Other	174,437,061	188,073,561	39.0
Total equity	211,657,419	242,083,561	50.2
Other	3,000,000	3,200,653	0.7
Total investments	$451,737,174	$481,991,407	100.0%

FIXED INCOME			Principal	Cost	Market
Government and U.S. Agency obligations:					
U.S. Treasury Notes:					
8 3/8%	11/15/92		$ 21,250,000	$ 21,147,305	$ 21,216,850
8%	7/15/94		6,420,000	6,155,175	6,211,350
7 3/8%	5/15/96		3,000,000	3,021,563	2,730,930
7 1/4%	11/15/96		15,200,000	13,665,750	13,670,424
8 1/2%	5/15/97		9,825,000	9,671,484	9,564,048
8 7/8%	11/15/97		25,800,000	25,785,644	25,815,996
Federal Housing Administration Mortgage Pools:					
7.43%	9/1/2002		9,845,852	8,947,418	8,042,781
7.43%	11/1/2002		9,695,573	8,574,522	7,938,250
Total Government and U.S. Agency obligations				96,968,861	95,190,629
Corporate and other:					
Short term:					
Interest bearing call accounts			71,588	71,588	78,998
Interest bearing demand notes:					
Cadbury Schweppes, Inc.			4,436,000	4,436,000	4,436,000
General Electric Company			6,285,000	6,285,000	6,285,000
General Motors Acceptance Corp.			41,602,000	41,602,000	41,602,000
Nordstrom Credit, Inc.			3,414,000	3,414,000	3,414,000
Pitney Bowes Credit Corp.			3,917,000	3,917,000	3,917,000
Time deposits:					
Commerzbank, AG					
8.44%	1/4/88	(Sterling)	2,856,938	5,327,618	5,391,042

Schedule of Investments

December 31, 1987
(continued)

FIXED INCOME		Principal	Cost	Market
Corporate and other (continued):				
Short term (continued):				
Time deposits (continued):				
Fujibank, Ltd.				
4.88% 1/4/88	(Yen)	2,896,617,658	$ 22,848,493	$ 23,948,885
Total short term			87,901,699	89,072,925
Long term:				
Atlantic Richfield Co.				
9 7/8% Debentures 3/1/2016		$ 5,000,000	4,993,750	4,986,950
Chesapeake & Ohio Railway Co.				
8 1/2% Conditional Sale Agreement 1/1/89		176,961	142,638	177,625
Citicorp				
10 7/8% Notes 6/15/2010		3,800,000	4,186,726	3,844,270
Citicorp Person to Person, Inc.				
12 1/2% Subordinated Capital Notes 1/15/96		3,000,000	3,322,500	3,229,920
City Developments, Ltd.				
5 1/2% Bonds 8/1/94	(Singapore $)	250,000	117,490	94,056
Connecticut General Life Insurance Co.				
10 1/4% Funding Agreement 11/12/88		7,000,000	7,000,000	7,166,250
Cooper Industries, Inc.				
7 7/8% Notes 12/23/93		5,000,000	5,000,000	4,650,000
Delta Airlines, Inc.				
10.45% Lease Obligation 7/2/2007		2,939,993	2,939,993	2,973,068
Dresdner Bank, AG				
6 1/2% Bonds 3/18/96 (ex warrants)	(Deutschmarks)	51,000	24,502	32,311
E. I. duPont de Nemours and Co.				
14% Notes 12/1/91		3,000,000	2,915,000	3,153,570
Federal Express Corp.				
10 3/4% Lease Obligation 5/1/2009		2,000,000	2,000,000	2,065,000
Ford Motor Credit Co.				
12.20% Notes 3/28/90		3,000,000	3,000,000	3,170,070
General Motors Acceptance Corp.				
8 3/8% Notes 5/1/97		3,000,000	2,977,770	2,931,330
Mellon Bank, NA				
11.60% Certificate of Deposit 1/13/89		1,600,000	1,592,000	1,659,280
NCNB Corp.				
14 1/2% Notes 9/1/92		3,000,000	3,007,500	3,258,000

Schedule of Investments

December 31, 1987
(continued)

FIXED INCOME		Principal	Cost	Market
Corporate and other (continued):				
Long term (continued):				
Puget Sound Power and Light Co.				
8 1/4% First Mortgage Bonds 4/1/96		$ 3,000,000	$ 2,981,250	$ 2,756,430
Standard Oil Co. (Ohio)				
13 5/8% Notes 9/15/92		3,000,000	2,981,250	3,236,520
Woolworth, PLC				
8 1/2% Convertible Unsecured Loan 10/31/2000	(Sterling)	20,400	26,826	47,349
Xerox Corp.				
10 1/2% Notes 3/1/88		3,000,000	3,000,000	3,011,640
Total long term			52,209,195	52,443,639
Total corporate and other			140,110,894	141,516,564
Total fixed income securities			$237,079,755	$236,707,193

Schedule of Investments

December 31, 1987
(continued)

EQUITY	Number of Shares	Cost	Market
United States:			
Arco Chemical Co.	80,000	$ 2,441,762	$ 2,380,000
Aristech Chemical Corp.	75,000	1,974,349	2,034,375
Ashton Tate	65,000	1,608,000	1,576,250
Avantek, Inc.	58,800	1,070,150	455,700
Avnet, Inc.	95,000	3,032,750	2,256,250
Bankers Trust New York Corp.	29,400	1,237,152	933,450
Beecham Group, PLC	100,000	1,754,875	1,637,500
Beverly Enterprises	205,800	3,808,332	1,440,600
Bowater, Inc.	77,000	2,782,903	2,271,500
Bristol-Myers Co.	55,000	2,642,934	2,289,375
Burlington Northern, Inc.	29,200	2,068,236	1,832,300
CNA Financial Corp.	29,400	1,469,516	1,635,375
CSX Corp.	100,000	2,843,026	2,912,500
Capital Cities/ABC, Inc.	23,520	5,632,519	8,114,400
Chase Manhattan Corp.	114,600	2,502,369	2,535,525
Citicorp	173,000	4,701,277	4,265,126
Coastal Corp.	80,000	2,443,410	2,080,000
Coca-Cola Co.	46,100	2,120,632	1,757,563
Commonwealth Edison Co.	72,900	2,282,133	2,004,750
Community Psychiatric Centers	141,000	2,827,918	3,613,125
Cyprus Semiconductor Corp.	80,000	981,823	930,000
Deere & Co.	87,600	2,644,449	3,044,100
Dresser Industries, Inc.	80,000	1,881,520	2,100,000
Eastman Kodak Co.	40,000	2,590,375	1,960,000
Endowment and Foundation Realty, Ltd.—JMB III	3,750	3,750,000	3,795,605
Falconbridge, Ltd.	65,000	1,050,389	1,186,250
Figgie International, Inc.	29,400	1,429,524	1,572,900
First Chicago Corp.	100,000	2,764,180	1,887,500
Freemont General Corp.	100,000	1,974,363	962,500
GTE Corp.	100,000	3,752,830	3,537,500
General Electric Co.	58,800	1,487,040	2,594,550
General Motors Corp.	880,000	37,220,358	54,010,000
General Re Corp.	70,000	3,722,333	3,911,250
Home Federal Savings & Loan Association	58,800	1,695,204	1,220,100
IMS International, Inc.	45,000	1,097,175	1,344,375
Imperial Chemical Industries, PLC	29,400	1,183,660	2,410,800
Interco, Inc.	47,700	1,946,246	1,538,325
International Business Machines Corp.	108,000	8,360,295	12,474,000

Schedule of Investments

December 31, 1987
(continued)

EQUITY	Number of Shares	Cost	Market
United States (continued):			
International Minerals & Chemical Corp.	88,200	$ 2,638,855	$ 4,189,500
International Paper Co.	58,800	1,688,793	2,484,300
Johnson Controls, Inc.	88,200	2,543,740	2,260,125
Johnson & Johnson	30,000	2,671,184	2,246,250
Litton Industries, Inc.	30,700	2,774,379	2,214,238
Long Island Lighting Co.	200,000	2,169,110	1,425,000
Mapco, Inc.	93,500	3,416,545	4,511,375
Marriott Corp.	56,000	2,119,430	1,680,000
May Department Stores Co.	85,000	3,680,550	2,475,625
Middle South Utilities, Inc.	400,000	5,372,011	3,300,000
Morgan (J.P.) & Company, Inc.	260,100	1,245,401	9,428,625
Multimedia, Inc.	20,000	944,400	1,070,000
Norsk Hydro, A.S., ADS	37,500	796,442	881,250
Northern Indiana Public Service Co.	300,000	3,429,079	2,550,000
Occidental Petroleum Corp.	147,600	4,625,304	3,597,750
Philip Morris Companies, Inc.	93,800	4,610,075	8,008,175
Ralston Purina Co.	58,100	3,014,017	3,711,138
Ryans Family Steak Houses, Inc.	50,000	122,452	362,500
Schlumberger, Ltd.	55,675	743,457	1,600,656
Shell Transport and Trading Company, PLC	88,200	3,305,497	6,681,150
Student Loan Marketing Association	40,000	2,696,414	2,820,000
Texaco, Inc.	130,000	4,353,113	4,842,500
Texas Instruments, Inc.	25,100	1,536,245	1,399,325
Trinova Corp.	30,000	774,900	956,250
Upjohn Co.	55,000	1,840,190	1,650,000
U.S. West, Inc.	55,000	1,758,708	2,811,875
Australia and New Zealand:			
Fletcher Challenge, Ltd.	84,739	239,132	241,400
I.C.I. Australia, Ltd.	33,366	63,739	108,482
News Corp.	10,000	114,277	84,532
Pacific Dunlop, Ltd	7,241	4,061	19,252
Pioneer Concrete Services, Ltd.	90,000	181,072	157,866
Canada:			
Abitibi-Price, Inc.	12,639	278,754	262,402
Asamera, Inc.	40,000	391,655	264,870
Bow Valley Industries, LTD.	30,000	322,985	341,083
CDC Life Sciences, Inc.	16,000	207,520	258,000

Schedule of Investments

December 31, 1987
(continued)

EQUITY	Number of Shares	Cost	Market
Canada (continued):			
Canadian Pacific, Ltd.	20,000	$ 333,309	$ 317,186
Cognos, Inc.	30,600	494,600	141,525
GW Utilities, Ltd.	9,000	131,179	162,630
Gulf Canada Resources, Ltd.	29,999	449,829	366,193
Hemlo Gold Mines, Inc.	10,000	158,550	149,942
Lonvest Corp. (warrants)	4,000	8,970	830
Metal Mining, Ltd.	32,000	286,943	276,817
Norcen Energy Resources, Ltd.	25,000	339,534	353,230
Numac Oil and Gas, Ltd.	25,000	208,223	177,816
Poco Petroleums, Ltd.	20,000	190,520	161,476
Royal Bank of Canada	18,000	441,855	391,003
Toronto Dominion Bank	40,000	718,106	861,207
Federal Republic of Germany:			
BASF Overzee, AG (warrants)	1,400	109,321	96,275
Bayer, AG	2,114	316,864	356,708
Bayerische Motoren Werke, AG	900	306,119	260,745
Dresdner Bank (warrants)	255	7,319	8,150
Hoechst, AG (warrants)	2,000	171,178	160,458
Mannesmann, AG	2,000	186,850	132,442
Mercedes-Automobile Holding, AG	820	387,590	229,475
Nixdorf Computer, AG, Preferred	600	170,085	213,754
Schering, AG	1,000	316,459	222,859
Siemens Western Finance, NV (warrants)	800	186,890	85,578
France and Netherlands:			
Akzo, NV	8,000	609,751	389,868
Buehrmann-Tetterode, NV	9,000	194,207	220,065
Elsevier Ndu, NV	12,000	316,150	285,270
Immeubles de la Plaine Monceau	76	2,566	4,843
KLM	14,000	345,439	220,500
Philips Gloeilampenfabrieken, NV	14,000	319,005	211,575
Wessanen, NV	20,000	870,168	628,272
Hong Kong, Japan and Singapore:			
City Developments, Ltd. (warrants)	250,000	797	26,963
Dairy Farm International Holdings, Ltd.	380,000	149,288	199,742
Fuji Machine Manufacturing, Ltd.	30,000	124,634	255,477
Fujitsu, Ltd.	30,000	293,101	275,320
Hong Kong and Shanghai Banking Corp.	251,093	221,522	234,818

Schedule of Investments

December 31, 1987
(continued)

EQUITY	Number of Shares	Cost	Market
Hong Kong, Japan and Singapore (continued):			
Jardine Matheson and Co.	76	$ 94	$ 101
Jardine Strategic Holding, Ltd.	70,680	91,805	67,466
Mitsubishi Electric Corp.	50,000	238,759	208,764
Singapore Press Holdings, Ltd.	60,000	279,759	200,150
Sumitomo Corp.	5,000	13,522	36,668
Swire Pacific, Ltd.	165	164	326
Norway and Switzerland:			
BBC, AG, Brown, Boveri and Cie	276	397,460	358,380
Hoffman-La Roche, AG	3	575,810	417,454
Nestle, AG (warrants)	850	418,401	294,025
Norsk Data, ADR	12,000	470,875	144,000
Norsk Hydro, A.S.	24,000	803,652	540,818
United Kingdom:			
Booker McConnell, PLC	45,000	263,871	326,923
Britoil, PLC	120,000	347,793	989,543
Cable and Wireless, PLC	32,000	140,495	199,871
Hanson Trust, PLC	80,000	154,298	192,474
Lex Service, PLC	40,000	212,031	218,892
News International, PLC	20,000	170,777	92,463
Scapa Group, PLC	30,000	162,738	117,183
U.E.I., PLC	30,000	98,701	198,135
Total equity		211,657,419	242,083,561
OTHER			
CIGNA Real Estate Fund "T" Limited Partnership		3,000,000	3,200,653
Total fixed income		237,079,755	236,707,193
Total investments		$ 451,737,174	$ 481,991,407

1987
Schedule of Grants and Appropriations

	Unpaid Dec. 31. 1986	1987 Authorized	1987 Payments	Unpaid Dec. 31, 1987
Acadia Institute	—	$ 25,000	$ 25,000	—
Alabama, University of	$ 300,000	—	200,000	$ 100,000
Albany State College	—	75,000	25,000	50,000
American Academy of Arts and Sciences	—	370,000	95,000	275,000
American Association for the Advancement of Science	—	155,000	—	155,000
American Committee on U.S.-Soviet Relations	—	100,000	—	100,000
American Council of Learned Societies	60,000	—	30,000	30,000
American Economic Association	175,000	—	100,000	75,000
American Mathematical Society	—	30,000	30,000	—
American Psychological Association	50,000	—	10,000	40,000
American Society for Engineering Education	—	75,000	75,000	—
American Statistical Association	—	5,000	5,000	—
Amherst College	50,000	25,000	62,500	12,500
Arizona, University of	25,000	148,082	110,082	63,000
Arkansas College	—	25,500	25,500	
Arms Control Association	—	50,000	25,000	25,000
Association of Governing Boards of Universities and Colleges	—	75,000	—	75,000
Bennett College	—	75,000	25,000	50,000
Boston University	12,500	75,000	50,000	37,500
Brandeis University	50,000	11,975	11,975	50,000
Brookings Institution	285,000	41,500	276,500	50,000
Brown University	12,500	219,316	128,316	103,500
Bryn Mawr College	—	150,000	—	150,000
Bucknell University	35,000	—	35,000	—
Calgary, University of	12,500	25,000	25,000	12,500
California, University of	1,630,000	1,150,855	1,763,855	1,017,000
California Institute of Technology	93,500	391,500	237,000	248,000
Carleton College	175,000	—	75,000	100,000
Carnegie Institution of Washington	—	25,000	12,500	12,500
Carnegie-Mellon University	290,000	135,000	335,000	90,000
Case Western Reserve University	12,500	—	12,500	—
Catticus Corporation	—	25,000	25,000	—
Center for Advanced Study in the Behavioral Sciences	100,000	230,000	50,000	280,000
Center for Cultural and Technical Interchange Between East and West, Inc.	—	74,000	50,000	24,000

1987
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31. 1986	1987 Authorized	1987 Payments	Unpaid Dec. 31, 1987
Center for Strategic and International Studies	—	$ 22,500	$ 22,500	—
Center on Budget and Policy Priorities	—	28,000	28,000	—
Centre College	—	30,000	30,000	—
Chicago, University of	$ 475,000	307,200	427,200	$ 355,000
Citizens Network for Foreign Affairs	—	30,000	30,000	—
Claremont University Center	225,000	—	125,000	100,000
Cognitive Neuroscience Institute	125,000	(125,000)	—	—
Colby College	25,000	150,000	25,000	150,000
Cold Spring Harbor Laboratory	142,000	25,000	78,500	88,500
Colgate University	50,000	150,000	50,000	150,000
Colorado, University of	12,500	218,000	123,000	107,500
Colorado State University	12,500	25,000	25,000	12,500
Columbia University	185,000	190,630	325,630	50,000
Committee for Economic Development	—	150,000	150,000	—
Connecticut, University of	—	25,000	12,500	12,500
Cornell University	37,500	263,200	75,700	225,000
Cornell University Medical College	—	125,000	125,000	—
Council on Foreign Relations	30,000	—	30,000	—
Council on Foundations, Inc.	—	24,700	24,700	—
Dartmouth College	—	29,000	29,000	—
Davidson College	125,000	—	75,000	50,000
Denison University	25,000	—	25,000	—
Dillard University	—	75,000	25,000	50,000
Duke University	955,500	1,876,000	1,748,500	1,083,000
Emory University	—	25,000	12,500	12,500
Exploratorium	200,000	—	100,000	100,000
Florida State University	—	25,000	12,500	12,500
Foundation Center	—	180,000	—	180,000
Foundation for Research in Economics and Education	—	110,000	55,000	55,000
Franklin and Marshall College	50,000	—	—	50,000
Fund for the City of New York	90,000	—	30,000	60,000
GMI Engineering and Management Institute	62,500	—	62,500	—
George Mason University	—	30,000	30,000	—
Georgetown University	—	94,000	—	94,000
Georgia, University of	12,500	—	12,500	—
Grinnell College	175,000	—	50,000	125,000
Harvard University	363,000	1,787,385	936,885	1,213,500
Harvey Mudd College	25,000	—	25,000	—

1987
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1986	1987 Authorized	1987 Payments	Unpaid Dec. 31, 1987
Hawaii, University of	$ 40,000	$ 25,000	$ 52,500	$ 12,500
Hebrew University of Jerusalem	—	25,000	25,000	—
Houston, University of	—	75,000	—	75,000
Illinois, University of	50,000	125,000	87,500	87,500
Independent Sector	—	7,400	7,400	—
Indiana University Foundation	12,500	40,800	40,800	12,500
Institute for Advanced Study	12,500	90,000	102,500	—
Institute for International Economics	200,000	—	100,000	100,000
Institute of International Education	—	100,000	—	100,000
Institute for Research on Public Policy	—	110,000	65,000	45,000
International Association for Research in Income and Wealth	—	66,000	—	66,000
International Student Pugwash	—	30,000	30,000	—
Iona College	—	75,000	37,500	37,500
Johns Hopkins University	210,500	160,500	185,500	185,500
Lafayette College	200,000	—	100,000	100,000
Laser Institute of America	—	30,000	30,000	—
Lawrence University	—	21,000	21,000	—
Marine Biological Laboratory	40,000	6,000	26,000	20,000
Maryland, University of	59,500	99,205	111,705	47,000
Massachusetts, University of	25,000	—	25,000	—
Massachusetts Institute of Technology	1,686,000	1,485,728	2,250,228	921,500
McMaster University	—	25,000	12,500	12,500
Media Alliance	—	25,000	25,000	—
Medical and Health Research Association of New York City, Inc.	150,000	—	100,000	50,000
Memorial Sloan-Kettering Cancer Center	1,500,000	10,000	510,000	1,000,000
Miami, University of	—	130,000	130,000	—
Michigan, University of	37,500	363,200	284,700	116,000
Michigan State University	12,500	—	12,500	—
Middlebury College	64,000	—	64,000	—
Minnesota, University of	97,500	178,696	276,196	—
Morehouse College	—	75,000	25,000	50,000
Morris Brown College	—	75,000	25,000	50,000
Mount Holyoke College	150,000	—	50,000	100,000
National Academy of Sciences	330,000	335,000	490,000	175,000
National Bureau of Economic Research, Inc.	246,500	453,751	278,751	421,500
National Charities Information Bureau	—	10,000	10,000	—
National Commission on the Public Service	—	150,000	75,000	75,000

1987
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1986	1987 Authorized	1987 Payments	Unpaid Dec. 31, 1987
Neurosciences Research Foundation, Inc.	$ 100,000	—	$ 100,000	—
Nevada, University of	—	$ 19,655	19,655	—
New School for Social Research	—	75,000	—	$ 75,000
New York Regional Association of Grantmakers	—	7,125	7,125	—
New York University	12,500	254,800	37,800	229,500
North Carolina, University of	12,500	50,000	37,500	25,000
Northeastern University	—	25,000	12,500	12,500
Northwestern University	12,500	184,300	134,300	62,500
Oberlin College	25,000	—	25,000	—
Ohio State University	—	30,000	30,000	—
Oklahoma State University	12,500	—	12,500	—
Oregon, University of	12,500	50,000	37,500	25,000
Paine College	—	75,000	25,000	50,000
Pennsylvania, University of	112,500	495,460	362,960	245,000
Pennsylvania State University	—	39,457	26,957	12,500
Pittsburgh, University of	—	25,000	12,500	12,500
Population Reference Bureau	—	27,000	27,000	—
Princeton University	660,000	422,250	760,750	321,500
Princeton University Press	120,150	—	60,000	60,150
Purdue University	12,500	75,000	50,000	37,500
Queens College Foundation	—	30,000	30,000	—
Rand Corporation	325,000	122,000	347,000	100,000
Reed College	100,000	—	50,000	50,000
Research Foundation of State University of New York	748,500	471,500	691,000	529,000
Research Foundation of the City University of New York	32,500	54,000	74,000	12,500
Rice University	—	50,000	25,000	25,000
Rochester, University of	229,000	48,120	111,620	165,500
Rockefeller University	197,000	(97,000)	100,000	—
Rollins College	20,000	—	20,000	—
Rutgers University Foundation	—	40,543	28,043	12,500
San Francisco State University	—	30,000	30,000	—
Sante Fe Institute	—	53,500	53,500	—
Saskatchewan, University of	25,000	—	25,000	—
Savannah State College	—	75,000	25,000	50,000
Scientists' Institute for Public Information	—	28,900	28,900	—
Smithsonian Institution	100,000	311,000	50,000	361,000
Social Science Research Council	—	215,000	30,000	185,000
Society for Neuroscience	—	10,000	10,000	—
South Carolina State College	—	75,000	25,000	50,000

1987
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1986	1987 Authorized	1987 Payments	Unpaid Dec. 31, 1987
Southern California, University of	—	$ 25,000	$ 12,500	$ 12,500
Southport Institute for Policy Analysis	—	20,000	20,000	—
Spelman College	—	215,000	—	215,000
Stanford University	$ 1,107,500	348,260	873,260	582,500
Sussex, University of	—	130,000	130,000	—
Swarthmore College	50,000	—	50,000	—
Syracuse University	62,500	—	62,500	—
Texas, University of	12,500	176,200	157,500	31,200
Toronto, University of	—	90,000	30,000	60,000
Trinity College	50,000	—	50,000	—
Tufts University	50,000	26,600	76,600	—
Tuskegee University	—	150,000	—	150,000
Union College	175,000	65,000	75,000	165,000
United Engineering Trustees Inc.	—	20,000	20,000	—
United Way of Tri-State	—	3,500	3,500	—
Urban Institute	60,000	—	—	60,000
Utah, University of	70,000	81,332	126,332	25,000
Vassar College	100,000	—	50,000	50,000
W. E. Upjohn Institute for Employment Research	—	185,000	100,000	85,000
WGBH Educational Foundation	125,000	—	125,000	—
Washington, University of	—	134,000	134,000	—
Washington University	—	25,000	12,500	12,500
Waterloo, University of	75,000	—	75,000	—
Wayne State University	12,500	—	12,500	—
Wellesley College	150,000	—	50,000	100,000
Western Ontario, University of	170,000	25,000	97,500	97,500
Wisconsin, University of	122,500	17,500	140,000	—
Yale University	162,500	114,920	252,420	25,000
Sloan Research Fellowships to be granted in ensuing year	2,250,000	—	—	2,250,000
Sloan Doctoral Dissertation Fellowships to be granted in ensuing year	950,000	50,000	—	1,000,000
Officer grant appropriation for grants in ensuing year	1,500,000	—	—	1,500,000
Book program	72,653	250,000	141,597	181,056
Other appropriations for grants and related expenses	30,000	1,031,217	40,469	1,020,748
	22,122,803	20,616,762	20,985,411	21,754,154
Reduction for grant transfers		(227,305)	(227,305)	
	$22,122,803	$20,389,457	$20,758,106	$21,754,154

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Index of Grants

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Alfred P. Sloan Foundation

Founded in 1934 by Alfred P. Sloan, Jr.

Report for 1988

Alfred P. Sloan, Jr.
1875—1966

The Life of Alfred P. Sloan, Jr., in Brief

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 judgment, 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.

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Policies and Procedures

The Alfred P. Sloan Foundation was established in 1934 by Alfred P. Sloan, Jr., and incorporated in the state of Delaware. Over the last three years the annual total of grants and appropriations authorized by the Foundation has averaged $20.4 million. Assets at market value at the end of 1988 were $541.9 million.

The main interests of the Foundation are in higher education, with an emphasis on science, technology, economics, management, and education for the public service, and on instructional programs and problems of society associated with these fields. The Foundation's activities do not extend to primary or secondary education, 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 very rarely made for general support or for activities outside the United States.

General and Particular Programs

In 1969 the Foundation adopted a mode of operation that distinguishes between the "general program," under which the established interests of the Foundation are pursued, and a set of "particular programs," which focus on sharply defined topics for more limited periods of time. Five particular programs have by now been developed and carried to completion: to increase the number of minority students in medicine and management; to support experimental work in educational technology; to help establish the new discipline of neuroscience; to increase the number of minority students in engineering; and to support research and training in cognitive science and computational neuroscience.

Two particular programs remain active. The New Liberal Arts Program completed its sixth full year of operation in 1988. The Minorities in Public Management Program continued its support of summer institutes and fellowships. Information about these particular programs can be found at appropriate places in this report.

How to Apply for a Grant

The Foundation's funds are spent in two ways: on programs and activities developed by the Foundation's staff and for which grants are made, usually on a competitive basis, in support of individuals and institutions; and in response to proposals that come unsolicited to the Foundation and that are also judged competitively. In considering both types of proposals, the Foundation often seeks the advice of outside reviewers. The Foundation unfortunately is obliged to turn down many more proposals, often proposals of great merit, than its resources allow it to support.

Application can be made at any time for support of activities falling within the guidelines indicated above. Grants of $30,000 or less are made throughout the year by the officers of the Foundation; grants over that amount are made by the Trustees who meet five times a year for that purpose. Letters of application are normally sent to the president 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 has no deadlines or standard application 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 the Foundation to make a preliminary response as to the possibility of support.

President's Statement

A foundation that makes grants to colleges and universities offers a unique vantage point from which to view the higher education system. Most of us on the staff of the Sloan Foundation have an academic background and each of us knows a few institutions very well. But here we receive visitors from many institutions, and ourselves travel to meetings and conferences at many campuses throughout the country. To be sure, our visitors are a self-selected, not a random, sample and overrepresent certain kinds of institutions. Nevertheless, we are constantly reminded of the incredible diversity of American higher education.

Some of our visitors come from institutions with thirty or forty thousand students and others from those with three or four hundred. Some of these institutions are located in the heart of large cities, others in rural hamlets. Some are entirely undergraduate, while a few others offer no degree except the Ph.D. We learn about colleges where every student follows the same curriculum, and others with no required core or distribution of subjects. On the same day, I talked to representatives of a university where every student and faculty member must believe that the Bible is the literal word of God, and approved a grant to another university to help publish an edition of Darwin's notebooks.

We see people from women's colleges, historically black colleges and universities, technical institutes, and freestanding universities of health sciences; from highly selective institutions and those with open admission; from institutions with tuition and fees of $14,000 a year and a few that charge no tuition at all. Surely there is in this bewildering array the right institution for every student, if he or she can only find it. More important, academic excellence is much more widely dispersed in this system than the public—high school seniors and their parents and guidance counselors in particular—believe it to be.

Impressive as this diversity is, it is not by itself enough to make a strong system of higher education. There is another quality to the people we see that is more fundamental. Almost without exception the college and university presidents we see seem devoted to improving and strengthening their institutions. Colleges and universities are not-for-profit institutions, but I do not believe that the chief executives of industrial corporations, for all their incentive pay and stock options, work any harder at improving their product and strengthening their balance sheets than chief executives in higher education do. We are also encouraged by the large number of college teachers we meet who devote a substantial part of their time, often during summers and vacation periods, to

learning how to improve, update, and broaden the courses they teach. Although research productivity is increasingly the main criterion for personal advancement in higher education, the dedicated teacher is fortunately alive and well.

All of this does not mean that higher education is without problems—far from it. It has many. These include steadily rising costs and the need to expand and modernize plant and equipment. Let me mention three other problems that seem to be of particular importance.

First, many students enter college poorly prepared to do college-level work. Recently, the Southern Regional Education Board reported that 35 percent of freshmen who entered public colleges in fifteen southern states required remedial instruction in reading, writing or mathematics. The situation may be a little better in private institutions or in other regions, but not much. For example, according to the 1986 National Assessment conducted by the Educational Testing Service, only about half of American 17-year olds could deal comfortably with the material usually taught in junior high school mathematics. It is a serious burden on colleges to have to teach large numbers of students material that should have been mastered in high school, or earlier.

Second, America's colleges and universities will face a serious shortage of faculty beginning in the mid-1990's. G. Gregory Lozier and Michael J. Dooris of Pennsylvania State University have estimated that in the years from 1994 to 2000, 30 percent of present faculty will retire. This is about the same time when the number of eighteen-year olds will begin to rise again. The present production of new Ph. D.'s is not adequate to meet the coming demand for replacement and expansion of faculties.

The third problem is related to the second. At a time when an increasingly large proportion of American youth are from minorities underrepresented in college and university faculties, the proportion of new Ph.D.'s from these groups remains alarmingly low. Although Blacks and Hispanics make up at least 18 percent of the U.S. population, they received only about 6 percent of doctorates awarded in 1986, according to the National Research Council. In science and mathematics, the percentages are even lower. For example, of 779 doctorates in mathematics awarded by U.S. universities in 1986-87, only six were awarded to Black and another six to Hispanic citizens of the United States.

Since 1970, the Sloan Foundation has had a series of programs designed to increase the number of minority students prepared to enter several professions: medicine, management, engineering, and most recently public management (see page 32). We are now exploring the possibility of a new program to increase the number of minority students prepared to do graduate work in the physical and mathematical sciences. Two exploratory grants are reported on

page 54. I hope that there will be substantially more to report in the years ahead.

Because this will be my last President's Statement, I should like to use it to thank those who have helped me over the past ten years in guiding and administering the affairs of the Foundation. However, I shall not try to name them one by one, because they are too numerous and because I would inevitably leave out someone who richly deserved to be included. My first great debt is to the Board of Trustees and to the three very able chairmen under whom I have served. The Board, despite many lively discussions, has always been able to reach consensus, and has guided our affairs with skill and wisdom, but with a light touch. My second great debt is to the staff of the Foundation during my tenure. Both in shaping programs and in deciding on and administering individual grants, the staff has always had a fine balance of expertise and good judgment, of which the latter is usually more important.

My third great debt is to the many distinguished outside advisers who have helped us to formulate and implement new programs and to award grants and fellowships. They have come long distances and worked long hours to give us the benefit of their advice and thereby to improve our decisions.

My greatest debt is to those grantees who have sent us outstanding proposals and in the event have done what they proposed to do. As another foundation officer, Dan M. Martin, pointed out several years ago in a report like this one, the applicant who sends a foundation an outstanding proposal does it a great favor by enabling it to carry out its mission of giving wisely. To those who have sent such proposals our way, my heartfelt thanks.

Two key members of the Board of Trustees retired during 1988. Thomas A. Murphy was elected to the Board in 1980 and became its chairman in 1982. He conducted our affairs with wisdom and efficiency, and with determination to involve all Trustees in key decisions. Charles J. Scanlon was elected to the Board in 1972 and became chair of the Investment Committee in 1973. Under his leadership the Foundation greatly increased the value of its endowment and broadened the range of its investments. I should like to record my deep appreciation to both of them for their wise counsel and generous support.

Albert Rees

President

Grants and Activities in 1988

Economics

Support of research and other activities in economics continued at a substantial level. Economists were among awardees of Sloan Research Fellowships and Dissertation Fellowships, as summarized elsewhere in this report. Renewals of five 1985 grants supporting university workshops in economics were authorized. Two additional grants in behavioral economics were made. A variety of other research projects and activities in economics received support by means of both trustee and officer grants.

Economics Workshops

Starting in 1974, a series of twenty-two grants were made to leading departments of economics to support graduate-level research workshops in applied microeconomics. In 1985 a new workshop program was initiated on the general theme of the increased openness of the U.S. economy and the significance of that fact for understanding both the internal behavior of the economy and its role in the world. Within this framework the following topics are included: open-economy macroeconomics; international financial markets; comparative analysis of institutions across countries; nature of trade in the modern world; traditional policy analysis as affected by a more open economy; and demography and immigration.

In establishing the workshop theme and reviewing proposals, the Foundation has been assisted by a distinguished advisory committee:

Robert Solow, Massachusetts Institute of Technology, Chairman

Alan Blinder, Princeton University

Richard Cooper, Harvard University

D. Gale Johnson, University of Chicago

Paul Joskow, Massachusetts Institute of Technology

Anne O. Krueger, Duke University

Charles Schultze, Brookings Institution

Five workshop grants were made in 1985, to Columbia, Minnesota, MIT, Princeton, and Wisconsin. Four more were approved in 1986, to Chicago, Duke, Rochester, and Western Ontario. Two final workshop grants, to UCLA

and Pennsylvania, were made in 1987. Details of these grants were specified in previous annual reports.

At the time of the initial awards, it was agreed that proposals for renewals would be considered, assuming the workshops were judged to be successful. Reports have indeed been encouraging and renewal grants of $170,000 were authorized to the following universities for continuation of their workshop programs. (The grant period in each case extends from July 1988 to June 1990.)

Columbia University
New York, New York 10027
(Project director: Jagdish Bhagwati, Professor of Economics.)

Massachusetts Institute of Technology
Cambridge, Massachusetts 02139
(Project director: Rudiger W. Dornbusch, Professor of Economics.)

Princeton University
Princeton, New Jersey 08544
(Project director: Richard E. Quandt, Professor of Economics.)

University of Minnesota
Minneapolis, Minnesota 55455
(Project director: Neil Wallace, Professor of Economics.)

University of Wisconsin
Madison, Wisconsin 53706
(Project directors: Mark Gertler and Kenneth Rogoff, Professors of Economics.)

Harvard University **$170,000**
Cambridge, Massachusetts 02138

In the final round of 1983 grants in the microeconomics workshop program, Harvard established a workshop on the econometrics of firm behavior. However, instead of applying for a scheduled renewal, it was decided instead to shift focus to a workshop on risk-bearing in the American economy. This new workshop is supported by the current grant. Pensions, social insurance, and financial intermediation will be reassessed as policies for avoiding and sharing risks. In addition, some of the recently developed theoretical work in the area of behavior under uncertainty, outside of the expected utility paradigm, will be utilized to understand how people have actually reacted to risky situations. (Project director: Jerry R. Green, Professor of Political Economy; Grant period: April 1988-June 1990.)

Behavioral Economics

In 1985, the Foundation initiated a program in behavioral economics. The behavioral approach suggests that traditional economic analysis can be significantly enriched by incorporating more empirically accurate assumptions about individual human behavior as well as social processes into economic models.

The following advisory committee oversaw the first competition for grants in this program and continued to assist the Foundation in 1988:

Robert Abelson, Professor of Psychology, Yale University

William J. Baumol, Professor of Economics, Princeton University

Leon Festinger, Professor of Psychology, New School for Social Research

Thomas C. Schelling, Professor of Economics, Harvard University

The thirteen one-year grants made in 1986 as well as the four requests for continued funding approved in 1987 were described in annual reports for those years. Of the four additional renewal grants recommended by the advisory committee, two have been made by the Russell Sage Foundation, our partner in this program. The two other grants, described below, are from two highly innovative psychologists whose work inspired the behavioral economics program.

Stanford University **$96,000**
Stanford, California 94305

Professor Tversky will do research on the assessment and determinants of well-being. In particular, he will compare the choices people make with ratings they assign to alternatives in an effort to see whether choices or ratings are better measures of satisfaction. (Project director: Amos Tversky, Professor of Psychology; Grant period: April 1988-March 1991.)

University of California, Berkeley **$96,000**
Berkeley, California 94720

Professor Kahneman will complete a critical review of experimental economics, continue work on the role of overconfidence in financial decision making, and do experiments exploring the ability of people to anticipate changes in their

tastes. (Project director: Daniel Kahneman, Professor of Psychology; Grant period: April 1988-March 1991.)

Other Trustee Grants in Economics

American Economic Association **$100,000**
1313 21st Avenue South
Nashville, Tennessee 37317

An AEA commission, chaired by Anne Krueger, has been appointed to study graduate education in economics. Data will be collected on the structure of graduate programs, backgrounds of graduate students, employment of recent recipients of the doctorate, and employers' views of new Ph.D.'s. Hearings will be held at several locations. This grant partially supports the work of the commission. (Project director: Anne O. Krueger, Professor of Economics, Duke University; Grant period: October 1988-December 1989.)

American Enterprise Institute for Public Policy Research **$186,000**
1150 Seventeenth Street, NW
Washington, D.C. 20036

This grant will support research on wages during the 1980's in order to identify the nature and sources of changes in the wage distribution. In particular, recent claims that this distribution has shifted toward the extremes as a result of plant closings and employment cutbacks in manufacturing that eliminated jobs in the middle of the distribution will be analyzed. (Project director: Marvin Kosters, Director of Economic Policy Studies; Grant period: February 1988-July 1989.)

Brookings Institution **$250,000**
1775 Massachusetts Avenue, NW
Washington, D.C. 20036

The Brookings Panel on Economic Activity, created in 1970 with support from the Sloan Foundation, generates research on macroeconomic issues of concern to policymakers. Panel meetings are held twice a year. Papers and selected conference proceedings are published in *The Brookings Papers on Economic Activity*, a journal that enjoys outstanding support of academic, government, and business economists. Continued work of the Brookings Panel will be partially funded by this grant. (Project directors: William C. Brainard, Professor of

Economics, Yale University, and George L. Perry, Senior Fellow; Grant period: July 1988-July 1990.)

Brookings Institution **$150,000**
1775 Massachusetts Avenue, NW
Washington, D.C. 20036

This grant supports a writing project of the distinguished economist Charles Schultze. Recognized as a masterful expositor of economics, he proposes to write a book designed to explain to a general audience important macroeconomic principles through consideration of particular policy issues. (Project director: Charles L. Schultze, Director, Economic Studies; Grant period: October 1988-December 1991.)

Centre for Economic Policy Research **$300,000**
6 Duke of York Street
London SW1Y 6LA, England

Research in international macroeconomics conducted by Centre associates, funded initially in 1985 through a collaborative project with The Brookings Institution, will continue to be supported by this grant. During the renewal period, topics to be studied include exchange rate stabilization, macroeconomic interaction between developed and less developed countries, and the effect of macroeconomic policy on international financial markets. (Project director: Richard Portes, Director; Grant period: May 1988-June 1991.)

Institute for International Economics **$375,000**
11 Dupont Circle, NW
Washington, D.C. 20036

In 1985 the Foundation made a three-year grant to the Institute for its research on international economic policy issues. That support, along with support of other foundations and corporations, enabled the IIE to offer senior government officials and corporate executives analyses of critical and complex economic problems. With the current grant, the Institute will study the political economy of international monetary cooperation. How such cooperation is impeded by national politics and institutions will be analyzed, as will the institutional reforms, if adopted within the G-7 countries, that may overcome the barriers to monetary cooperation. (Project director: C. Fred Bergsten, Director; Grant period: January 1989-December 1991.)

London School of Economics and Political Science **$100,000**
London WC2A 2AE, England

This grant will support annual research conferences for young economists from the United States and Britain. LSE plans to invite the best six new Ph.D.'s from U.S. departments to present their research before faculty and graduate students from Britain. The presented papers would be published in the *Review of Economic Studies*, which is edited at LSE. The aim is to establish links between LSE and leading U.S. economists at an early stage in their careers. (Project director: I. G. Patel, Director; Grant period: December 1988-December 1991.)

National Research Council **$150,000**
2101 Constitution Avenue
Washington, D.C. 20418

Advocacy groups, airlines, airport operators, and government agencies point to different but interrelated factors that may underlie problems with air passenger service and safety: a sharp growth in demand for air travel, limited airport capacity, constraints on air traffic control, competitive pressures of deregulation, and hub and spoke airline service patterns. The Transportation Research Board has established a committee made up of experts in aviation, air safety, economics, and public policy to assess the critical forces affecting air service, sort out the underlying causes of problems, and identify policy actions that could improve passenger air service in the future. The committee's work is partially supported by this grant. (Project director: Thomas B. Deen, Executive Director, Transportation Research Board; Grant period: December 1988-December 1990.)

Rand Corporation **$375,000**
1700 Main Street
Santa Monica, California 90406

Despite widespread concern about the impact of the U.S. civil justice system on the economy, surprisingly little empirical research on this important topic has been conducted. With this grant the Rand Institute for Civil Justice will undertake a research program on the economic consequences of expanded business liability in three areas: personnel policies ("wrongful termination"); product safety; and environmental liability. In each case, attention will be paid to the assessment of relevant transaction costs, the extent of modification of firm behavior in the intended direction, and the distributional effects. (Project director: James N. Dertouzos, Associate Head, Economics Department; Grant period: January 1989-December 1991.)

University of Michigan **$163,000**
Ann Arbor, Michigan 48109

Although relationships among personal savings, asset accumulation, and consumption have been much studied in economics, there are several competing hypotheses as to how personal consumption and savings behaviors are affected by such factors as private and public pension plans, different wage payment and bonus arrangements, the predictability of income, and the rate of return on savings. A pretest having demonstrated that the use of data from participants in the TIAA/CREF retirement system is both feasible and promising, the proposed study of life-cycle savings behavior will be based on the income history and pension/annuity assets of a sample of such participants. (Project directors: F. Thomas Juster and John P. Laitner, Professors of Economics; Grant period: October 1988-September 1989.)

University of Pittsburgh **$150,000**
Pittsburgh, Pennsylvania 15260

The research supported by this grant will focus on the labor markets for entry level elite professionals, such as the allocation of new MD's to first year residencies and of new law graduates to law firms. It is proposed to extend the work to include markets in France, the United Kingdom, and Japan. The method used involves the construction of a mathematical model to simulate the market based on data obtained from market participants. (Project director: Alvin E. Roth, Professor of Economics; Grant period: July 1988-June 1991.)

W. E. Upjohn Institute for Employment Research **$65,000**
300 South Westnedge Avenue
Kalamazoo, Michigan 49007

Last year the Foundation made a grant to the Upjohn Institute to fund a major part of the design and analysis costs of a re-employment bonus experiment. The purpose of the experiment is to continue studying the effect of offering bonuses to eligible unemployment insurance claimants who succeed in obtaining full-time jobs well before their insurance payments are exhausted and holding these jobs for extended periods of time. The experiment is being carried out in the state of Washington and is going well. This supplementary grant will take care of some increased costs arising from unexpected changes in the design of the field experiment. (Project director: Robert G. Spiegelman, Executive Director; Grant period: January 1989-December 1990.)

American Arbitration Association **$30,000**
140 West 51st Street
New York, New York 10020

Additional support for continued study of the Social Security Disability Program. (Project director: Frederick B. Arner, Consultant; Grant period: April 1988-June 1989.)

American Economic Association **$5,500**
1313 21st Avenue South
Nashville, Tennessee 37212

Support for economists from abroad invited to participate in the December 1988 AEA meeting. (Project director: Joseph A. Pechman, President; Grant period: July 1988-January 1989.)

Brookings Institution **$20,000**
1775 Massachusetts Avenue, NW
Washington, D.C. 20036

Support for a conference on the Third World debt problem. (Project director: B. K. MacLaury, President; Grant period: October 1988-June 1989.)

International Association for Research in Income and Wealth **$12,000**
Post Office Box 1962 (Yale Station)
New Haven, Connecticut 06520

Partial support for experimental collection of national accounts data via personal computers. (Project director: Richard Ruggles, Executive Secretary; Grant period: November 1988-November 1989.)

Johns Hopkins University **$30,000**
Baltimore, Maryland 21218

For a conference on the economic impacts of the AIDS epidemic. (Project director: Gregory de Lissovoy, Assistant Professor of Health Policy and Management; Grant period: July 1988-June 1989.)

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

For a symposium to examine recent changes in the economic environment in which American colleges and universities operate. (Project director: Katherine H. Hanson, Executive Director, Consortium on Financing Higher Education; Grant period: July 1988-December 1988.)

National Academy of Social Insurance **$24,100**
505 Capitol Court, NE
Washington, D.C. 20002

Partial support for the Academy's Annual Conference on "Social Security and the Budget." (Project director: Alicia H. Munnell, President; Grant period: July 1988-February 1989.)

National Bureau of Economic Research, Inc. **$30,000**
1050 Massachusetts Avenue
Cambridge, Massachusetts 02138

Support for a conference on dynamics of the growth of firms. (Project director: Geoffrey Carliner, Executive Director; Grant period: April 1988-June 1989.)

Overseas Development Council **$30,000**
1717 Massachusetts Avenue, NW
Washington, D.C. 20036

Partial support for a conference on the future of the International Monetary Fund. (Project director: John W. Sewell, President; Grant period: January 1988-July 1989.)

University of California, Berkeley **$15,000**
Berkeley, California 94720

For planning a research agenda on competitiveness and cooperation at a consortium of business schools. (Project directors: David J. Teece and Peter T. Jones, Professors of Business Administration; Grant period: July 1988-June 1989.)

University of California, Berkeley **$30,000**
Berkeley, California 94720

Support for a Sherman Act Centennial Conference. (Project director: David J. Teece, Professor of Business Administration; Grant period: February 1988-December 1988.)

Vanderbilt University **$20,000**
Nashville, Tennessee 37240

Interim funding for the Luxembourg Income Study. (Project director: Timothy M. Smeeding, Professor of Public Policy and Economics; Grant period: June 1988-December 1988.)

Yale University **$15,000**
New Haven, Connecticut 06520

Support of research assistance for completion of a monograph on monetary policy. (Project director: James Tobin, Professor of Economics; Grant period: May 1988-May 1991.)

Fellowships

Sloan Research Fellowships **$2,250,000**

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 approximately 2400 scientists at more than 180 colleges and universities and have accounted for expenditures of over $50 million. Sloan Research Fellows continue to receive numerous prizes and awards in recognition of their major research accomplishments. Fifteen Fellows have received Nobel prizes and eleven 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, currently $25,000 over a two-year term, 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 1988, the Foundation awarded Research Fellowships to 90 scholars at 43 institutions. To arrive at the final selections, some 400 nominations were reviewed by the following committees:

Chemistry
Harry B. Gray, California Institute of Technology
Robin M. Hochstrasser, University of Pennsylvania
Jerrold Meinwald, Cornell University

Economics
Rudiger W. Dornbusch, Massachusetts Institute of Technology
David M. Kreps, Stanford University
Christopher A. Sims, University of Minnesota

Mathematics
Richard B. Melrose, Massachusetts Institute of Technology
John W. Milnor, Institute for Advanced Study
John T. Tate, Harvard University

Neuroscience
Gerald D. Fischbach, Washington University
Patricia S. Goldman-Rakic, Yale University
Solomon H. Snyder, The Johns Hopkins University

Physics
Roger Dashen, University of California, San Diego
Hans Frauenfelder, University of Illinois at Urbana-Champaign
William Press, Harvard University

The following scholars, listed by institution and field, received the 1988 awards:

Brandeis University
Mathematics: Daniel Ruberman

Brown University
Mathematics: Walter Craig
Neuroscience: David M. Berson
Physics: Robert H. Brandenberger

California Institute of Technology
Neuroscience: David J. Anderson
Physics: Stanislav Djorgovski
Shrinivas R. Kulkarni

University of California, Berkeley
Chemistry: Peter G. Schultz
Angelica M. Stacy
Physics: Andrew E. Lange

University of California, Los Angeles
Chemistry: Peter M. Felker
Robert L. Whetten
Mathematics: Mladen Bestvina

University of California, San Diego
Chemistry: John D. Simon
T. Don Tilley
Mathematics: Ruth J. Williams
Physics: Patrick H. Diamond
Herbert Levine
Andrei E. Ruckenstein

University of Chicago
Economics: Paul M. Romer
Mathematics: Daniel S. Freed
Christopher D. Sogge
Neuroscience: Aaron P. Fox

Columbia University
Mathematics: David A. Bayer
Neuroscience: Susan A. DeRiemer
Warren H. Meck

Florida State University
Chemistry: Timothy A. Cross

University of Florida
Chemistry: David E. Richardson
Neuroscience: John C. Middlebrooks

Harvard University
Economics: Dilip Abreu
James H. Stock
Physics: David Vanderbilt

University of Illinois at Urbana-Champaign
Chemistry: Gregory S. Girolami
Mathematics: Adolf Hildebrand

Johns Hopkins University
Chemistry: Jeremy M. Berg
Thomas D. Tullius

Massachusetts Institute of Technology
Chemistry: Stephen L. Buchwald
Economics: James M. Poterba
Mathematics: Antonio Sanchez-Calle
Physics: Edmund Bertschinger
Nicholas P. Warner

University of Michigan
Physics: Bradford G. Orr

University of Minnesota
Mathematics: Richard B. Moeckel
Physics: Ronald A. Poling

University of Montreal
Neuroscience: Jean-Claude LaCaille

New York University
Mathematics: Graeme Walter Milton
Neuroscience: Dan H. Sanes

University of North Carolina
Mathematics: Mark Williams

Northwestern University
Neuroscience: John B. Troy

Ohio State University
Physics: Daniel L. Cox

Oklahoma State University
Mathematics: David J. Wright

University of Oregon
Neuroscience: Nathan Tublitz

University of Pennsylvania
Chemistry: Hai-Lung Dai
Mathematics: Charles L. Epstein
Physics: Philip Nelson

University of Pittsburgh
Chemistry: Craig S. Wilcox

Princeton University
Mathematics: Curtis T. McMullen
Avraham Soffer
Physics: Phillipe M. Fauchet
Daniel S. Fisher
Jeremy Goodman
David N. Spergel

Rice University
Mathematics: Deane Yang
Physics: Randall G. Hulet

University of Rochester
Chemistry: Joseph P. Dinnocenzo
R. J. Dwayne Miller
Neuroscience: Catherine E. Carr

Rutgers University
Mathematics: Abbas Bahri
Physics: Piers Coleman

Salk Institute
Neuroscience: Christopher R. Kintner
John B. Thomas

Stanford University
Chemistry: Steven M. George
Economics: Peter C. Reiss
Mathematics: Iain M. Johnstone

State University of New York, Health Science Center, Syracuse
Neuroscience: James E. Schwob

State University of New York, Stony Brook
Chemistry: Scott L. Anderson
Mathematics: Ralf J. Spatzier
Physics: Daniel M. Davis

Texas A & M University
Chemistry: Robert R. Lucchese

University of Texas
Chemistry: Thomas E. Mallouk

University of Toronto
Physics: Melissa E. B. Franklin

University of Virginia
Physics: B. S. Shivaram

Washington University
Chemistry: John-Stephen Taylor

University of Washington
Chemistry: Paul B. Hopkins

University of Waterloo
Chemistry: John W. Hepburn

University of Wisconsin
Economics: James L. Powell
John P. Rust

Yale University
Economics: David Pearce
Neuroscience: John R. Carlson

Yeshiva University
Neuroscience: Lloyd D. Fricker

Sloan Dissertation Fellowships $965,694

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 are tasks performed with great difficulty alongside a candidate's teaching duties and other obligations. The Sloan awards allow Fellows to concentrate on finishing their doctoral work.

Informal reactions from the graduate departments have been highly favorable. A large percentage of the Fellows completed their dissertations or made substantial progress with their research and writing during the fellowship year. Almost all of these former fellows are now employed, many as junior faculty at major research universities.

In 1988, awards covering full tuition plus a stipend of $12,000 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
Peter A. Diamond, Massachusetts Institute of Technology
Zvi Griliches, Harvard University
Edward E. Leamer, University of California, Los Angeles

Mathematics
Benedict Gross, Harvard University
Robert Gunning, Princeton University
Allen Hatcher, Cornell University

The following scholars, listed by institution and field, received the 1988 awards:

Brandeis University
Mathematics: Luis Piovan

Brown University
Economics: Robert Glendon Donaldson

California Institute of Technology
Economics: Patrick A. Legros
Guofu Tan
Mathematics: Renato Feres

University of California, Berkeley
Mathematics: Burt J. Totaro
Kevin M. Walker

University of California, Los Angeles
Economics: Stephen D. Prowse
Mathematics: Aaron James Bertram
Yasuyuki Kawahigashi

University of California, San Diego
Economics: Andreas Blume
Wen-Ling Lin

University of Chicago
Economics: Stephen V. Cameron
John Heaton
Mathematics: Paul Burchard
Georgios Daskalopoulos
Sean M. Keel

Columbia University
Mathematics: Sai-Kee Yeung

Cornell University
Mathematics: James Lipton

Duke University
Economics: Robert Hussey

Harvard University
Economics: Iain M. Cockburn
Kevin H. O'Rourke
William Perraudin
Mathematics: Rama Kocherlakota
Dipendra Prasad
Wan-Xiong Shi

University of Maryland
Mathematics: David F. Walnut

Massachusetts Institute of Technology
Economics: Gregory K. Leonard
Gary Loveman
Matthew J. Rabin
Mathematics: Yu-ching You
Maciej R. Zworski

Northwestern University
Economics: Avner Greif

University of Pennsylvania
Economics: Kevin A. Hassett

Princeton University
Economics: Joshua D. Angrist
Dwayne Benjamin
Lin Zhou
Mathematics: Chun-nip Lee
Yi-biao Pan
Luis Angel Seco

Rutgers University
Mathematics: Yi-Zhi Huang

Stanford University
Economics: Andrew T. Levin
Mathematics: Jay A. Jorgenson

State University of New York, Stony Brook
Mathematics: Xianzhe Dai
Delin Tan
Guofang Wei

University of Virginia
Economics: Barbara Steinberg

University of Wisconsin
Economics: Margaret Simpson

Yale University
Economics: Shin-Ichi Fukada
Christopher R. Udry

New Liberal Arts

This sixth "particular program" of the Foundation, initiated in 1982, is based on our conviction that a liberal education should develop student understanding of the problem-solving techniques and fundamental concepts which underlie modern technology. It should also produce graduates comfortable with quantitative reasoning, computing, and mathematical modeling, all now so important for the analysis of problems encountered throughout the curriculum.

Details of all activities undertaken as part of the New Liberal Arts Program have appeared in past annual reports. The program began in the spring of 1982 with small planning grants to 30 independent liberal arts colleges. These grants were followed later that year by major awards of $250,000 to 10 of the colleges, and presidential discretionary grants of $25,000 to the other 20 that had taken part in the first round of competition. Since that time, grants have gone to a small number of universities, to many of the same 20 colleges that received discretionary grants, and to a number of historically black institutions. In 1985, the first renewal grants were made to colleges that won major awards three years earlier. Invitations to apply for renewal grants have been extended to all colleges participating in the program and, as indicated below, we continued in 1988 to receive and act on renewal proposals. Our limited resources, we believe, are best used in a sustained effort to develop at these colleges a body of experience and tested teaching materials to support the goals of the program. The preparation of textbooks and other materials based on successful new liberal arts courses and suitable for dissemination to interested faculty members, at participating colleges and elsewhere, is now an important priority within the program.

An outside advisory committee of the following persons continued to assist the Foundation in all phases of the New Liberal Art Program:

Elting E. Morison, Professor Emeritus, Massachusetts Institute of Technology, Chairman of the Committee

David P. Billington, Professor of Civil Engineering, Princeton University

Nannerl O. Keohane, President, Wellesley College

William Kessen, Professor of Psychology, Yale University

C. Dwight Lahr, Dean of the Faculty, Dartmouth College

John G. Truxal, Distinguished Teaching Professor, Department of Technology and Society, State University of New York, Stony Brook

Trustee Grants in the New Liberal Arts

We were aware from the beginning of the New Liberal Arts Program that the educational reform we were inviting colleges to undertake could only succeed if they had the patience and staying power necessary to effect a fundamental change in the undergraduate curriculum. That meant the Foundation, too, had to commit itself for the long term and had to be ready to continue its support of the colleges that entered the program, provided they were making good progress. Certain conditions for renewal grants were stipulated, including a careful evaluation of activities under the first grant, plans for further faculty and course development and exposure of students to topics in technology, and a commitment from the colleges (with the exception of the historically black institutions) for matching funds.

Fourteen colleges have received renewal grants in past years. The following seven colleges and universities participating in the program met the required conditions and received renewal grants, with amounts as indicated, in 1988:

Bucknell University **$150,000**
Lewisburg, Pennsylvania 17837

(Project director: Trudy R. Cunningham, Associate Dean, College of Engineering; Grant period: July 1988-June 1991.)

North Carolina A & T State University **$150,000**
Greensboro, North Carolina 27411

(Project directors: Sara V. Kirk, Professor of Sociology & Social Work, and Peter V. Meyers, Professor of History; Grant period: July 1988-August 1991.)

Oberlin College **$125,000**
Oberlin, Ohio 44074

(Project director: Ira S. Steinberg, Associate Dean, College of Arts and Sciences; Grant period: July 1988-August 1991.)

Rust College **$30,000**
Holly Springs, Mississippi 38635

(Project director: Muhammad I. Shafi, Associate Professor of Biology; Grant period: June 1988-May 1990.)

Swarthmore College **$150,000**
Swarthmore, Pennsylvania 19081

(Project directors: T. Kaori Kitao, Professor of Art History; Nelson A. Macken, Professor of Engineering; and Peter Schmidt, Assistant Professor of English; Grant period: September 1988-August 1991.)

Trinity College **$150,000**
Hartford, Connecticut 06106

(Project director: J. Ronald Spencer, Associate Academic Dean; Grant period: July 1988-June 1992.)

Williams College **$250,000**
Williamstown, Massachusetts 02167

(Project director: Stuart B. Crampton, Professor of Physics; Grant period: June 1988-May 1993.)

A Resource Center for the New Liberal Arts Program, located at the State University of New York, Stony Brook, was established in 1985. The Center has carried out many functions of vital importance to the Program: maintaining contact with project directors and faculty members at the NLA colleges; organizing summer faculty workshops; editing, publishing, and distributing the *NLA News*, a monthly newsletter devoted to the NLA Program; collecting and disseminating syllabi, teaching modules, monographs, and other course materials developed at the colleges and universities taking part in the program; administering the special-leave grant program; and representing the NLA Program to the outside world by contributing to publications, participating in professional meetings and conferences, and by other outreach activities. The following grant enables the Resource Center to continue to perform its important role within the New Liberal Arts Program:

Research Foundation of State University of New York **$400,000**
Post Office Box 9
Albany, New York 12201

(Project directors: John G. Truxal, Professor, Department of Technology and Society, and Marian Visich, Jr., Associate Dean, College of Engineering and Applied Sciences, both at SUNY-Stony Brook; Grant period: September 1988-December 1990.)

Workshops for faculty members have been held each summer since the start of the New Liberal Arts Program. They have been among the most popular and valuable activities in the program. The workshop format has allowed college teachers to get sustained exposure for at least a full week to experienced and outstanding engineering educators or other specialists, and to work together to develop curriculum materials in technology and applied mathematics. The preparation of such materials in a form suitable for general distribution is emphasized in the workshop-like programs planned for the 1988-89 year. Four grants were authorized by the Trustees in 1988 for these workshop and writing projects, as follows:

Claremont McKenna College **$75,000**
Claremont, California 91711

With support from our NLA grant to the Claremont Colleges, biologist Newton Copp and chemist Andrew Zanella have developed and taught a successful introductory science course which includes both topics in technology and laboratory projects in engineering design. During the summer of 1989 they will conduct a one-week workshop for faculty teaching science courses for non-science majors. Workshop participants will complete two design projects used in the Claremont course, evaluate and develop ideas for course modules on technology, and discuss methods for teaching technology as part of an introductory general education course in science. A significant writing component, related to the textbook Copp and Zanella are preparing, is included as part of the workshop itself and also of follow-up activities. (Project directors: Newton H. Copp, and Andrew W. Zanella, Professors, Joint Science Department; Grant period: February 1989-January 1990.)

Princeton University **$146,000**
Princeton, New Jersey 08544

Among the faculty members who have attended previous Princeton workshops, many have collaborated on NLA projects with one of the four Princeton mentors, have been using workshop materials in their own teaching, and have begun developing additional modules for their courses. The plan is now to have a group of such faculty write a series of polished case studies and other course materials in a form suitable for distribution to colleagues at other institutions. The topics to be covered include pre-modern building technology, engineering innovations in modern society, and computer models in decision-making. Well-developed modules will be supplemented by supporting materials (annotated bibliographies, solutions to exercises, discussion of related visual materials and computer software, etc.) in order to be as helpful as possible to college faculty members who may want to use them for their own courses. (Project directors: David P. Billington, Professor of Civil Engineering; Michael S. Mahoney, Professor of History of Science; Robert Mark, Professor of Architecture; and John M. Mulvey, Professor of Engineering/Applied Science; Grant period: January 1989-March 1990.)

Research Foundation of State University of New York **$100,000**
Post Office Box 9
Albany, New York 12201

Summer NLA workshops on topics in technology have been a major influence at many of our colleges, leading to the development of new courses and significant revisions of existing courses. Faculty members who have prepared and taught some of the most successful of these new course units will be engaged to write them up in a form suitable for dissemination to colleagues at other colleges. Topics involving technology, already proven suitable for a liberal arts curriculum, will be identified with a primary author. Each of these modules will be supplemented by essays emphasizing historical, political, ethical, and other important aspects of the technology. This grant also includes support for a one-day meeting of project directors from all colleges with major grants in the New Liberal Arts Program, to be held on the Wellesley College campus in August 1989. This will be the fifth such annual event, the first having been held in 1985. (Project directors: John G. Truxal, Professor, Department of Technology and Society, and Marian Visich, Jr., Associate Dean, College of Engineering and Applied Sciences, both at SUNY-Stony Brook; Grant period: November 1988-December 1989.)

Union College **$75,000**
Schenectady, New York 12308

This grant will support a workshop on mathematical modeling of bargaining, arbitration, and mediation processes to be held at Union College June 18-25, 1989. Analytic study and game-theoretic modeling of negotiation have appeal not only to mathematicians, but also to political scientists, economists, philosophers, and others interested in conflict resolution. The workshop will be led by Steven J. Brams who conducted successful NLA faculty workshops during the summers of 1987 and 1988. Alan Taylor, a Union mathematician interested in game theory and its applications in political science, will assist with workshop plans. (Project director: Steven J. Brams, Professor of Politics, New York University; Grant period: January 1989-October 1989.)

Special-leave grants offer partial support for faculty members from colleges in the New Liberal Arts Program to spend an academic year or two summers on full-time curriculum development projects. The first four such $20,000

grants were made in 1985-86. Their popularity and effectiveness led us to double their number in subsequent years. Last year, the guidelines were strengthened to emphasize the writing of course materials. The Stony Brook Resource Center for the New Liberal Arts Program serves as administrative agent for this project. Funds for individual grants are awarded to the colleges of the recipients, with no overhead charges at either Stony Brook or the home institutions. Starting in 1989-90 each award will be increased to $25,000. Given the unexpended balance from last year's competition, when only four awards were made, the following grant will make possible six special-leave awards for 1989-90.

Research Foundation of the State University of New York **$70,000**
Post Office Box 9
Albany, New York 12201

(Project directors: John G. Truxal, Professor, Department of Technology and Society, and Marian Visich, Jr., Associate Dean, College of Engineering and Applied Sciences, both at SUNY-Stony Brook; Grant period: February 1989-December 1989.)

Publication of textbooks resulting from NLA projects is an important way to spread new liberal arts themes and to make more likely the teaching of NLA-related courses by faculty at colleges throughout the country. The MIT Press and McGraw-Hill Publishing Company were approached about jointly publishing books in a New Liberal Arts Series. Their enthusiastic response led to the establishment of such a series and the selection of a distinguished Editorial Advisory Board with the following members:

John G. Truxal, Distinguished Teaching Professor, Department of Technology and Society, SUNY-Stony Brook

Joseph Bordogna, Alfred Fitler Moore Professor and Dean, School of Engineering and Applied Science, University of Pennsylvania

Robert W. Mann, Whitaker Professor of Biomedical Engineering, Massachusetts Institute of Technology

Merritt Roe Smith, Professor of The History of Technology, Massachusetts Institute of Technology

J. Ronald Spencer, Associate Academic Dean and Lecturer in History, Trinity College

Allen B. Tucker, Jr., Professor of Computer Science, Bowdoin College

The first books in the series are expected to be published late in 1989 and early in 1990. In addition to a $20,000 internal appropriation to cover travel and other meeting costs of the Editorial Advisory Board, the Trustees approved the following grant as a modest subvention to enable the publishers to include experimental and innovative books in the series and to permit the books to be attractively priced.

Massachusetts Institute of Technology **$20,000**
Cambridge, Massachusetts 02139

(Project director: Frank P. Satlow, Executive Editor, The MIT Press; Grant period: October 1988-September 1990.)

The computer is an instrument of enormous power for enriching instruction in quantitative reasoning, applied mathematics, and technology. As college administrators know all too well, the demand for more and up-to-date computer equipment appears to be insatiable. Although student use of the computer has become commonplace, there is yet much to be done to develop effective and innovative uses for teaching and learning.

The Foundation was therefore extremely pleased when discussions with representatives of the International Business Machines Corporation led to an agreement for a joint project. IBM would make available various models of its Personal System 2 computers in sufficient number to equip networked classrooms and faculty support centers for up to 20 colleges: five NLA colleges (Hosts) and fifteen other colleges or universities (Neighbors), each Host collaborating with three Neighbors to establish a two-year program for educationally effective uses of the IBM equipment. The Foundation would offer grants to the five Host colleges to support the development and offering of faculty workshops, travel, and administrative and other costs (at both Hosts and Neighbors) of the collaborative effort.

The project was announced in August. Proposals from fifteen colleges were received by the November 1, 1988 deadline and reviewed by both IBM and the Foundation. Grants of $60,000 each were made to the following five colleges, each listed with its associated Neighbors. (The grant period in each case extends from January 1989-June 1991.)

Mount Holyoke College
South Hadley, Massachusetts 01075
(Project directors: Mark A. Peterson, Applications Director, Academic Computing, and Lester J. Senechal, Professor of Mathematics;
Neighbors: Amherst College, College of Holy Cross, Hampshire College.)

Pomona College
Claremont, California 91711
(Project directors: Joanne M. Badagliacco, Associate Professor of Sociology, and Robert P. Wolf, Professor of Physics, Harvey Mudd College; Neighbors: Harvey Mudd College, Pitzer College, Scripps College.)

Savannah State College
Savannah, Georgia 31404
(Project director: Gaye H. Hewitt, Associate Professor, Department of Social and Behavioral Sciences; Neighbors: Armstrong State College, Brunswick College, Georgia Southern College.)

Spelman College
Atlanta, Georgia 30314
(Project director: Frederick H. Langhorst, Assistant Professor of Spanish; Neighbors: Morehouse College, Morris Brown College, Tuskegee University.)

Trinity College
Hartford, Connecticut 06106
(Project directors: Ellen Hughes-Cromwick, Assistant Professor of Economics, and Diane Zannoni, Associate Professor of Economics; Neighbors: Clark University, Connecticut College, St. Joseph College.)

These five colleges, together with the fifteen Neighbors, have received the IBM personal computers and have set up both their networked classrooms and faculty support centers. Mount Holyoke's project concentrates on the use of the computer for the teaching of mathematics. Trinity's is also sharply focused, but on economics. Savannah State plans to emphasize the use of the computer in sociology, government, and history courses. The projects at Pomona and Spelman are more wide ranging, with planned use of the computer for numerous courses distributed throughout all divisions of the curriculum.

We take this opportunity to express our thanks to IBM for its generous gifts of computing equipment to these 20 colleges and for the extraordinary cooperation of its representatives in developing all aspects of this joint study project.

An Officer Grant in the New Liberal Arts

Princeton University **$24,000**
Princeton, New Jersey 08544

For support of a workshop on engineering education. (Project director: David P. Billington, Professor of Civil Engineering; Grant period: September 1988-February 1989.)

Public Management

During 1988 the Foundation continued to cooperate with the Association for Public Policy Analysis and Management (APPAM) in our program to increase the flow of minority students into high-quality graduate schools of public management. The history of this program, now coming to a close, has been described in previous annual reports. Here we describe various trustee and officer grants made in the current year in support of education for public service.

Particular Program for Minorities in Public Management

Post-Junior Year Summer Institutes **$960,000**

This is the final year of the Foundation's support for summer institutes for minority students between their junior and senior years in college. Our aim is to increase the number of minority students in graduate programs in public policy and management, as a step toward increasing the number of minorities in significant public sector careers. The institutes, jointly developed by APPAM and the Foundation, are eight-week residential programs of intensive study of management, economics, statistics, computing, and communication skills. As part of each institute, successful minority public managers are invited to discuss their careers with students. Each student attending an institute is provided a summer stipend. Eight grants of $120,000 were made to support 1988 post-junior year institutes for a total of 216 students, at the following APPAM schools:

Carnegie-Mellon University
Pittsburgh, Pennsylvania 15213
(Project director: Alfred Blumstein,
Dean, School of Urban and Public Affairs.)

Princeton University
Princeton, New Jersey 08544
(Project director: Donald E. Stokes, Dean,
Woodrow Wilson School of Public and International Affairs.)

State University of New York, Stony Brook
Stony Brook, New York 11794
(Project director: Harry Weiner, Professor,
W. Averell Harriman School for Management and Policy.)

University of California, Berkeley
Berkeley, California 94720
(Project director: Phyllis Strong Green,
Associate Dean, Graduate School of Public Policy.)

University of Michigan
Ann Arbor, Michigan 48109
(Project director: Edie N. Goldenberg,
Director, Institute for Public Policy Studies.)

University of Minnesota
Minneapolis, Minnesota 55455
(Project director: John Brandl, Professor,
Hubert H. Humphrey Institute for Public Affairs.)

University of Texas at Austin
Austin, Texas 78712
(Project director: Lodis Rhodes, Associate Dean,
Lyndon B. Johnson School of Public Affairs.)

University of Washington
Seattle, Washington 98195
(Project director: Margaret T. Gordon, Dean,
Graduate School of Public Affairs.)

Post-Senior Year Summer Institutes **$513,500**

These intensive seven-week summer programs are restricted to students of high promise who have successfully completed one of the post-junior year institutes and who have been accepted by an APPAM school for enrollment in a graduate program the following fall. The subjects studied are again economics, mathematics, computing, and communication skills. APPAM minority students now in graduate school are emphatic in crediting the summer institutes with making it possible for them to compete in high-quality graduate programs. The two post-senior year institutes in 1988 were held, as in previous years, at Harvard ($403,000 grant for 64 students) and at the Rand Corporation ($110,500 grant for 18 students):

Harvard University
Cambridge, Massachusetts 02138
(Project director: Ronald F. Ferguson, Associate Professor,
John F. Kennedy School of Government.)

Rand Corporation
1700 Main Street
Santa Monica, California 90406
(Project director: Charles Wolf, Jr.,
Dean of the Rand Graduate School.)

Duke University **$1,780,000**
Durham, North Carolina 27706

The third component of our particular program for minorities in public management is fellowship support for those students who successfully complete one of the summer institutes and enroll in an APPAM graduate program. The Foundation meets the cost of their first year of graduate school. In the student's second year (almost all are in two-year Master's programs) support is provided by the graduate institution. In 1988-89, the eighth and penultimate year for this fellowship program, there were 114 fellows enrolled in 22 APPAM graduate schools. As in past years, this grant was administered by Duke University on behalf of the participating APPAM schools. (Project director: Robert D. Behn, Professor, Institute of Policy Sciences and Public Affairs, and Treasurer, APPAM; Grant period: August 1988-December 1989.)

Georgetown University **$153,000**
Washington, D.C. 20057

An internship program, to begin in 1989, will place about 10 minority students in the Department of State during the summer between their first and second year of graduate study. The program, it is hoped, will encourage more minorities to consider careers in the diplomatic service. Internships will be open on a competitive basis to minority students enrolled in the 24 schools of public management supported under our particular program. Interns will receive summer stipends and reimbursement for costs of travel to and from Washington, D.C. (Project director: Peter F. Krogh, Dean of the Edmund A. Walsh School of Foreign Service; Grant period: July 1988-December 1990.)

Officer Grants in Public Management

Center for National Policy **$25,000**
317 Massachusetts Avenue, NE
Washington, D.C. 20002

For a book on "Presidential Choices for the Next Decade." (Project director: Maureen S. Steinbruner, Executive Vice President; Grant period: January 1988-December 1988.)

Foundation for the Establishment of a Graduate School of Political Management, Inc. **$24,000**
17 Lexington Avenue
New York, New York 10010

Fellowship support for minority students. (Project director: F. Christopher Arterton, Dean; Grant period: July 1988-July 1989.)

Georgetown University **$8,000**
Washington, D.C. 20057

To increase the number of minority students preparing for careers in U.S. international affairs agencies. (Project director: Peter F. Krogh, Dean, Edmund A. Walsh School of Foreign Service; Grant period: January 1988-December 1988.)

Science and Society

Scientists and engineers play an increasingly important role in our society. Their advice is sought at the highest levels in setting national policies. Their ability to communicate effectively with policy makers, directly or through intermediaries, is vital for democratic decision-making. Media able faithfully to present (and a public able to understand) the methods, results, and recommendations of scientists and engineers are also essential.

Science policy and public understanding of science and technology have been continuing interests of the Foundation. Here we report on the Science Book Program, on a series of grants in arms control and defense policy made primarily to assist college teachers understand the difficult issues involved in nuclear weaponry and arms control, on grants focusing on the history of science and on studies of science policy, and on other trustee and officer grants that in one way or another are concerned with improving communication and understanding of science and technology and their impacts on society.

Science Book Program

Under this program, initiated in 1975, the Foundation invites outstanding scientists to write about their experiences and lives in science. Authors are encouraged to reflect on all aspects of their professional work and to write in such a way as to give laymen a better sense of what a life is like when it is devoted to science.

Among the books that have already appeared in the series, the final four in the list below were published in 1988:

Disturbing the Universe by Freeman Dyson

Advice to a Young Scientist by Peter B. Medawar

The Youngest Science by Lewis Thomas

Haphazard Reality by Hendrik B. G. Casimir

In Search of Mind by Jerome Bruner

A Slot Machine, A Broken Test Tube by S. E. Luria

Enigmas of Chance by Marc Kac

Rabi: Scientist and Citizen by John S. Rigden

Alvarez: Adventures of a Physicist by Luis W. Alvarez

Making Weapons, Talking Peace by Herbert F. York

The Statue Within by François Jacob

In Praise of Imperfection by Rita Levi-Montalcini

What Mad Pursuit by Francis Crick

Memoirs of an Unregulated Economist by George J. Stigler

Astronomer by Chance, by the distinguished British radio astronomer Sir Bernard Lovell, will be published shortly as the fifteenth book in the series.

In all aspects of this book program, the Foundation was ably assisted during 1988 by the following advisory committee:

Michael Bessie, Publisher, Cornelia & Michael Bessie Books, Chairman of the Committee

Howard H. Hiatt, Professor of Medicine, Harvard Medical School and Harvard School of Public Health

Eric R. Kandel, University Professor of Physiology and Psychology, Columbia University

Daniel Kevles, Professor of History, California Institute of Technology

Robert Merton, University Professor Emeritus and Special Service Professor, Columbia University

Paul Samuelson, Institute Professor of Economics, Massachusetts Institute of Technology

Robert Sinsheimer, Chancellor Emeritus, University of California at Santa Cruz

Steven Weinberg, Josey Regental Professor of Science, University of Texas at Austin

Stephen White, foundation officer (retired), writer

Trustee Grants in Arms Control and Defense Policy

The Foundation's activities in arms control and defense policy continue to be quite limited. The main thrust is to help college and university faculty members respond effectively to the very large number of undergraduates interested in instruction on the technology of nuclear weapons, the history of arms control, and national security policy. The bulk of the grants reported in this section supported workshops and other means to serve this purpose. A few dealt with research on defense budgets. All were intended in one way or another to increase understanding of the complex issues of the nuclear age.

Center on Budget and Policy Priorities **$150,000**
236 Massachusetts Avenue, NE
Washington, D.C. 20002

The Center's Defense Budget Project, established in 1983, is now a major source of information and analysis on the defense budget and related issues. Topics recently studied include the distribution of fiscal and military burdens among NATO members; the impact of defense spending on employment, productivity, technology, and economic growth; and the future budgetary impact of current research and development programs. The Project has contributed extensively to the literature available to researchers, media, and policymakers seeking to understand the history of defense spending and the budgetary consequences of the defense options that will be faced in the next decade. Continued work of the Project is partially supported by this grant. (Project director: Gordon Adams, Director, Defense Budget Project; Grant period: June 1988-June 1990.)

Harvard University **$100,000**
Cambridge, Massachusetts 02138

An important mission of Harvard's Center for Science and International Affairs (CSIA) has been the training in national security issues of specialists drawn from the physical sciences and engineering. CSIA fellows engage in research on such topics with a technical component as verification of a nuclear test ban, particle beams as weapons, and limitations on anti-submarine warfare. Our grant continues support of this postdoctoral fellowship program. (Project director: Joseph S. Nye, Jr., Director, CSIA; Grant period: June 1988-August 1989.)

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

University of California, San Diego **$140,000**
La Jolla, California 92093

University of Miami **$130,000**
Coral Gables, Florida 33124

University of Sussex **$148,000**
Brighton, BN1 9RF England

Starting in 1983, we have made grants to MIT for annual summer workshops on nuclear weapons and arms control for college and university faculty members who are teaching courses and seminars on issues of the nuclear age and are interested in deepening their understanding of these complex subjects. In 1984, a second such workshop was organized in San Diego, mainly for participants from the West. Since few faculty members from the southern states attended these summer workshops, a third intensive workshop was started in Miami early in 1986. Recognizing the differences in European and U.S. perspectives on these issues, another summer program was organized in 1987 at Sussex. This workshop permits college teachers from Europe and the United States to hear from defense policy experts from both sides of the Atlantic. They are able to discuss European thinking on issues of global security as well as the political culture in which decisions about weapons and arms control are made in the United States. Evaluations of all past workshops have been very positive. These four grants supported another set of workshops held on the east and west coasts and in Sussex during the summer of 1988 and one in Miami scheduled for 1989. (Project directors: Jack Ruina, Professor of Electrical Engineering (MIT), Herbert F. York, Director, Institute on Global Conflict and Cooperation (UC, San Diego), Behram N. Kursunoglu, Director, Center for Theoretical Studies (U. of Miami), J. P. Perry Robinson, Senior Fellow, Science Policy Research Unit (U. of Sussex); Grant periods: February 1988-June 1989 (MIT and U. of Miami), February 1988-December 1988 (UC, San Diego and U. of Sussex).)

University of California, San Diego **$146,500**
La Jolla, California 92093

Under the auspices of the Institute on Global Conflict and Cooperation (IGCC) at the University of California, the Armament and Disarmament Information Unit at the University of Sussex, and Moscow State University, a workshop modeled after those described above has been planned for the summer of 1989 in Moscow. Thirty-two participants are expected: eight from the United States, eight from the Soviet Union, and eight each from West and East Europe. Close interaction among these faculty members and the presentation and discussion of diverse perspectives, it is hoped, will lead to better understanding of peace and security issues. This workshop, as the others, is also intended to enhance the knowledge of faculty members and thereby improve their courses on issues of global security and arms control. (Project director: Herbert F. York, Director, IGCC; Grant period: October 1988-December 1989.)

Officer Grants in Arms Control and Defense Policy

American Committee on U.S.-Soviet Relations — **$5,000**
109 Eleventh Street, SE
Washington, D.C. 20003

Support of consultations to be held in Moscow on future defense budgets and U.S. and Western European approaches to common security in the 1990s. (Project director: Roland S. Homet, Jr., Specialists Program Director; Grant period: April 1988-October 1988.)

Committee for National Security — **$10,000**
1601 Connecticut Avenue, NW
Washington, D.C. 20009

For a publication on the defense budget. (Project director: Anne H. Cahn, Director; Grant period: April 1988-April 1989.)

Foundation for International Studies on Peace and Security — **$30,000**
9728 HA Groningen
The Netherlands

Support for a summer school on arms control, security and peace. (Project director: H. W. Tromp, Director, Polemologisch Instituut, Rijksuniversiteit; Grant period: July 1988-June 1989.)

George Mason University — **$30,000**
Fairfax, Virginia 22030

For a national conference on nuclear war and peace courses. (Project director: Robert Ehrlich, Professor of Physics; Grant period: November 1988-December 1989.)

Global Outlook Education Institute — **$25,000**
405 Lytton Avenue
Palo Alto, California 94301

Support for a project, "Revolution or Evolution: Soviet New Thinking About International Security." (Project director: Gloria Duffy, President; Grant period: March 1988-September 1989.)

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

For writer Richard Rhodes to spend a year with the Defense and Arms Control Studies Program at the Center for International Studies. (Project director: Richard Rhodes, Visiting Fellow; Grant period: July 1988-June 1989.)

Nuclear Control Institute — **$29,200**
1000 Connecticut Avenue, NW
Washington, D.C. 20036

Support for a workshop on tritium's role in nuclear weaponry. (Project director: Paul Leventhal, President; Grant period: October 1988-April 1989.)

Trustee Grants in Science and Society

Harvard University — **$75,000**
Cambridge, Massachusetts 02138

Two experienced journalists, David Lampe and Susan Rosegrant, have for some years been gathering information and doing research on the so-called Route 128 phenomenon. This grant will enable them to devote full time to the project. They plan to complete a draft of a book that will be a comprehensive study of the complex economic, political, technological, and cultural forces that have made the region around Boston such a fertile ground for high technology companies. (Project director: David R. Lampe, Assistant Director, Industrial Liaison Program, MIT; Grant period: June 1988-August 1989.)

London School of Economics and Political Science — **$130,000**
London WC2A 2AE, England

Norman Macrae, recently retired as Deputy Editor of *The Economist*, has undertaken to write a biography of John von Neumann for the general reader. With this grant, he will conduct research, interview persons familiar with von Neumann's life and work as mathematician, scientist, and government adviser, and complete a draft of the book. (Project director: Norman Macrae; Grant period: December 1988-December 1990.)

Medical and Health Research Association of New York City, Inc. **$500,000**
40 Worth Street
New York, New York 10013

Despite advances of scientific research, the Acquired Immune Deficiency Syndrome (AIDS) remains an incurable disease. Public health officials have called for education tailored to the needs of local communities as an important strategy for controlling the growth of the disease. This project is an experiment in AIDS education by the New York City Department of Health, which will coordinate efforts at three medical centers: Downstate, associated with the State University of New York; Mt. Sinai, associated with the City University of New York; and Montefiore, associated with Albert Einstein School of Medicine. Medical service providers at each center will first be fully informed about AIDS and then will develop and mount an educational program to meet the needs of the community served by the center, with special attention to women of child bearing age as an especially important population at risk. The city will provide a focus for exchanging information among the centers and other public health workers, and will evaluate the entire program. (Project director: Peggy Clarke, Assistant Commissioner for AIDS Program Services; Grant period: May 1988-April 1990.)

National Academy of Sciences **$500,000**
2101 Constitution Avenue
Washington, D.C. 20418

Substantial grants by the Foundation in 1984 and 1986 first helped create and then renewed support of the National Academy of Sciences' Government-University-Industry Research Roundtable. The Roundtable serves as a very effective forum, staffed in part by Academy specialists, in part by outside experts, for examination of science and technology problems facing the country, and for designing and testing of solutions. The so-called Florida Demonstration Project, involving the standardization of grant administration procedures of federal sponsors of university research, is a recent noteworthy example. The current grant will support continued operation of the Roundtable for another two years. (Project director: Don I. Phillips, Executive Director, Government-University-Industry Roundtable; Grant period: February 1988-August 1990.)

Rutgers University Foundation **$200,000**
New Brunswick, New Jersey 08903

At his death in 1931, Thomas Alva Edison left more than three million pages of correspondence, laboratory notebooks, and other documents. Over a wide range

of technical topics, they reveal the development of ideas from their embryonic stages to patent application, pilot plant, manufacture, and marketing. Some of these ideas led to great industries and fundamental changes in society. In 1981, a project to organize, edit, and publish the Edison papers was established, jointly sponsored by the Smithsonian Institution, the National Park Service, the New Jersey Historical Commission, and Rutgers University. The project, expected to continue over a period of 20 years, has produced parts of microfilm editions of Edison's work between 1850 and 1886, a first volume of a series of books, and a documentary film. Additional microfilm and book editions, as well as museum exhibits, are planned. This grant, a duplicate of one made by the Foundation in 1981, supports the second phase of this historically important project. (Project director: Reese V. Jenkins, Director and Editor, The Edison Papers; Grant period: April 1988-March 1991.)

Smithsonian Institution **$300,000**
Washington, D.C. 20560

Foundation grants in 1986 and 1987 supplied start-up and then additional support for a major undertaking by the Smithsonian to employ the special historiographical capability of video technology in its efforts to document the character of science and technology and their impact on our times. The project continues to go well. Videotaped footage has been created during the past year on subjects as varied as the first digital computer, the Manhattan Project, twentieth century small arms development, and the Mariner flight to Venus. This grant renews our support of the project for another year. (Project director: David DeVorkin, Committee Chairman, Smithsonian Videohistory Program; Grant period: October 1988-December 1989.)

WGBH Educational Foundation **$50,000**
125 Western Avenue
Boston, Massachusetts 02134

In early 1989, WGBH (Boston's public television station) will broadcast over PBS a one-hour NOVA program entitled *The Hidden City*, a film about New York City's power, water, and sewage disposal systems. Although the Foundation normally turns down proposals for film documentaries, this project was unusually attractive given our location in the City and our interest in means by which the public can better understand modern technology. Difficulties encountered with underground location shots requiring special lighting and other unexpected arrangements have increased costs beyond what was budgeted. This grant will complete the funding required for the project. (Project director: Carl Charlson, Producer; Grant period: October 1988-December 1989.)

American Chemical Society **$30,000**
1155 Sixteenth Street, NW
Washington, D.C. 20037

For a project on communicating chemical risk information. (Project director: Jean A. Parr, Staff Associate; Grant period: April 1988-March 1989.)

Brandeis University **$25,700**
Waltham, Massachusetts 02254

Additional support to write a biography of Jerrold Zacharias. (Project director: Jack S. Goldstein, Professor of Physics; Grant period: October 1988-December 1989.)

Brookings Institution **$11,000**
1775 Massachusetts Avenue, NW
Washington, D.C. 20036

Partial support to complete the writing of a biography of Leo Szilard. (Project director: William Lanouette, Writer; Grant period: January 1988-June 1988.)

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

For research and writing of a book on Einstein, Haber, and the scientific environment of Berlin. (Project director: Fritz Stern, Professor of History; Grant period: April 1988-March 1989.)

Columbia University **$15,000**
New York, New York 10027

For preparation of a book, *Reading DNA*. (Project director: Robert E. Pollack, Dean and Professor of Biological Sciences; Grant period: July 1988-June 1990.)

Georgetown University **$30,000**
Washington, D.C. 20057

Partial support of an issue of *Daedalus* on Risk in America. (Project directors: Edward J. Burger, Director, Institute for Health Policy Analysis, and Stephen R. Graubard, Editor, *Daedalus*; Grant period: June 1988-September 1989.)

George Washington University **$30,000**
Washington, D.C. 20052

For planning and a conference on the future of international cooperation in space. (Project director: John M. Logsdon, Director, Space Policy Institute; Grant period: June 1988-May 1989.)

Harvard University **$30,000**
Cambridge, Massachusetts 02138

To develop legislative options concerning the AIDS epidemic. (Project director: William J. Curran, Professor of Legal Medicine, School of Public Health; Grant period: January 1988-January 1989.)

Marine Biological Laboratory **$30,000**
Woods Hole, Massachusetts 02543

Support for a fellowship program for young science writers. (Project director: James Shreeve, Program Director; Grant period: May 1988-April 1991.)

Pennsylvania State University **$30,000**
University Park, Pennsylvania 15802

To support the writing of the second volume of *To Advance Knowledge: The Growth of American Research Universities*. (Project director: Roger L. Geiger, Associate Professor of Higher Education; Grant period: June 1988-May 1989.)

Rensselaer Polytechnic Institute **$6,000**
Troy, New York 12180

For a series of breakfast seminars for media representatives on science and technology policy issues. (Project director: Herbert I. Fusfeld, Director, Center for Science and Technology Policy; Grant period: October 1988-June 1989.)

Rensselaer Polytechnic Institute **$1,800**
Troy, New York 12180

Start-up support for the above program of breakfast seminars. (Project director: Herbert I. Fusfeld, Director, Center for Science and Technology Policy; Grant period: May 1988-April 1989.)

Resources for the Future $30,000
1616 P Street, NW
Washington, D.C. 20036

For a conference on assessing natural resources damages. (Project director: Robert W. Fri, President and Senior Fellow; Grant period: April 1988-March 1989.)

University of Colorado Foundation $26,000
Boulder, Colorado 80309

To plan a Center for Space Policy. (Project director: Radford Byerly, Jr., Director, Center for Space and Geosciences Policy; Grant period: April 1988-March 1989.)

University of Denver $30,000
Denver, Colorado 80208

For research assistance on economic and social policy problems. (Project director: Richard D. Lamm, Director, Center for Public Policy and Contemporary Issues; Grant period: August 1988-January 1990.)

Science, Technology, and Mathematics

Foundation support of research in science and mathematics continued this year in our research and doctoral dissertation fellowship programs. Some research in engineering, especially as it relates to the development of courses and teaching materials on various technological topics suitable for undergraduates, was funded within the particular program in the new liberal arts. As in past years, many projects involving public policy or public understanding of science and technology received our support. These programs and projects have been described elsewhere in this report.

In this section we bring together a number of grants supporting research in molecular studies of evolution and population sciences. Of course, there are both trustee and officer grants that do not fit under these headings, yet also support various projects in science, technology, or mathematics. These are also listed and described here.

Molecular Studies of Evolution

Powerful techniques of molecular biology are making it possible to study the evolutionary history encoded in the genetic complement of living species. Research in evolution need no longer rely solely upon the incomplete fossil record and the often hard-to-interpret evidence from morphological comparisons. Each of these well-established approaches continues to have its own special strengths, but both can now be checked against wholly new scientific evidence arising from the rapidly developing methods of molecular biology.

Our activities in molecular studies of evolution have been described in annual reports dating from 1985. They consist mainly of grants supporting various research projects, scientific conferences, and an intensive workshop designed to introduce the study of evolution into the research agendas of molecular biologists. During 1987 a new postdoctoral fellowship program was announced for young molecular and evolutionary biologists interested in developing the interdisciplinary skills necessary for molecular research on evolution. Details of the first twelve awards were included in last year's annual report. The second round of these fellowships is described below.

During 1988 the following distinguished advisory committee continued to assist the Foundation in all aspects of this program:

Wesley M. Brown, Associate Professor of Biology, University of Michigan

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 at Los Angeles

Philip J. Regal, Professor of Ecology, University of Minnesota

Allan C. Wilson, Professor of Biochemistry, University of California at Berkeley

Postdoctoral Fellowships in Molecular Studies of Evolution **$805,000**

As in the first year of this fellowship program, there were over 100 applications received in the second round of these competitive awards. The final selection process was completed by the advisory committee in December. (The actual grants were not officially made until 1989, but are included here for the record.) Each grant 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. Last year all 12 fellowships extended over a two-year period. This time there were 8 two-year and 4 one-year awards.

Awards are listed as follows: name and affiliation of the fellow at the time of application; name, department, and institution of the senior scientist in whose laboratory the postdoctoral research will be carried out.

Christopher J. Basten, North Carolina State University at Raleigh; Professor Bruce S. Weir, Department of Statistics, North Carolina State University at Raleigh

J. Fernando Bazan, University of California at Berkeley; Professor Robert J. Fletterick, Department of Biochemistry, University of California at San Francisco

Debashish Bhattacharya, Simon Fraser University; Professor Mitchell L. Sogin, Department of Molecular and Cellular Biology, National Jewish Center for Immunology and Respiratory Medicine

Timothy Collins, Yale University; Professor Wesley M. Brown, Department of Biological Sciences, University of Michigan

Parul Doshi, UMDNJ-Robert Wood Johnson Medical School; Professor C. I. Wu, Department of Biology, University of Rochester

Jeffrey L. Feder, Michigan State University; Professor Martin Kreitman, Department of Biology, Princeton University

Benjamin F. Koop, Wayne State University; Professor Leroy Hood, Division of Biology, California Institute of Technology

Axel Meyer, University of California at Berkeley; Professor Allan C. Wilson, Department of Biochemistry, University of California at Berkeley

Margaret Ann Riley, Harvard University; Professor Bruce Levin, Department of Zoology, University of Massachusetts at Amherst

Michael J. Sanderson, University of Arizona; Professor Jeffrey J. Doyle, Department of Botany, Cornell University

Carol A. Stepien, University of California at San Diego; Professor David M. Hillis, Department of Zoology, University of Texas at Austin

Caro-Beth Stewart, University of California at San Francisco; Professor William J. Rutter, Hormone Research Institute, University of California at San Francisco

Trustee Grants in Molecular Evolution

Marine Biological Laboratory **$52,000**
Woods Hole, Massachusetts 02543

Complementing our efforts to acquaint young molecular biologists with the research methods and problems in molecular evolution and evolutionary biology, we have also sought to foster interest among scientists from the fields of ecology, evolutionary biology, and systematics in molecular approaches to evolutionary studies. A summer course at the Marine Biological Laboratory will serve this latter purpose. The two-week program will include a series of lectures exploring multiple approaches to molecular evolution, including discussions of structural considerations, antibodies, proteins, and nucleic acids. (Project director: Harlyn Harlvorson, President and Director; Grant period: April 1988-March 1989.)

University of California, Los Angeles **$92,300**
Los Angeles, California 90024

A 1986 grant supported the first one-week intensive "school" in molecular evolution. Twenty outstanding young molecular biologists, at the advanced graduate or early postdoctoral levels, were offered lectures and laboratory experiences provided by leading scientists in molecular evolution and focused upon important questions in evolutionary biology. The goal was to bring the study of evolution into the mainstream of research among younger molecular biologists. The program received high praise from participants and faculty alike. This grant supported a second offering of the short course in December 1988. (Proj-

ect director: James A. Lake, Professor of Molecular Biology; Grant period: April 1988-June 1991.)

Officer Grants in Molecular Evolution

University of California, Los Angeles **$20,000**
Los Angeles, California 90024

For a symposium on molecular evolution. (Project director: C. Fred Fox, Professor of Microbiology and Director, UCLA Symposia; Grant period: January 1989-December 1989.)

Wistar Institute of Anatomy and Biology **$15,000**
Thirty-Sixth Street at Spruce
Philadelphia, Pennsylvania 19104

Partial support for a symposium on evolution. (Project directors: Leonard Warren, Professor, Wistar Institute, and Matthew Meselson, Professor of Biochemistry and Molecular Biology, Harvard University; Grant period: October 1988-September 1989.)

Population Sciences

The Foundation has sought since 1985 to encourage scientific interest in cross-disciplinary population sciences. This initiative was based upon the realization that there was much parallel work but often only limited communication among the numerous disciplines in which population-level analysis is undertaken, including demography, ecology, economics, epidemiology, genetics, mathematics, and population biology. In these disciplines, quantitative techniques of various kinds are applied to the study of populations. Believing that much could be gained from joint work involving these separate scientific approaches, our support was designed to facilitate interaction and collaborative research in the population sciences among faculty members from the different disciplines. By the end of 1987, awards had been made to ten universities: officer grants for initiating faculty seminars and other cross-disciplinary activities at Duke, Johns Hopkins, Michigan, Minnesota, Pennsylvania, Princeton, and Texas; and larger trustee grants in support of research activities at Stanford, University of California at Berkeley, and University of California at Davis. These have all been described in previous annual reports.

Trustee Grants in Population Sciences

Stanford University **$225,000**
Stanford, California 94305

In 1985, the Foundation made its first major grant in the population sciences to Stanford, which had already begun to organize a program in this area with an outstanding group of faculty scientists. That grant provided seed funding for cross-disciplinary research that would ultimately be funded from other sources, support for colloquia and seminars, and dissertation fellowships for doctoral candidates interested in working on population problems. Based on its strong record in developing this interdisciplinary area of science, Stanford's program is renewed for another three years by this grant. (Project directors: Marcus W. Feldman, Professor of Biology, and W. Brian Arthur, Professor of Population Studies and Economics; Grant period: November 1988-October 1991.)

University of Minnesota **$248,000**
Minneapolis, Minnesota 55455

The University of Minnesota received a $25,000 officer grant in 1987, as part of our effort to initiate activities in cross-disciplinary population sciences. A weekly faculty research seminar attracted the active participation of faculty members from many departments. The seminar was focused on assessing the prospects and the consequences of very long human lifespans. Ten research projects on this common theme have been identified, including: demographic and epidemiological studies of the alternative hypotheses that human life expectancy will continue to increase to 100 years, or to level off at 85 years; genetic experiments with evolutionary forces that some believe impose a cap on lifespan; and economic and actuarial analyses of the possible impacts of life extension upon labor supply and pension funding. This grant will provide seed funding of these and other related projects. (Project director: James W. Vaupel, Professor of Public Affairs and Planning, Humphrey Institute of Public Affairs; Grant period: July 1988-June 1991.)

Officer Grants in Population Sciences

Chinatown Planning Council, Inc. **$25,000**
480 Broadway
New York, New York 10013

Partial support to develop a demographic profile of the Asian population in the New York region, in association with the Regional Plan Association and the

United Way of Tri-State. (Project director: Charles P. Wang, Executive Director; Grant period: January 1988-September 1988.)

Population Reference Bureau **$30,000**
777 14th Street, NW
Washington, D.C. 20005

For preparation of a background report and briefings on the Federal Statistical System. (Project director: Thomas W. Merrick, President; Grant period: March 1988-December 1988.)

Trustee Grants in Science, Technology, and Mathematics

Cooper Union for the Advancement of Science and Art **$250,000**
New York, New York 10003

The School of Engineering at Cooper Union plans to develop a comprehensive curriculum emphasizing design. Beginning with advanced courses, but ultimately suffusing the full educational experience, emphasis will be placed on design projects that prepare students for the variety of challenges and the kind of team work they will experience in their engineering careers. Projects will deal with aspects of the problems of an urban environment, for example, pothole repairs on city streets, maintenance of bridges, and the clean-up of waterways. Many faculty members are engaged in research and consulting on urban problems, have design experience in industry, and are eager to integrate these interests into their classes. (Project director: Eleanor Baum, Dean, School of Engineering; Grant period: February 1988-July 1991.)

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

An officer grant made in 1987 assisted the Harvard School of Public Health with the planning and start-up costs for an interdisciplinary Program for Technology Assessment in Health and Medicine. A strong network of persons engaged in technology assessment projects has now been established. Organization of health services, roles of health care providers, facilities and equipment, drugs and diagnostics, information systems, and mechanics of regulation encompass the elements of health care technology in the program. The goals of the program are to develop new methodological approaches for assessing emerging technologies, disseminate findings to practitioners and policy makers in health care, and integrate the lessons learned from these activities into the HSPH curriculum. This grant will support work on a number of research problems within the program and thereby contribute to the much-needed improvement in systematic assessment of medical technology. (Project director: Frederick Mosteller, Professor Emeritus, Harvard School of Public Health; Grant period: April 1988-April 1990.)

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

This grant supports a program of visiting scientists who will come to Cambridge for extended periods to work with Harvard and MIT mathematicians and theoretical physicists on various research projects. Many branches of "pure" mathematics have become extremely important for modern theoretical physics. For example, ideas from geometry, algebra, and number theory permeate the many attempts to understand fundamental particles that go under the name "string theory." The relationship is two-way since new ideas from theoretical physics have also contributed to major advances in modern mathematics. Collaboration among physicists and mathematicians will be featured in this program as visitors participate in research seminars led by faculty members from both Harvard and MIT. (Project director: Arthur M. Jaffe, Professor of Mathematics and Theoretical Science; Grant period: March 1989-June 1992.)

Mathematical Association of America **$115,000**
1529 Eighteenth Street, NW
Washington, D.C. 20036

Colby College **$30,000**
Waterville, Maine 04901

Grants were made in 1986 to eight colleges and universities to support pilot projects designed to gain experience with symbolic computation systems and their role in the teaching of undergraduate mathematics. Those working on these projects, as well as other mathematicians experimenting with such sophisticated computer software, were brought together in July 1988 at Colby College to present and review course materials, to discuss their classroom experiences, and to suggest directions for future development. It seemed clear at the conclusion of the summer meeting that the time had arrived to seek national leadership and coordination in this area. A Subcommittee on Symbolic Computer Systems has since been organized by the MAA's Committee on the Undergraduate Program in Mathematics. Its charge is "to promote widespread experimentation with symbolic computer systems in order to stimulate development of curricular materials and teaching practices appropriate to a world in which common mathematical practice will routinely employ the power of such

systems." Our grant to the MAA supports the work of this subcommittee. (Project directors: Zaven A. Karian, Professor of Mathematics, Denison University (MAA), Donald B. Small, Professor of Mathematics, (Colby); Grant periods: January 1989-December 1991 (MAA), February 1988-September 1988 (Colby).)

University of California, Berkeley **$200,000**
Berkeley, California 94720

Oberlin College **$37,500**
Oberlin, Ohio 44074

These two grants were made as part of our preliminary exploration of means by which to alleviate the severe underrepresentation of minorities among college majors in the physical and mathematical sciences. Berkeley will develop and offer a six-week summer program for minority students, mainly blacks and Hispanics, with outstanding mathematics records in their first two years. Carefully organized introductory seminars on advanced topics in mathematics will attempt to lead these students to a better understanding of higher mathematics and the nature of mathematical research. Together with counseling and other supportive summer activities, it is hoped that more will continue as majors and that the program will suggest a way to develop a growing stream of minority students bound for graduate study in mathematics. The Oberlin grant supports the preparation of a research report and a follow-up conference to be held in the fall of 1989 on the undergraduate education of minority students, especially in the sciences and mathematics. Invitations to the conference will be limited to presidents of selected institutions. Its aim is to identify programs and investments that might be most effective in increasing the number of minority scientists and mathematicians. (Project directors: Leon Henkin, Professor of Mathematics (UC, Berkeley), S. Frederick Starr, President (Oberlin College); Grant period: November 1988-October 1989 for both grants.)

University of Chicago **$300,000**
Chicago, Illinois 60637

This grant supports a three-year program of visiting mathematicians and scientists who will collaborate with Chicago faculty members in research on topics in chaos, complex systems, and fluid dynamics. Individuals in the departments of mathematics, physics, astronomy and astrophysics, chemistry, economics, and geophysics are actively involved in research on various aspects of these topics. They will undertake a joint program aimed at improving their understanding of how chaos and complexity manifest themselves in physical systems. Our grant enables them to attract distinguished researchers for extended visits and thereby to enhance their collaborative work. (Project director: J. Peter May, Professor of Mathematics; Grant period: July 1988-June 1991.)

American Academy of Arts and Sciences **$30,000**
Norton's Woods, 136 Irving Street
Cambridge, Massachusetts 02138

Partial support for the activities of the United States Committee for the International Institute for Applied Systems Analysis. (Project director: Harvey Brooks, Professor of Technology and Public Policy, Harvard University; Grant period: February 1988-January 1989.)

Association for Symbolic Logic, Inc. **$23,000**
Urbana, Illinois 61801

For preparation of a cumulative reviews index for *The Journal of Symbolic Logic*. (Project director: Herbert B. Enderton, Editor of *JSL*, Department of Mathematics, UCLA; Grant period: December 1988-December 1990.)

Harvard University **$30,000**
Cambridge, Massachusetts 02138

For writing a book on conceptual and philosophical issues of biology. (Project director: Ernst Mayr, Emeritus Professor, Museum of Comparative Zoology; Grant period: July 1988-June 1990.)

International Society of Chemical Ecology, Inc. **$3,000**
Ithaca, New York 14853

Partial support for a series of symposia on topics in chemical ecology. (Project director: Jerrold Meinwald, President, ISCE, and Professor of Chemistry, Cornell University; Grant period: April 1988-March 1991.)

LaGuardia Education Fund, Inc. **$30,000**
31-10 Thomson Avenue
Long Island City, New York 11101

To develop a series of workshops on effective uses of the computer for faculty members from community colleges in the Northeast. (Project director: Stephen J. Brown, Associate Dean of the Faculty, LaGuardia Community College; Grant period: February 1988-August 1989.)

Menlo College $18,500
Atherton, California 94025

For preparation of a second volume of *Mathematical People*. (Project director: Donald J. Albers, Associate Dean, School of Letters and Sciences; Grant period: May 1988-May 1990.)

New York Academy of Sciences $30,000
2 East 63rd Street
New York, New York 10021

Partial support of a Soviet-USA Conference on Frontiers of Mathematics. (Project director: Peter D. Lax, Professor of Mathematics, Courant Institute of Mathematical Sciences; Grant period: November 1988-February 1989.)

Rockefeller University $3,500
New York, New York 10021

For a symposium to honor Abraham Pais. (Project director: Nicola N. Khuri, Professor of Physics; Grant period: March 1988-September 1988.)

St. John's College $25,000
Santa Fe, New Mexico 87501

To support a faculty study program on thermodynamics and its role in the curriculum. (Project director: Michael P. Riccards, President; Grant period: June 1988-August 1989.)

Technical Education Research Centers, Inc. $30,000
1696 Massachusetts Avenue
Cambridge, Massachusetts 02138

Partial support for development of computer software for statistics. (Project director: Christopher M. Hancock, Research Associate; Grant period: April 1988-December 1988.)

Tufts University $30,000
Medford, Massachusetts 02155

For a conference on educationally effective curriculum software. (Project directors: Daniel C. Dennett and George E. Smith, Professors of Philosophy; Grant period: February 1988-December 1988.)

Tufts University $29,200
Medford, Massachusetts 02155

Partial support for planning a joint course with Moscow State University on the environment and the superpowers. (Project director: Martin J. Sherwin, Professor of History; Grant period: October 1988-October 1989.)

University of Arizona $30,000
Tucson, Arizona 85721

Partial support for a 1988 summer school on Complex Systems. (Project director: Daniel L. Stein, Associate Professor of Physics; Grant period: June 1988-December 1988.)

University of California, Los Angeles $15,000
Los Angeles, California 90024

For support of the Marshak Interdisciplinary Colloquium on Mathematics in the Behavioral Sciences. (Project director: Michael D. Intriligator, Professor of Economics; Grant period: January 1989-June 1992.)

University of Hartford $21,000
West Hartford, Connecticut 06117

To develop an undergraduate course on epidemics and AIDS. (Project director: Stephen Joel Trachtenberg, President; Grant period: March 1988-February 1989.)

University of Illinois at Urbana-Champaign $30,000
Champaign, Illinois 61820

To prepare a volume of letters by, to, and about the Indian mathematician, S. Ramanujan. (Project director: Bruce C. Berndt, Professor of Mathematics; Grant period: January 1989-September 1990.)

University of New Mexico $22,000
Albuquerque, New Mexico 87131

For research and writing of a book on philosophy of mathematics. (Project director: Reuben Hersh, Professor of Mathematics; Grant period: July 1988-August 1989.)

Other Officer Grants

Collected here are miscellaneous officer grants that do not fit into any specific program of the Foundation and thus have not found a place elsewhere in this report.

Centenary College **$14,500**
Hackettstown, New Jersey 07840

For a Harold S. Sloan Scholarship Fund. (Project director: Gerald R. Beaver, Vice President.)

Council on Foundations, Inc. **$24,700**
1828 L Street, NW
Washington, D.C. 20036

A membership contribution of the Sloan Foundation for 1988. (Project director: James A. Joseph, President.)

Harvard University **$15,000**
Cambridge, Massachusetts 02138

Support for a survey and assessment of the recent scientific literature on criminal behavior. (Project directors: Richard J. Herrnstein, Professor of Psychology, and James Q. Wilson, Professor of Management, UCLA; Grant period: June 1988-August 1989.)

Independent Sector **$7,400**
1828 L Street, NW
Washington, D.C. 20036

A membership contribution of the Sloan Foundation for 1988. (Project director: Astrid Merget, Treasurer.)

Independent Sector **$30,000**
1828 L Street, NW
Washington, D.C. 20036

Partial support for the 1988 Spring Research Forum and the Academic Retreat. (Project director: Brian O'Connell, President; Grant period: January 1988-December 1988.)

New School for Social Research **$20,000**
New York, New York 10011

A planning grant to develop an urban research and training program focused on Lower Manhattan as a research laboratory. (Project director: Ira Katznelson, Dean, The Graduate Faculty; Grant period: May 1988-November 1989.)

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

A membership contribution of the Sloan Foundation for 1988. (Project director: Barbara Bryan, Executive Director.)

United Way of Tri-State **$3,500**
99 Park Avenue
New York, New York 10016

A civic grant made as a contribution to United Way's annual fund-raising drive. (Project director: Calvin E. Green, President.)

University of Arizona **$10,000**
Tucson, Arizona 85721

Partial support of an interdisciplinary conference: Towards a Scientific Analysis of Values. (Project director: Michael Hechter, Professor of Sociology; Grant period: November 1988-April 1989.)

We Care About New York, Inc. **$10,000**
One Madison Avenue
New York, New York 10010

For production of new public service television commercials for "We Care." (Project director: Donald C. Platten, Co-Chairperson; Grant period: January 1988-December 1988.)

Financial Review

Financial Review

The financial statements and schedules of the Foundation, which have been audited by Ernst & Whinney, independent auditors, appear on pages 64 to 84. They include balance sheets, statements of income, expenses and changes in fund balance and of changes in financial position, and schedules of management and investment expenses, investments, and grants and appropriations.

Investment and other income for 1988 was $30,105,538, an increase of $2,223,271 from $27,882,267 in 1987. After the deduction of investment expenses and provision for Federal excise tax from investment and other income, net investment income was $28,303,992 in 1988 as compared with $25,162,002 for the prior year. Investment expenses during 1988 totaled $1,352,546 of which $905,667 represented investment counsel fees. Provision for Federal excise tax amounted to $449,000. The total of these deductions from income in 1988 was $1,801,546 versus $2,720,265 in 1987.

The total of grants and appropriations authorized, net of grant refunds and management expenses during 1988, was $21,994,881. This sum was $6,309,111 under 1988 net investment income. Of this total, grants and appropriations authorized amounted to $19,921,805 while management expenses were $2,170,646. Since the Foundation's inception in 1934, the cumulative excess of grants and expenses over the Foundation's income has amounted to $26,393,570.

Grant and appropriation payments in 1988 were $25,003,190 compared with $20,758,106 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 1988 was $28,877,812, while in 1987 the amount was $27,175,507.

The market value of the Foundation's total assets was $541,886,057 at December 31, 1988, including investments valued at $541,085,952, as compared with total assets of $482,920,715 at December 31, 1987. A summary of the Foundation's investments at cost and market value at December 31, 1988 appears on page 69.

A listing of grants made during 1988, including grants and appropriations authorized and payments during the year, will be found on pages 79 to 84.

Report of Ernst & Whinney Independent Auditors

Board of Trustees
Alfred P. Sloan Foundation
New York, New York

We have audited the balance sheets of the Alfred P. Sloan Foundation as of December 31, 1988 and 1987 and the related statements of income, expenses and changes in fund balance and changes in financial position for the years then ended and the supplementary schedules of management and investment expenses for the years ended December 31, 1988 and 1987, investments at December 31, 1988, and grants and appropriations 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 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 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, 1988 and 1987, 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. The supplementary schedules of management and investment expenses for the years ended December 31, 1988 and 1987, investments at December 31, 1988, and grants and appropriations for the year then ended are presented for purposes of additional analysis and are not a required part of the financial statements of the Alfred P. Sloan Foundation. In our opinion, these supplementary schedules are fairly stated in all material respects in relation to the financial statements taken as a whole.

Ernst & Whinney

New York, New York
February 1, 1989

Balance Sheets

December 31, 1988 and 1987

	1988	1987
Assets		
Investments:		
Fixed income:		
Government and agency	$138,867,707	$ 96,968,861
Corporate and other	91,354,398	140,110,894
	230,222,105	237,079,755
Equity:		
General Motors Corporation	36,932,297	37,220,358
Other	192,645,042	170,687,061
	229,577,339	207,907,419
Other	11,250,000	6,750,000
Total investments (market value: $541,085,952 in 1988 and $481,991,407 in 1987)	471,049,444	451,737,174
Interest purchased		774,302
Other	357,355	185,316
Cash	800,105	155,006
Total	$472,206,904	$452,851,798
Liabilities and Fund Balance		
Grants and appropriations unpaid	$ 16,672,769	$ 21,754,154
Other liabilities	94,209	6,252
Fund balance	455,439,926	431,091,392
Total	$472,206,904	$452,851,798

See accompanying notes to financial statements.

Statements of Income, Expenses and Changes In Fund Balance

For the years ended December 31, 1988 and 1987

	1988	1987
Investment Income:		
Dividends	$ 11,681,604	$ 10,886,242
Interest	18,419,656	16,991,031
Other	4,278	4,994
	30,105,538	27,882,267
Less:		
Investment expenses	1,352,546	1,304,265
Provision for Federal excise tax	449,000	1,416,000
	1,801,546	2,720,265
Net investment income	28,303,992	25,162,002
Grants and management expenses:		
Grants and appropriations authorized (net of grant refunds of $97,570 in 1988 and $52,213 in 1987)	19,824,235	20,337,244
Management expenses	2,170,646	1,988,751
Total	21,994,881	22,325,995
Grants and expenses less than income for the year	6,309,111	2,836,007
Net gain on disposals of securities	18,039,423	51,379,263
Net change in fund balance for year	24,348,534	54,215,270
Fund balance January 1	431,091,392	376,876,122
Fund balance at end of year	$455,439,926	$431,091,392

See accompanying notes to financial statements.

Statements of Changes in Financial Position

For the years ended December 31, 1988 and 1987

	1988	1987
SOURCE OF FUNDS:		
Investment income	$ 30,105,538	$ 27,882,267
Net gain on disposals of securities	18,039,423	51,379,263
Federal excise tax refund and other	270,918	
	48,415,879	79,261,530
APPLICATION OF FUNDS:		
Grant and appropriation payments (net of grant refunds of $97,570 in 1988 and $52,213 in 1987)	24,905,620	20,705,893
Management expenses	2,170,646	1,988,751
Investment expenses	1,352,546	1,304,265
Federal excise taxes	631,961	3,086,222
Other		90,376
	29,060,773	27,175,507
INCREASE (DECREASE) IN FUNDS CONSISTING OF:		
Cost of investments	19,312,270	51,167,744
Interest purchased	(774,302)	479,103
Cash balances	645,099	253,860
Other	172,039	185,316
Net increase	$ 19,355,106	$ 52,086,023

See accompanying notes to financial statements.

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

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.

Investments purchased are carried at cost; for those received by gift or bequest, cost is market value at date of gift or bequest. Gain or loss on disposal of investments is determined generally on the basis of first-in, first-out cost, but in certain instances the identified lot basis is used. Net gain or loss on disposals is applied to the principal section of the fund balance.

Grant 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 provides for purchase of annuities for employees. Retirement plan expense was $191,817 and $137,397 for 1988 and 1987, respectively.

4. LEASE

The Foundation's lease for its office space expires April 30, 1993. 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 was $592,054 in 1988 and $534,340 in 1987.

5. FUND BALANCE

Fund balance, at year end, is comprised of the following:

	1988	1987
Principal	$481,833,496	$463,794,073
Income—cumulative excess of grants and expenses over income from inception of the Foundation	(26,393,570)	(32,702,681)
Fund Balance	$455,439,926	$431,091,392

Schedules of Management and Investment Expenses

For the years ended December 31, 1988 and 1987

	1988	1987
MANAGEMENT EXPENSES		
Salaries and employee benefits:		
Salaries	$ 1,120,156	$ 1,013,366
Employees' retirement plan and other benefits	387,517	330,963
Total	1,507,673	1,344,329
Rent	592,054	534,340
Program expenses	264,285	261,614
Office expenses and services	185,152	191,711
Reports and publications	18,537	21,808
Professional fees	49,824	45,874
Total management expenses	2,617,525	2,399,676
Less management expenses applicable to investments	446,879	410,925
Management expenses applicable to grant making	$ 2,170,646	$ 1,988,751
INVESTMENT EXPENSES		
Investment counsel fees	$ 905,667	$ 893,340
Management expenses applicable to investments	446,879	410,925
Total investment expenses	$ 1,352,546	$ 1,304,265

Schedule of Investments

December 31, 1988

SUMMARY	Cost	Market Amount	Market Percent of Total Investment
Fixed income:			
Government and agency	$138,867,707	$134,283,145	24.8%
Corporate and other	91,354,398	90,877,139	16.8
Total fixed income	230,222,105	225,160,284	41.6
Equity:			
General Motors Corporation	36,932,297	72,227,500	13.3
Other	192,645,042	230,859,000	42.7
Total equity	229,577,339	303,086,500	56.0
Other	11,250,000	12,839,168	2.4
Total investments	$471,049,444	$541,085,952	100.0%

FIXED INCOME	Principal	Cost	Market
Government and agency obligations:			
U.S. Treasury:			
7 5/8% Notes 4/30/90	$ 14,340,000	$ 14,340,000	$ 14,071,125
8 1/4% Notes 6/30/92	15,800,000	15,736,642	15,370,398
8 3/4% Notes 9/30/92	6,000,000	5,998,980	5,919,360
8 1/4% Notes 2/15/93	25,000,000	25,537,500	24,203,000
7 3/8% Notes 4/15/93	7,160,000	6,884,787	6,705,770
8% Notes 7/15/94	6,420,000	6,155,175	6,088,985
7 3/8% Notes 5/15/96	3,000,000	3,021,563	2,706,570
8 1/2% Notes 5/15/97	9,825,000	9,671,484	9,422,764
8 7/8% Notes 11/15/97	5,000,000	4,997,656	4,901,550
9% Notes 5/15/98	9,000,000	9,021,094	8,904,330
9 1/4% Notes 8/15/98	1,000,000	1,027,188	1,005,000
9 1/8% Bonds 5/15/2018	11,000,000	11,220,000	11,116,820
Federal Housing Administration Mortgage Pools:			
7.43% 9/1/2022	9,732,602	8,843,593	8,022,441
7.43% 11/1/2022	9,624,830	8,511,959	7,946,452
Federal National Mortgage Association			
9.80% Notes 12/10/98	2,500,000	2,497,656	2,500,000
Student Loan Marketing Association			
9.34% Notes 7/28/98	5,500,000	5,402,430	5,398,580
Total Government and agency obligations		138,867,707	134,283,145

Schedule of Investments

December 31, 1988

(continued)

FIXED INCOME		Principal	Cost	Market
Corporate and other:				
Short term:				
Interest bearing demand notes		$ 21,460,000	$ 21,460,000	$ 21,460,000
Commercial Paper:				
Ford Motor Credit Corp.				
9.76% 1/3/89		13,204,000	13,254,000	13,254,000
Time deposits:				
Sumitomo Bank, Ltd.				
5.56% 1/4/89	(Yen)	1,612,331,701	12,854,947	12,893,496
Westpac Banking Corp.				
6% 1/3/89	(Deutschemarks)	3,581,537	2,003,097	2,017,199
Total short term			49,572,044	49,624,695
Long term:				
Bank of Nova Scotia				
10.15% Notes 12/15/98		5,000,000	5,000,000	4,988,500
Chesapeake & Ohio Railway Co.				
8 1/2% Conditional Sale Agreement 1/1/89		4,366	35,197	43,662
Citicorp				
10 7/8% Notes 6/15/2010		3,800,000	4,186,726	3,871,060
Citicorp Person to Person, Inc.				
12 1/2% Subordinated Capital Notes 1/15/96		3,000,000	3,322,500	3,128,010
Daiwa Bank				
0.5% Convertible Bonds 3/31/94	(Swiss Francs)	1,100,000	803,840	807,155
Delta Airlines, Inc.				
10.45% Lease Obligation 7/2/2007		2,889,891	2,889,891	2,911,565
Dresdner Bank, AG				
6.5% Bonds 3/18/96 (ex warrants)	(Deutschemarks)	51,000	24,502	28,552
Federal Express Corp.				
10 3/4% Lease Obligation 5/1/2009		1,721,601	1,721,601	1,768,944
Ford Motor Credit Co.				
12.20% Notes 3/28/90		3,000,000	3,000,000	3,095,370
General Motors Acceptance Corp.				
8 3/8% Notes 5/1/97		3,000,000	2,977,770	2,885,940
IBM Credit Corp.				
8.80% Notes 5/25/93		5,000,000	5,000,000	4,902,250
Mellon Bank, N.A.				
11.60% Certificate of Deposit 1/13/89		1,600,000	1,592,000	1,600,448
Mitsubishi Bank				
0.5% Convertible Bonds 9/30/92	(Swiss Francs)	1,000,000	728,557	752,080

Schedule of Investments

December 31, 1988

(continued)

FIXED INCOME		Principal	Cost	Market
Corporate and other (continued):				
Long term (continued):				
Mitsui Bank				
2 5/8% Convertible Bonds 3/31/2003		$ 300,000	$ 302,944	$ 313,500
NCNB Corp.				
14 1/2% Notes 9/1/92		3,000,000	3,007,500	3,086,460
Northrop Corp.				
10% Notes 11/1/93		1,200,000	1,200,000	1,194,000
Puget Sound Power & Light Co.				
8 1/4% First Mortgage Bonds 4/1/96		3,000,000	2,981,250	2,759,460
Standard Oil Co. (Ohio)				
13 3/8% Notes 9/15/92		3,000,000	2,981,250	3,075,330
Woolworth, PLC				
8.5% Convertible Unsecured Loan 10/31/2000	(Sterling)	20,400	26,826	40,158
Total long term			41,782,354	41,252,444
Total corporate and other			91,354,398	90,877,139
Total fixed income securities			$ 230,222,105	$ 225,160,284

Schedule of Investments

December 31, 1988
(continued)

EQUITY	Number of Shares	Cost	Market
United States:			
AMR Corp.	30,000	$ 1,123,605	$ 1,608,750
Alza Corp.	50,000	1,115,357	1,118,750
American Home Products Corp.	30,000	2,262,153	2,497,500
American Management Systems, Inc.	37,000	563,354	573,500
Aristech Chemical Corp.	75,000	1,974,349	2,109,375
Ashton -Tate Corp.	83,000	2,089,500	1,743,000
Avnet, Inc.	95,000	3,032,750	2,113,750
Bairnco Corp.	11,000	276,087	272,250
Bank of New York Co., Inc.	77,000	2,322,617	2,849,000
Banks of Iowa, Inc.	3,900	225,550	257,400
Bio-Electric Systems, Inc. (with warrants)	6,250	89,570	84,375
Boeing Co.	45,300	2,149,080	2,746,313
Bowater, Inc.	77,000	2,782,903	2,107,875
Bristol-Myers Co.	55,000	2,642,934	2,488,750
Businessland, Inc.	25,000	292,500	371,875
CPC International, Inc.	45,000	1,940,518	2,334,375
Canonie Environmental Services Corp.	9,000	231,750	240,750
Capital Cities/ABC, Inc.	18,000	4,435,994	6,520,500
Carpenter Technology Corp.	6,800	328,463	315,350
Cellular Communications, Inc.	14,800	308,025	395,900
Chambers Development, Inc.	7,800	151,653	170,625
Charming Shoppes, Inc.	26,100	322,988	378,450
Citicorp	150,000	3,419,751	3,881,250
Clayton Homes, Inc.	37,500	316,286	318,750
Coastal Corp.	80,000	2,443,410	2,740,000
Coca-Cola Co.	46,100	2,120,632	2,057,213
Colonial Life & Accident Insurance Co.	10,900	325,800	351,525
Comair, Inc.	19,400	154,575	169,750
Commercial Metals Co.	14,000	412,540	394,319
Commonwealth Edison Co.	85,000	2,571,989	2,805,000
Concept, Inc.	17,300	230,436	263,825
Consolidated Rail Corp.	56,000	1,697,573	1,890,000
Country Lake Foods, Inc.	15,000	148,125	150,000
Cracker Barrel Old Country Stores, Inc.	7,500	144,375	191,250
Crestar Financial Corp.	34,200	811,594	820,800
Cypress Semiconductor Corp.	40,900	451,677	444,788
Detroit Edison Co.	200,000	2,575,675	3,475,000
Digital Microwave Corp.	9,500	165,900	228,000
Dionex Corp.	10,300	305,675	260,075
Donaldson Company, Inc.	10,200	235,416	211,650
Dress Barn, Inc.	20,000	289,875	305,000

Schedule of Investments

December 31, 1988
(continued)

EQUITY	Number of Shares	Cost	Market
United States (continued):			
Dreyfus Corp.	100,000	$ 2,588,168	$ 2,500,000
Dun & Bradstreet Corp.	36,045	1,097,175	1,932,913
Duquesne System, Inc.	7,900	152,075	171,825
Echlin, Inc.	120,000	1,971,195	1,980,000
First Chicago Corp.	14,500	340,097	429,562
Florida National Banks of Florida, Inc.	20,000	306,250	327,500
Forest Laboratories, Inc.	17,000	363,155	420,750
Fremont General Corp.	100,000	1,974,363	1,312,500
General Electric Co.	58,800	1,487,040	2,631,300
General Motors Corp.	865,000	36,932,297	72,227,500
General Re Corp.	65,000	3,454,644	3,607,500
General Signal Corp.	65,000	3,007,962	3,087,500
Goodyear Tire & Rubber Co.	40,000	2,133,960	2,045,000
HMSS, Inc.	12,000	215,412	207,000
Harnischfeger Industries, Inc.	120,000	1,774,208	2,085,000
Healthco International, Inc.	30,000	560,550	615,000
Healthsouth Rehabilitation Corp.	28,100	252,900	263,438
Hechinger Co.	20,000	394,375	357,500
Helix Technology Corp.	20,000	516,300	340,000
Hilb Rogal & Hamilton Co.	12,500	143,750	190,625
ITT Corp.	50,000	2,341,558	2,518,750
Innovex, Inc.	30,000	172,500	120,000
Intel Corp.	51,000	1,285,964	1,211,250
International Business Machines Corp.	78,000	7,369,198	9,506,250
International Minerals & Chemical Corp.	58,000	2,401,319	2,218,500
International Paper Co.	58,800	1,688,793	2,726,850
J. J. Snack Foods Corp.	8,300	157,700	188,825
James River Corp. of Virginia	85,000	2,081,772	2,433,125
Johnson Controls, Inc.	88,200	2,543,740	3,230,325
Johnson & Johnson	30,000	2,671,184	2,553,750
Juno Lighting, Inc.	7,100	175,200	133,125
Kaydon Corp.	21,000	607,125	564,375
Kemper Corp.	93,300	2,159,215	2,239,200
LSI Lighting Systems, Inc.	20,500	235,750	279,312
La Petite Academy, Inc.	27,100	417,313	257,450
Limited, Inc.	114,000	2,088,107	3,106,500
Linear Technology, Inc.	38,000	453,750	318,250
Litton Industries, Inc.	30,700	2,774,379	2,206,562
Manor Care, Inc.	140,000	1,615,475	1,750,000
Mapco, Inc.	80,000	2,923,041	4,370,000
Marc, Inc.	19,000	323,562	185,250

Schedule of Investments

December 31, 1988

(continued)

EQUITY	Number of Shares	Cost	Market
United States (continued):			
May Department Stores Co.	85,000	$ 3,680,550	$ 3,081,250
Middle South Utilities, Inc.	325,000	4,339,561	5,200,000
Morgan (J. P.) & Company, Inc.	260,100	1,245,401	9,070,987
NIPSCO Industries, Inc.	250,000	2,843,418	3,468,750
National Commerce Bancorporation	9,900	241,625	272,250
National Insurance Group	14,000	213,500	213,500
Network Equipment Technologies, Inc.	8,300	158,737	149,400
New York Times Co.	33,500	893,452	900,313
Nobel Insurance, Ltd.	45,000	264,500	213,750
Noble Drilling Corp.	30,000	176,250	146,250
Norsk Hydro, A.S., ADR	214,800	2,529,662	3,866,400
North Fork Bancorporation, Inc.	13,200	216,700	242,550
Nowsco Well Service, Ltd.	20,000	278,750	227,500
Pacific Gas & Electric Co.	100,000	1,579,774	1,750,000
Peoples Heritage Savings Bank	12,800	245,150	243,200
Philip Morris Companies, Inc.	60,000	3,129,391	6,112,500
Policy Management Systems, Inc.	18,000	418,500	436,500
Price Co.	41,200	1,449,750	1,545,000
Puritan Bennett Corp.	17,000	423,700	267,750
Quaker Oats Co.	24,000	1,026,625	1,275,000
Ralston Purina Co.	32,000	1,743,132	2,620,000
Regal Beloit Corp.	23,000	408,160	388,125
Roto-Rooter, Inc.	6,800	156,400	153,000
SHL Systemhouse, Inc.	27,800	233,750	243,250
Sbarro, Inc.	21,000	387,751	464,625
Schlumberger, Ltd.	55,675	743,457	1,816,397
Shell Transport & Trading Company, PLC	176,400	3,305,497	6,306,300
Simpson Industries, Inc.	24,000	371,350	390,000
Southern Co.	120,000	2,623,800	2,685,000
Standard Federal Bank	26,900	229,995	238,737
Strategic Planning Association	13,000	195,989	87,750
Telecredit, Inc.	20,500	661,940	697,000
Telxon Corp.	28,000	591,999	518,000
Texaco, Inc.	130,000	4,353,113	6,646,250
Trans World Music Corp.	5,000	122,500	120,000
Trinova Corp.	40,000	1,066,498	1,100,000
UNUM Corp.	84,500	1,724,907	2,281,500
Union Carbide Corp.	29,000	687,155	743,125
Unisys Corp.	61,400	2,006,087	1,726,875
U.S. West, Inc.	50,000	1,629,524	2,887,500
Versa Technologies, Inc.	22,000	391,700	357,500

Schedule of Investments

December 31, 1988

(continued)

EQUITY	Number of Shares	Cost	Market
United States (continued):			
W. H. Brady Co.	9,000	$ 222,375	$ 189,000
Warner-Lambert Co.	35,000	2,506,455	2,743,125
Werner Enterprises, Inc.	15,000	222,325	288,750
Australia and New Zealand:			
Boral, Ltd.	90,000	215,415	276,955
Fletcher Challenge, Ltd.	91,656	239,132	257,535
Jennings Industries, Ltd.	120,000	212,661	205,152
Kidston Gold Mines, Ltd.	150,000	461,720	314,139
Pacific Dunlop, Ltd.	7,422	4,431	29,057
Pioneer Concrete Services, Ltd.	90,000	181,072	190,022
Thomas Nationwide Transport, Ltd.	120,000	308,382	370,984
Westpac Banking Corp.	144,000	457,705	649,921
Canada and United Kingdom:			
Booker, PLC	116,372	738,414	796,536
British Aerospace, PLC	34,000	221,592	262,195
Cable and Wireless, PLC	100,235	599,732	682,462
Connaught Biosciences, Ltd.	12,500	162,125	278,250
Cognos, Inc.	25,600	414,600	182,552
Glaxo Holdings, PLC	25,000	455,701	482,541
Guinness, PLC	100,000	570,040	603,203
Hanson Trust, PLC	80,000	154,298	223,583
Jaguar, PLC	100,000	458,112	485,814
News International, PLC	20,000	170,777	77,297
Woolworth Holdings, PLC	70,000	298,723	302,144
Federal Republic of Germany:			
BASF, AG	1,400	219,077	221,177
Bayer, AG	2,114	316,864	365,530
Bayerische Motoren Werke, AG	900	306,119	265,615
Beiersdorf, AG	1,588	460,372	472,241
Commerzbank, AG	1,500	204,934	198,602
Continental, AG	3,500	510,373	533,821
Deutsche Bank, AG	1,000	254,753	317,375
Dresdner Bank, AG	3,333	474,292	569,171
Dresdner Bank, AG (warrants)	255	7,319	8,072
Fredmuhle-Nobel, AG	3,000	445,614	463,813
Hoeschst, AG	3,000	495,676	515,686
Hoeschst, AG (warrants)	2,000	171,178	192,622
Mannesmann, AG	3,000	201,715	358,209

Schedule of Investments

December 31, 1988

(continued)

EQUITY	Number of Shares	Cost	Market
Federal Republic of Germany (continued):			
Nixdorf Computer, AG, Preferred	600	$ 170,085	$ 99,825
Schering, AG	1,700	468,827	541,740
Siemens, AG	1,200	282,024	365,982
Siemens Western Finance, NV (warrants)	800	186,890	138,327
Volkswagen, AG	3,500	502,584	688,961
France, Italy and Netherlands:			
Aegon, NV	12,000	521,796	548,965
Air Liquide, S.A.	3,000	247,426	296,780
Amsterdam Rotterdam Bank, NV	16,000	603,753	644,949
Buhrmann-Tetterode, NV	4,615	97,156	131,923
Compagnie Bancaire, S.A.	7,000	440,888	623,121
Credit Foncier de France, S.A.	2,250	283,857	329,604
Elf Aquitaine, S.A.	10,000	435,829	642,444
Essilor International, S.A.	750	309,191	428,731
KLM	14,000	345,439	294,000
L'Oreal, S.A.	1,500	838,530	1,089,761
Midi (Cie du)	21	2,364	5,206
Philips Gloeilampenfabrieken, NV	28,000	527,881	476,328
STET, S.p.A.	100,000	241,839	293,103
Thomson, CSF	15,000	515,357	569,529
Hong Kong and Singapore:			
City Developments, Ltd. (warrants)	250,000	797	22,512
Dairy Farm International Holdings, Ltd.	380,000	149,288	291,989
Hong Kong and Shanghai Banking Corp.	322	396	264
Jardine Matheson and Co., Ltd.	76	94	142
Jardine Strategic Holding, Ltd.	70,680	91,805	87,801
Swire Pacific, Ltd.	165	164	401
Japan:			
Asahi Chemical, Ltd. (warrants)	8	17,600	17,600
Asahi Glass, Ltd. (warrants)	300	83,597	91,847
C. Itoh, Ltd. (warrants)	10	18,625	23,000
Canon, Inc.	12,000	136,699	142,983
Chiyoda Fire and Marine Insurance Co., Ltd.	35,000	274,134	282,687
Daiichi Seiyaku Co., Ltd.	7,000	148,233	164,574
Fanuc Co., Ltd.	4,000	198,157	190,324
Fuji Photo Film Co., Ltd.	10,000	242,627	285,486
Fujitsu, Ltd.	20,000	229,097	241,503
Hitachi, Ltd.	30,000	361,616	376,649

Schedule of Investments

December 31, 1988

(continued)

EQUITY	Number of Shares	Cost	Market
Japan (continued):			
Honda Motor Co., Ltd.	20,000	$ 218,388	$ 324,670
Ito-Yokado, Ltd.	7,000	247,928	250,780
Joshin Denki Co., Ltd.	15,000	278,242	280,688
Kansai Electric Power Co., Inc.	9,000	288,331	345,462
Kao Corp. (warrants)	100	92,629	122,501
Kinki Electrical Construction Co., Inc.	5,000	112,034	111,955
Kinki Nippon Railway, Ltd. (warrants)	40	86,500	79,000
Kubota, Ltd.	23,000	175,351	159,464
Kumagai Gumi Co., Ltd. (warrants)	14	45,500	53,900
Kyocera Corp.	2,000	84,956	82,367
Long-Term Credit Bank of Japan, Ltd.	2,000	320,228	342,263
Maeda Construction Co., Ltd.	11,000	116,563	124,910
Matsushita Electric Industrial Co., Ltd.	30,000	564,888	609,356
Mitsubishi Estate Co., Ltd.	6,000	146,674	127,149
Mitsubishi Heavy Industries, Ltd. (warrants)	44	100,238	88,000
Mitsui Real Estate, Ltd.	9,000	216,860	208,717
Mitsui Toatsu Chemicals, Inc.	23,000	160,992	152,659
Nippon Denso, Ltd. (warrants)	15	38,250	41,625
Nippon Shokubai Kagaku Kogyo Co., Ltd.	14,000	157,779	144,422
Nomura Securities, Ltd.	18,000	529,277	536,905
Osaka Gas Co., Ltd.	44,000	291,734	284,302
Seino Transportation Co., Ltd.	12,000	195,374	199,600
Sekisui Chemical Co., Ltd.	25,000	221,368	249,900
Sekisui House, Ltd. (warrants)	12	31,950	30,900
Shikoku Electric Power, Inc.	4,000	104,721	128,269
Shinetsu Chemical, Ltd.	12,000	161,006	160,256
Sony Corp.	13,000	569,152	745,382
Sumitomo Corp.	25,000	216,231	249,900
Sumitomo Electric Industries, Ltd.	7,000	79,247	80,608
Sumitomo Marine and Fire Insurance Co., Ltd.	16,000	173,467	176,569
Sumitomo Metal Industries, Ltd.	20,000	122,595	114,514
Sumitomo Metal Industries, Ltd. (warrants)	6	19,600	17,400
Taisho Marine and Fire Insurance Co., Ltd.	16,000	176,590	179,128
Taisho Pharmaceutical Co., Ltd.	10,000	162,862	156,737
Takashimaya, Ltd. (warrants)	13	38,350	39,650
Takeda Chemical Industries, Ltd.	8,000	172,753	169,532
Toa Nenryo Kogyo, K. K.	10,000	156,519	143,143
Tohoku Electric Power Co., Inc.	9,000	209,593	297,962
Tokyo Electric Power Co., Inc.	7,000	377,916	394,642
Toppan Printing Co., Ltd.	10,000	158,317	163,934
Toyota Motor Co., Ltd.	16,800	306,121	341,240

Schedule of Investments

December 31, 1988

(continued)

EQUITY	Number of Shares	Cost	Market
Japan (continued):			
Uny, Ltd.	7,000	$ 125,386	$ 117,553
Yakult Honsha Co., Ltd.	10,000	235,382	234,306
Yamanouchi Pharmaceutical, Ltd.	7,700	209,019	244,454
Yamatake-Honeywell Co., Ltd.	10,000	122,665	151,140
Yamazaki Baking Co., Ltd.	20,000	223,072	228,709
Yodogawa Steel Works, Ltd.	19,000	180,478	170,172
Yokogawa Electric, Ltd.	11,000	109,833	129,308
Norway, Sweden and Switzerland:			
BBC, Brown, Boveri and Cie	136	182,239	248,918
Ciba-Geigy, AG	400	495,201	559,068
Electrolux, AB	6,200	223,460	296,588
Hoffman LaRoche, AG	3	575,810	453,245
Nestle, AG (warrants)	1,050	484,630	1,132,113
Norsk Hydro, A.S.	28,800	438,306	517,655
Schweiz-Ruckversicherungs, AG	90	121,813	90,496
Schweizerischer Bankgesellschaft, AG	250	532,994	532,446
Zurich Versicherungs, AG	360	446,034	407,322
Total equity		229,577,339	303,086,500
OTHER			
CIGNA Real Estate Fund "T" Limited Partnership	5,000	5,000,000	5,741,123
CIIF II Business Trust	750	750,000	760,140
Endowment and Foundation Realty, Ltd.-JMB III	5,000	5,000,000	5,837,905
PCA Sammis Industrial Fund, Inc.	500	500,000	500,000
Total other		11,250,000	12,839,168
Total fixed income		230,222,105	225,160,284
Total investments		$ 471,049,444	$ 541,085,952

1988
Schedule of Grants and Appropriations

	Unpaid Dec. 31, 1987	1988 Authorized	1988 Payments	Unpaid Dec. 31, 1988
Alabama, University of	$ 100,000	—	$ 100,000	—
Albany State College	50,000	—	50,000	—
American Academy of Arts and Sciences	275,000	$ 30,000	255,000	$ 50,000
American Arbitration Association	—	30,000	30,000	—
American Association for the Advancement of Science	155,000	—	100,000	55,000
American Chemical Society	—	30,000	30,000	—
American Committee on U.S.-Soviet Relations	100,000	5,000	105,000	—
American Council of Learned Societies	30,000	—	30,000	—
American Economic Association	75,000	105,500	180,500	—
American Enterprise Institute	—	186,000	186,000	—
American Psychological Association	40,000	—	40,000	—
Amherst College	12,500	—	12,500	—
Arizona, University of	63,000	66,449	129,449	—
Arms Control Association	25,000	—	25,000	—
Association for Symbolic Logic, Inc.	—	23,000	23,000	—
Association of Governing Boards of Universities and Colleges	75,000	—	50,000	25,000
Bennett College	50,000	—	50,000	—
Boston University	37,500	—	37,500	—
Brandeis University	50,000	64,175	51,675	62,500
Brookings Institution	50,000	431,000	281,000	200,000
Brown University	103,500	110,020	176,020	37,500
Bryn Mawr College	150,000	—	150,000	—
Bucknell University	—	150,000	50,000	100,000
Calgary, University of	12,500	—	12,500	—
California, University of	967,000	1,529,446	1,854,696	641,750
California, University of, San Diego Foundation	50,000	—	50,000	—
California Institute of Technology	248,000	145,843	231,343	162,500
Carleton College	100,000	—	50,000	50,000
Carnegie Institution of Washington	12,500	—	12,500	—
Carnegie-Mellon University	90,000	130,846	220,846	—
Centenary College	—	14,500	14,500	—
Center for Advanced Study in the Behavioral Sciences	280,000	—	280,000	—
Center for Cultural and Technical Interchange Between East and West, Inc.	24,000	—	24,000	—

1988
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1987	1988 Authorized	1988 Payments	Unpaid Dec. 31, 1988
Center for National Policy	—	$ 25,000	$ 25,000	—
Center on Budget and Policy Priorities	—	150,000	100,000	$ 50,000
Centre for Economic Policy Research	—	300,000	100,000	200,000
Chicago, University of	$ 355,000	506,086	591,086	270,000
Chinatown Planning Council, Inc.	—	25,000	25,000	—
Claremont McKenna College	—	75,000	75,000	—
Claremont University Center	100,000	—	100,000	—
Colby College	150,000	30,000	180,000	—
Cold Spring Harbor Laboratory	88,500	—	88,500	—
Colgate University	150,000	—	75,000	75,000
Colorado, University of	107,500	26,000	133,500	—
Colorado State University	12,500	—	12,500	—
Columbia University	50,000	386,400	313,900	122,500
Committee for National Security	—	10,000	10,000	—
Connecticut, University of	12,500	—	12,500	—
Cooper Union for the Advancement of Science and Art	—	250,000	220,000	30,000
Cornell University	225,000	94,900	229,650	90,250
Council on Foundations, Inc.	—	24,700	24,700	—
Davidson College	50,000	—	—	50,000
Denver, University of	—	30,000	30,000	—
Dillard University	50,000	—	50,000	—
Duke University	1,083,000	1,794,038	2,395,038	482,000
Emory University	12,500	—	12,500	—
Exploratorium	100,000	—	100,000	—
Florida, University of	—	50,000	25,000	25,000
Florida State University	12,500	25,000	25,000	12,500
Foundation Center	180,000	—	120,000	60,000
Foundation for International Studies on Peace and Security	—	30,000	30,000	—
Foundation for Research in Economics and Education	55,000	—	55,000	—
Foundation for the Establishment of a Graduate School of Political Management	—	24,000	24,000	—
Franklin and Marshall College	50,000	—	50,000	—
Fund for the City of New York	60,000	—	30,000	30,000
George Mason University	—	30,000	30,000	—
George Washington University	—	30,000	30,000	—
Georgetown University	94,000	191,000	136,000	149,000
Global Outlook Education Institute	—	25,000	25,000	—

1988
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1987	1988 Authorized	1988 Payments	Unpaid Dec. 31, 1988
Grinnell College	$ 125,000	—	$ 50,000	$ 75,000
Hartford, University of	—	$ 21,000	21,000	—
Harvard University	1,213,500	1,669,940	1,770,690	1,112,750
Hawaii, University of	12,500	—	12,500	—
Houston, University of	75,000	—	50,000	25,000
Illinois, University of	87,500	160,500	182,750	65,250
Independent Sector	—	37,400	37,400	—
Indiana University Foundation	12,500	80,500	52,750	40,250
Institute for International Economics	100,000	375,000	100,000	375,000
Institute of International Education	100,000	—	100,000	—
Institute for Research on Public Policy	45,000	—	45,000	—
International Association for Research in Income and Wealth	66,000	12,000	56,000	22,000
International Society of Chemical Ecology	—	3,000	3,000	—
Iona College	37,500	—	37,500	—
Johns Hopkins University	185,500	80,000	240,500	25,000
LaGuardia Education Fund, Inc.	—	30,000	30,000	—
Lafayette College	100,000	—	—	100,000
London School of Economics and Political Science	—	230,000	—	230,000
Marine Biological Laboratory	20,000	82,000	102,000	—
Maryland, University of	47,000	19,144	66,144	—
Massachusetts Institute of Technology	921,500	693,500	1,417,500	197,500
Mathematical Association of America	—	115,000	—	115,000
McMaster University	12,500	—	12,500	—
Medical and Health Research Association of New York City, Inc.	50,000	500,000	300,000	250,000
Memorial Sloan-Kettering Cancer Center	1,000,000	—	500,000	500,000
Menlo College	—	18,500	18,500	—
Miami, University of	—	130,000	130,000	—
Michigan, University of	116,000	308,000	311,500	112,500
Minnesota, University of	—	588,000	340,000	248,000
Montreal, University of	—	25,000	12,500	12,500
Morehouse College	50,000	—	50,000	—
Morris Brown College	50,000	—	50,000	—
Mount Holyoke College	100,000	60,000	100,000	60,000
National Academy of Sciences	175,000	500,000	425,000	250,000
National Academy of Social Insurance	—	24,100	24,100	—
National Bureau of Economic Research, Inc.	421,500	30,000	301,500	150,000

1988
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1987	1988 Authorized	1988 Payments	Unpaid Dec. 31, 1988
National Commission on the Public Service	$ 75,000	—	$ 75,000	—
National Research Council	—	$ 150,000	—	$ 150,000
New Mexico, University of	—	22,000	22,000	—
New School for Social Research	75,000	20,000	95,000	—
New York Academy of Sciences	—	30,000	30,000	—
New York Regional Association of Grantmakers	—	7,125	7,125	—
New York University	229,500	50,000	254,500	25,000
North Carolina, University of	25,000	25,000	37,500	12,500
North Carolina Agricultural and Technical State University	—	150,000	50,000	100,000
Northeastern University	12,500	—	12,500	—
Northwestern University	62,500	40,825	90,825	12,500
Nuclear Control Institute	—	29,200	29,200	—
Oberlin College	—	162,500	87,500	75,000
Ohio State University	—	25,000	12,500	12,500
Oklahoma State University	—	25,000	12,500	12,500
Oregon, University of	25,000	25,000	37,500	12,500
Overseas Development Council	—	30,000	30,000	—
Paine College	50,000	—	50,000	—
Pennsylvania, University of	245,000	89,890	212,390	122,500
Pennsylvania State University	12,500	110,500	82,750	40,250
Pittsburgh, University of	12,500	175,000	75,000	112,500
Pomona College	—	60,000	—	60,000
Population Reference Bureau	—	30,000	30,000	—
Princeton University	321,500	762,880	924,380	160,000
Princeton University Press	60,150	—	60,150	—
Purdue University	37,500	—	37,500	—
Queen's University	—	80,500	40,250	40,250
Rand Corporation	100,000	485,500	210,500	375,000
Reed College	50,000	—	50,000	—
Rensselaer Polytechnic Institute	—	7,800	7,800	—
Research Foundation of State University of New York	529,000	837,205	966,205	400,000
Research Foundation of the City University of New York	12,500	—	12,500	—
Resources for the Future	—	30,000	30,000	—
Rice University	25,000	50,000	50,000	25,000
Rochester, University of	165,500	87,500	113,500	139,500
Rockefeller University	—	3,500	3,500	—
Rust College	—	30,000	30,000	—
Rutgers University	12,500	67,100	54,600	25,000

1988
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1987	1988 Authorized	1988 Payments	Unpaid Dec. 31, 1988
Rutgers University Foundation	—	$ 200,000	$ 75,000	$ 125,000
St. John's College	—	25,000	25,000	—
Salk Institute	—	50,000	25,000	25,000
Savannah State College	$ 50,000	60,000	50,000	60,000
Showa University Research Institute for Biomedicine in Florida	—	80,500	40,250	40,250
Smithsonian Institution	361,000	300,000	511,000	150,000
Social Science Research Council	185,000	—	45,000	140,000
South Carolina State College	50,000	—	50,000	—
Southern California, University of	12,500	—	12,500	—
Spelman College	215,000	60,000	215,000	60,000
Stanford University	582,500	445,110	746,610	281,000
Sussex, University of	—	148,000	148,000	—
Swarthmore College	—	150,000	50,000	100,000
Technical Education Research Centers, Inc.	—	30,000	30,000	—
Texas, University of	31,200	145,000	163,700	12,500
Texas A & M University	—	25,000	12,500	12,500
Toronto, University of	60,000	25,000	72,500	12,500
Trinity College	—	210,000	50,000	160,000
Tufts University	—	59,200	59,200	—
Tuskegee University	150,000	—	75,000	75,000
Union College	165,000	75,000	115,000	125,000
United Way of Tri-State	—	3,500	3,500	—
Urban Institute	60,000	—	60,000	—
Utah, University of	25,000	25,470	50,470	—
Vanderbilt University	—	20,000	20,000	—
Vassar College	50,000	—	50,000	—
Virginia, University of	—	38,000	25,500	12,500
Washington, University of	—	145,000	132,500	12,500
Washington University	12,500	105,500	65,250	52,750
Waterloo, University of	—	25,000	12,500	12,500
We Care About New York Inc.	—	10,000	10,000	—
Wellesley College	100,000	—	50,000	50,000
Western Ontario, University of	97,500	—	97,500	—
W. E. Upjohn Institute for Employment Research	85,000	65,000	85,000	65,000
WGBH Educational Foundation	—	50,000	50,000	—
Williams College	—	250,000	50,000	200,000
Wisconsin, University of	—	232,468	122,468	110,000
Wistar Institute of Anatomy and Biology	—	15,000	15,000	—

1988
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1987	1988 Authorized	1988 Payments	Unpaid Dec. 31, 1988
Yale University	$ 25,000	$ 114,400	$ 114,400	$ 25,000
Yeshiva University	—	25,000	12,500	12,500
Sloan Research Fellowships to be granted in ensuing year	2,250,000	—	—	2,250,000
Sloan Doctoral Dissertation Fellowships to be granted in ensuing year	1,000,000	—	—	1,000,000
Officer grant appropriation for grants in ensuing year	1,500,000	—	—	1,500,000
Book program	181,056	250,000	170,259	260,797
Other appropriations for grants and related expenses	1,020,748	(112,664)	86,362	821,722
	21,754,154	20,024,996	25,106,381	16,672,769
Reduction for grant transfers		(103,191)	(103,191)	
	$ 21,754,154	$ 19,921,805	$25,003,190	$16,672,769

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Index of Grants

Alfred P. Sloan Foundation

Founded in 1934 by Alfred P. Sloan, Jr.

Report for 1989
and
Programs and Interests of the Foundation
Summer 1990

Alfred P. Sloan, Jr.
1875—1966

The Life of Alfred P. Sloan, Jr., in Brief

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. duPont, 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 judgment, 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.

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** Elected President June 14, 1989

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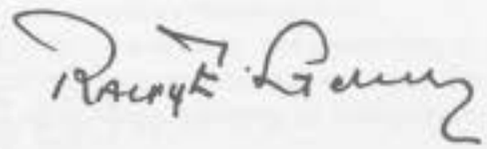
President's Statement

In June 1989, Albert F. Rees retired as trustee and president after ten years and many contributions to this Foundation. Inevitably then this has been a year of change, and change will be evident in the description of 1990 Foundation interests in this report.

However, the informed reader will also see the large measure of continuity with the past. The fundamental program interests, many of which have animated this Foundation from its beginnings, remain the same. The changes and adaptations of our program reflect the continuation of those interests in a world that is changing rapidly in its political, economic, and social structure and in its scientific and technical base.



President

Introduction

The Alfred P. Sloan Foundation was established in 1934 by Alfred P. Sloan, Jr., and incorporated in the state of Delaware. Over the last three years the annual total of grants and appropriations authorized by the Foundation has averaged $20.5 million. Assets at market value at the end of 1989 were $622 million.

The main interests of the Foundation can be summarized under four headings:

(1) Science and Technology
(2) Education in Science, Technology, and Management
(3) Competitiveness/Economics
(4) Other National Problems

More information can be found in the section of this report headed "Programs and Interests of the Foundation, Summer 1990."

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.

How to Apply for a Grant

Application can be made at any time for support of activities falling within the guidelines indicated above. Grants of $30,000 or less are made throughout the year by the officers of the Foundation; grants over that amount 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 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.

Grants and Activities in 1989

Science and Technology

Science and technology continue as main interests of the Foundation. Described below are the Sloan Research Fellowship and Doctoral Dissertation Programs, trustee and officer grants in support of research and related activities in molecular studies of evolution and cross-disciplinary population sciences, and a collection of trustee grants for direct support of scientific research and for projects on ethics in science and history of science and technology. As in past years, a substantial number of officer grants support special scientific symposia, workshops, and conferences.

Sloan Research Fellowships **$2,275,000**

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 approximately 2500 scientists at more than 180 colleges and universities and have accounted for expenditures of over $50 million. Sloan Research Fellows continue to receive numerous prizes and awards in recognition of their major research accomplishments. Fifteen Fellows have received Nobel prizes and eleven 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, currently $25,000 over a two-year term, 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 1989, the Foundation awarded Research Fellowships to 91 scholars at 55 institutions. To arrive at the final selections, some 400 nominations were reviewed by the following committees:

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

Economics
Rudiger W. Dornbusch, Massachusetts Institute of Technology
David M. Kreps, Stanford University
Christopher A. Sims, University of Minnesota

Mathematics
Barry Mazur, Harvard University
Richard B. Melrose, Massachusetts Institute of Technology
John W. Milnor, Institute for Advanced Study

Neuroscience
Gerald D. Fischbach, Washington University
Bruce S. McEwen, Rockefeller University
Robert H. Wurtz, National Eye Institute, NIH

Physics
Roger Dashen, University of California, San Diego
R. C. Dynes, AT&T Bell Laboratories
William Press, Harvard University

The following scholars, listed by institution and field, received the 1989 awards:

Arizona State University
Physics: Rogier A. Windhorst

Boston University
Physics: Assa Auerbach
Ryan Rohm

Brandeis University
Mathematics: Takahiro Shiota

Brown University
Mathematics: Panagiotis E. Souganidis
Neuroscience: Robert C. Drugan

California Institute of Technology
Chemistry: Geoffrey A. Blake

California, University of, Berkeley
Chemistry: Kenneth A. Dawson
Daniel M. Neumark
Economics: Christina D. Romer
Mathematics: Andreas Floer
Physics: Joel Fajans

California, University of, Davis
Mathematics: Joel Hass

California, University of, Irvine
Physics: Rognvald P. Garden

California, University of, Los Angeles
Mathematics: Jennifer Tour Chayes
Lincoln Chayes

California, University of, San Diego
Mathematics: Matthew A. Grayson
Hans Wenzl
Neuroscience: Charles Zuker
Physics: Daniel P. Arovas

California, University of, San Francisco
Chemistry: Peter Walter

California, University of, Santa Barbara
Physics: Jeffrey D. Richman

California, University of, Santa Cruz
Mathematics: Solomon Friedberg
Physics: Elise Knittle

Case Western Reserve University
Neuroscience: Robert H. Miller

Chicago, University of
Chemistry: Gregory L. Hillhouse
Economics: Kevin M. Murphy
Robert W. Vishny
Mathematics: Fang-Hua Lin
Jill C. Pipher

Colorado, University of
Chemistry: Rex T. Skodje
Physics: Patricia Rankin

Columbia University
Mathematics: Sidney I. Frankel

Cornell University
Physics: Veit Elser
Robert E. Thorne

Duke University
Mathematics: Leslie D. Saper

Emory University
Neuroscience: Marla B. Luskin

Florida State University
Chemistry: Marlie E. Krafft

Harvard University
Economics: Alberto Alesina
Mathematics: Zhihong Xia
Physics: Cumrun Vafa

Houston, University of
Chemistry: B. Montgomery Pettitt

Illinois, University of
Neuroscience: Susan E. Fahrbach

Iowa State University
Neuroscience: Philip G. Haydon

Iowa, University of
Chemistry: Richard F. Jordan

Kansas State University
Chemistry: Duy H. Hua

Louisiana State University
Chemistry: Leslie G. Butler

Maryland, University of
Neuroscience: Richard Payne

Massachusetts Institute of Technology
Mathematics: David J. Anick
Neuroscience: Christopher G. Atkeson
Physics: Katherine Freese
John M. Graybeal

Michigan, University of
Chemistry: Vincent L. Pecoraro
Mathematics: John W. Lott

Minnesota, University of
Chemistry: Margaret C. Etter

Montana State University
Chemistry: Thomas S. Livinghouse

New York University
Mathematics: Alain Sol Sznitman

Northwestern University
Mathematics: Keith Burns
Neuroscience: Mark A. Segraves
Physics: Fulvio Melia

Ohio State University
Chemistry: Anthony W. Czarnik

Oklahoma State University
Mathematics: Amit Ghosh

Oregon State University
Chemistry: Douglas A. Keszler

Pennsylvania State University
Chemistry: Andrew G. Ewing
Ken S. Feldman

Pennsylvania, University of
Neuroscience: Michael B. Robinson

Pittsburgh, University of
Chemistry: Rob D. Coalson

Princeton University
Economics: John Y. Campbell
Mathematics: Matei Machedon
Physics: Mansour Shayegan
Neil Turok

Purdue University
Chemistry: Timothy S. Zwier

Rochester, University of
Chemistry: Anne B. Myers
Economics: Jeffrey S. Banks
Physics: Yongli Gao

Salk Institute
Neuroscience: Thomas D. Albright

St. Louis University
Neuroscience: Rodrigo Andrade

State University of New York, Stony Brook
Physics: Vladimir J. Goldman

Temple University
Neuroscience: Lee-Yuan Liu-Chen

Texas, University of
Chemistry: Jonathan L. Sessler
Physics: Michael P. Marder

Texas, University of, Houston HSC
Neuroscience: Daniel J. Felleman

Utah, University of
Mathematics: Janos Kollar
Neuroscience: Gary J. Rose

Virginia, University of
Physics: Louis A. Bloomfield

Washington, University of
Chemistry: James M. Mayer
Neuroscience: Eliot A. Brenowitz

Wisconsin, University of
Economics: Kenneth D. West

Yale University
Economics: Barry Nalebuff
Physics: Nicholas Read
Subir Sachdev

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

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 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 290 graduate students and have accounted for expenditures of just over $5 million. In 1989, awards covering full tuition plus a stipend of $12,000 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
Zvi Griliches, Harvard University
Bengt Holmstrom, Yale University
Edward E. Leamer, University of California, Los Angeles

Mathematics
William Fulton, University of Chicago
Robert Gunning, Princeton University
Allen Hatcher, Cornell University

The following scholars, listed by institution and field, received the 1989 awards:

California Institute of Technology
Economics: Richard T. Boylan
Shawn E. Kantor

California, University of, Berkeley
Economics: Mark Steven Carey
Alfredo Marcos Kofman
Mathematics: Martin Robert Goldstern

California, University of, Los Angeles
Economics: Silverio Foresi
Mathematics: Sinai Robins

California, University of, San Diego
Mathematics: Steven J. Altschuler
Nantel Bergeron
Michael D. Slack

Carnegie-Mellon University
Economics: Susanne Lohmann

Chicago, University of
Economics: Anjini Kochar
Nathaniel Wilcox
Mathematics: Paul R. Boisen
Daniel Goldstein

Columbia University
Economics: Alwyn Young
Mathematics: Paul Lockhart
Richard A. Wentworth
Shouwu Zhang

Cornell University
Mathematics: Randolph McCarthy
Ambar Sengupta
Alberto G. Setti

Harvard University
Economics: Peter David Boone
David Nathan Weil
Mathematics: Edward Shpiz
Richard Stong

Massachusetts Institute of Technology
Economics: Janice C. Eberly
Mitchell A. Petersen
Mathematics: Shirong Lu
Dorshka C. Wylie

Michigan, University of
Economics: William Michael Baker

Minnesota, University of
Economics: Harald Uhlig

Northwestern University
Economics: Tai-Yeong Chung
Michael Suk-Young Chwe

Pennsylvania, University of
Mathematics: Zhiren Jin

Princeton University
Economics: David J. Genesove
John V. Leahy
Jeroen M. Swinkels
Mathematics: Scott Axelrod
Benji Fisher
John M. Sullivan

Rutgers University
Mathematics: Yuan Wang

Stanford University
Economics: Gillian K. Hadfield
Joel Waldfogel
Mathematics: Ulrike Luise Tillmann

State University of New York, Stony Brook
Mathematics: Zhongmin Shen

Virginia, University of
Economics: Donald Keith Sill

Yale University
Economics: Torben Andersen
Amanda Sue Bayer
Mathematics: Zeev Rudnick

Molecular Evolution

Powerful techniques of molecular biology are making it possible to study the evolutionary history encoded in the genetic complement of living species. Research in evolution need no longer rely solely upon the incomplete fossil record and the often hard-to-interpret evidence from morphological comparisons. Each of these well-established approaches continues to have its own special strengths, but both can now be checked against wholly new scientific evidence arising from the rapidly developing methods of molecular biology.

Starting in 1985, our grants in molecular studies of evolution have supported various research projects, scientific conferences, and intensive workshops designed to introduce the study of evolution into the research agendas of molecular biologists. During 1987 an annual postdoctoral fellowship program was initiated for young molecular and evolutionary biologists interested in developing the interdisciplinary skills necessary for molecular research on evolution. A corresponding sabbatical supplement awards program for established scientists was approved in 1989, with the first grants announced later that year.

During 1989 the following distinguished advisory committee continued to assist the Foundation in all aspects of this program:

Wesley M. Brown, Associate Professor of Biology, University of Michigan

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 at Los Angeles

Philip J. Regal, Professor of Ecology, University of Minnesota

Allan C. Wilson, Professor of Biochemistry, University of California at Berkeley

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

In 1989, the third year of this competitive fellowship program, applications again greatly exceeded the number of available awards. Each grant 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. (The actual grants were not officially made until early 1990, but are included here for the record.)

Awards are listed as follows: name and current affiliation of the fellow; name, department, and institution of the senior scientist in whose laboratory the postdoctoral research will be carried out.

Joy Bergelson, University of Washington; Professor Christopher J. Lamb, Department of Biology, Salk Institute

Walter W. Dimmick, Southern Illinois University; Professor Allan Larson, Department of Biology, Washington University

Beth A. Dombroskik, Johns Hopkins Hospital; Professor Haig H. Kazazian, Jr., Department of Pediatrics, Johns Hopkins School of Medicine

Scott L. Gardner, University of New Mexico; Professor Lawrence G. Abele, Department of Biological Sciences, Florida State University

Ki-Joong Kim, University of Texas at Austin; Professor Robert K. Jansen, Department of Ecology and Evolutionary Biology, University of Connecticut

Enrique P. Lessa, University of California at Berkeley; Professor James L. Patton, Department of Zoology, University of California at Berkeley

David R. Maddison, Harvard University; Professor Richard C. Lewontin, Department of Organismic and Evolutionary Biology, Harvard University

H. Allen Orr, Jr., University of Chicago; Professor Charles Langley, Center for Population Biology and Department of Genetics, University of California at Davis

Ronald A. Van Den Bussche, University of Idaho; Professor Holly A. Wichman, Department of Biological Sciences, University of Idaho

Linda Vigilant, University of California at Berkeley; Professor Henry Harpending, Department of Anthropology, Pennsylvania State University

Kenneth H. Wolfe, Trinity College, Ireland; Professor Jeffrey D. Palmer, Department of Biology, Indiana University

Sabbatical Awards Program in Molecular Evolution **$219,841**

This new 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.

Awards are listed as follows: name and current affiliation of the awardee; name, department, and institution of the scientist(s) in whose laboratory the sabbatical leave research will be carried out. (Some of these 1989 competition awards were not officially made until 1990, but all are listed here for the record.)

James C. Fogleman, University of Denver; Professor Ross J. MacIntyre, Section of Genetics and Development, Cornell University

James E. Haber, Brandeis University; Professor Allan C. Wilson, Department of Biochemistry, University of California at Berkeley

John C. LaDuke, University of North Dakota; Professor John Doebley, Department of Plant Biology, University of Minnesota

John M. Martinko, Southern Illinois University at Carbondale; Professor Jan Klein, Department of Microbiology and Immunology, University of Miami School of Medicine

Glenn M. Nagel, California State University at Fullerton; Professor Russell Doolittle, Center for Molecular Genetics, University of California at San Diego

Peter B. Stacey, University of New Mexico; Professors John Longmire and Scott Cram, Division of Life Sciences, Los Alamos National Laboratory

Linda D. Strausbaugh, University of Connecticut; Professors Robert DeSalle and Jeffrey Powell, Department of Biology, Yale University.

Trustee Grants in Molecular Evolution

Marine Biological Laboratory **$66,000**
Woods Hole, Massachusetts 02543

With our support, MBL designed and offered for the first time in 1988 a two-week special course in research methods and problems of molecular evolution directed toward evolutionary biologists. Positive evaluations from all involved and the existence of a large pool of prospective participants led to this grant supporting a second offering of the course in 1989. (Project director: Harlyn O. Halvorson, Director; Grant period: March 1989-February 1990.)

Wayne State University **$147,000**
Detroit, Michigan 48201

Dr. Roger Lewin, a biochemist and award-winning science writer, plans to write a book about molecular evolution. The impact of this relatively new orientation on evolutionary biology and genetics will receive special emphasis. The book is intended to be accessible to nonspecialists. This appears to be a timely point to bring the implications and potential of molecular studies of evolution to the attention of the wide audience of scientists and others interested in science. (Project director: Roger Lewin, Visiting Professor, Department of Anatomy and Cell Biology, School of Medicine; Grant period: April 1990-September 1993.)

We have been interested in encouraging attention by mathematical scientists to the analytic problems of molecular biology. The volume of molecular sequence data is increasing very rapidly but the mathematical methods to analyze similarities and regularities in such data have been slow to develop. In past years, a small number of officer grants have been made to bring this promising area of application to the attention of mathematicians and to offer support for those interested in spending some time at one of the centers where research in mathematics applied to molecular biology is underway. (See below for two 1989 officer grants for these purposes, one to Societal Institute of the Mathematical Sciences, the other to Stanford University.) Two trustee grants were also made this year:

University of Southern California **$50,000**
Los Angeles, California 90089

Whitehead Institute for Biomedical Research **$50,000**
Cambridge, Massachusetts 02142

These grants support seminars on the two coasts and joint national meetings at which mathematicians and molecular biologists from a number of universities

and laboratories will discuss ongoing research and seek to stimulate additional mathematical attention to this field. (Project directors: Michael S. Waterman, Professor of Mathematics and Molecular Biology, USC, and Eric Lander, Member, Whitehead Institute; Grant period: January 1990-June 1992.)

Officer Grants in Molecular Evolution

American Association for the Advancement of Science **$7,025**
Washington, D.C. 20005

Support for a symposium on "Molecular Basis of Biological Diversity" at the 1990 meetings of the AAAS. (Project directors: Elizabeth A. Zimmer, Associate Professor of Biochemistry and Adjunct Associate Professor of Botany, Louisiana State University, and Allan C. Wilson, Professor of Biochemistry, University of California, Berkeley; Grant period: December 1989-May 1990.)

Cold Spring Harbor Laboratory **$30,000**
Cold Spring Harbor, New York 11724

Support for a meeting on Molecular Clocks of Evolution. (Project director: James D. Watson, Director; Grant period: July 1989-March 1990.)

Societal Institute of the Mathematical Sciences **$16,500**
New Canaan, Connecticut 06840

Support for a conference on "The Role of Mathematics and Mathematicians in the Human Genome Project." (Project director: Donald L. Thomsen, Jr., President; Grant period: January 1989-December 1989.)

Stanford University **$24,000**
Stanford, California 94305

Partial support for a research appointment in mathematics applied to the human genome sequencing project. (Project director: Samuel Karlin, Professor of Mathematics; Grant period: August 1989-August 1991.)

University of California, Los Angeles **$20,400**
Los Angeles, California 90024

Support for a symposium on DNA-DNA Hybridization and Evolution. (Project directors: Clifford F. Brunk, Associate Professor of Cell and Molecular Biology, and Everett C. Olson, Professor of Zoology and Paleontology; Grant period: January 1989-June 1989.)

University of Maryland Foundation $30,000
College Park, Maryland 20742

Partial support for molecular symposia at the Fourth International Congress of Systematic and Evolutionary Biology. (Project director: Rita R. Colwell, Director, Maryland Biotechnology Institute and Professor of Microbiology; Grant period: December 1989-November 1990.)

Population Sciences

The Foundation has sought since 1985 to encourage scientific interest in cross-disciplinary population sciences. This initiative was based upon the realization that there was much parallel work but often only limited communication among the numerous disciplines in which population-level analysis is undertaken, including demography, ecology, economics, epidemiology, genetics, mathematics, and population biology. In these disciplines, quantitative techniques of various kinds are applied to the study of populations. Believing that much could be gained from joint work involving these separate scientific approaches, our support was designed to facilitate interaction and collaborative research in the population sciences among faculty members from the different disciplines. By the end of 1988, seven universities had received officer grants for initiating faculty seminars and other cross-disciplinary activities. Larger trustee grants in support of research projects had been awarded to University of California at Berkeley, University of California at Davis, University of Minnesota, and Stanford University. Stanford's program was renewed by a grant made last year. Two additional renewal grants are reported below.

Trustee Grants in Population Sciences

University of California, Berkeley $85,815
Berkeley, California 94720

Our 1986 grant supported research involving nonlinear population models in biology and demography by, among others, a mathematician, an entomologist, a demographer, and a population biologist. This grant will sustain two continuing research projects as additional long-term support is sought from government sources for the university's population sciences program. (Project director: Kenneth W. Wachter, Professor of Demography and Statistics, Institute of International Studies; Grant period: January 1990-December 1990.)

University of California, Davis $135,331
Davis, California 95615

Our UC-Davis 1987 grant has created ongoing, coherent research groups cutting across the normal departmental/disciplinary boundaries. The university has recently committed substantial funds to the creation of a new Center for Population Biology. This renewal grant supports research on four topics: extinctions of small populations; clonal organisms; insect-plant interactions; and human cultural evolution. (Project directors: Louis W. Botsford, Professor, Department of Wildlife and Fisheries Biology, Kevin J. Rice, Assistant Professor of Agronomy and Range Sciences, and Peter J. Richerson, Professor of Environmental Studies and Director, Institute of Ecology; Grant period: January 1990-December 1991.)

Officer Grants in Population Sciences

Rutgers University Foundation $10,000
New Brunswick, New Jersey 08903

Support for a Demographic History Conference on European Fertility Decline. (Project directors: John Gillis, Professor of History, Rutgers University, Louise A. Tilly, Professor of History and Sociology, New School for Social Research, and David Levine, Professor of History, Ontario Institute for Studies in Education; Grant period: February 1989-September 1989.)

University of Michigan $25,000
Ann Arbor, Michigan 48109

For the development of computer-based teaching materials in social demography. (Project director: William H. Frey, Population Studies Center and Department of Sociology; Grant period: September 1989-December 1990.)

Trustee Grants in Science and Technology

American Association for the Advancement of Science $61,482
Washington, D.C. 20005

The AAAS, with our support, has in recent years undertaken a project, now concluded, on issues of integrity and responsible conduct in science. They now wish to produce a culminating publication intended for broad distribution and drawn from project workshops, commissioned papers, and recommendations. Symposia on the findings will be organized at professional meetings of scientific as

well as legal societies. This supplementary grant will support these dissemination activities. (Project directors: Albert H. Teich and Mark S. Frankel, Acting Assistant Directors, Directorate for Science and Policy Program; Grant period: January 1990-December 1990.)

Association for Symbolic Logic **$60,000**
Urbana, Illinois 61801

In 1984, a grant of $106,000 was made to the ASL for a project involving the translation and publication of the work of the renowned mathematical logician Kurt Gödel. Two volumes, covering publications from 1929-1936 and 1937-1974 have been published and well-reviewed. This second grant will support the preparation of two additional volumes consisting of unpublished papers, texts of individual lectures, notes from Gödel's courses, excerpts from his scientific notebooks, and selected correspondence. (Project director: Solomon Feferman, Professor of Mathematics, Stanford University; Grant period: May 1989-June 1991.)

Harvard University **$150,000**
Cambridge, Massachusetts 02138

A 1988 grant to the Harvard School of Public Health supported a number of research projects within the Program for Technology Assessment in Health and Medicine. By way of illustration, one project dealt with meta-analysis, a method of systematically combining information from many different studies in order to extract conclusions not obtainable from the individual studies themselves. This renewal grant will support continued research of the technology assessment group. (Project director: Frederick Mosteller, Emeritus Professor, Harvard School of Public Health; Grant period: October 1989-June 1991.)

National Academy of Sciences **$75,000**
Washington, D.C. 20418

This grant partially supports a major study of the underlying issues arising out of allegations of misconduct and unethical practices in science, developed by the Committee on Science, Engineering and Public Policy, a joint entity of the National Academy of Science, the National Academy of Engineering, and the Institute of Medicine. Following a synthesis of all available evidence regarding those elements that have been encouraging or damaging scientific integrity, an attempt will be made to formulate a set of principles to guide the responsible conduct of science, including both the roles and responsibilities of individual scientists and also those of research institutions. (Project director: Rosemary Chalk, Study Director, Institute of Medicine; Grant period: July 1989-June 1991.)

New York University **$300,000**
New York, New York 10012

The Courant Institute of Mathematical Sciences at NYU is in a strong position to take advantage of the new opportunities now available to Soviet mathematicians and scientists for overseas travel and for collaborative research with their counterparts in the United States. Courant mathematicians already have close professional relationships with the strongest Soviet mathematicians. This grant supports academic-year visits of young scientists (mainly mathematicians and physicists) and shorter visits of distinguished senior scientists from the Soviet Union to the Courant Institute. (Project director: Peter D. Lax, Professor of Mathematics; Grant period: June 1989-August 1992.)

Smithsonian Institution **$258,000**
Washington, D.C. 20560

Annual grants starting in 1986 have supported a major undertaking by the Smithsonian to employ video technology to document the history of science and technology of our times. Videotaped footage has been created on subjects as varied as the first digital computer, the Manhattan Project, the early history of the Rand Corporation, twentieth century small arms development, and the Mariner flight to Venus. All projects provide a visual record of the Smithsonian's ongoing historical research undertakings. This is our final grant to support the videohistory project, it being expected that other funds will become available to the Smithsonian to keep the activity in place. (Project director: David DeVorkin, Committee Chairman, Videohistory Program; Grant period: December 1989-December 1991.)

American Institute of Physics $25,000
New York, New York 10017

Support of a Soviet-American Conference/Workshop on Chaos. (Project director: Kenneth W. Ford, Executive Director and CEO; Grant period: March 1989-December 1989.)

American Museum of Natural History $30,000
New York, New York 10024

Support for an International Symposium on the Analysis of Phylogenetic Relationships Among Mammals. (Project directors: Michael Novacek, Chairman, Department of Vertebrate Paleontology, and Frederick S. Szalay, Professor of Anthropology, Hunter College; Grant period: July 1989-December 1990.)

American Philosophical Society $27,000
Philadelphia, Pennsylvania 19106

Support for the publication of a book by Joseph S. Fruton entitled: *Contrasts in Scientific Style: Research Groups in Chemical and Biological Sciences.* (Project director: Herman H. Goldstine, Executive Officer; Grant period: August 1989-August 1990.)

American Physical Society $5,000
New York, New York 10017

A contribution to the I. I. Rabi Prize Fund for an award in atomic, molecular and optical physics. (Project director: William W. Havens, Jr., Executive Secretary.)

Boston University $30,000
Boston, Massachusetts 02215

For research on studies of the aerodynamics and acoustics of human speech production. (Project director: Herbert M. Teager, Professor of Medicine, Chief of Biomedical Engineering; Grant period: January 1990-December 1990.)

Cornell University $25,000
Ithaca, New York 14853

Support for a symposium on Science, Technology and Society. (Project director: Sheila Jasanoff, Director, Program on Science, Technology and Society; Grant period: January 1989-September 1989.)

Hebrew University of Jerusalem $25,000
Jerusalem, Israel 91904

Support of the Jerusalem Winter Schools for Theoretical Physics. (Project director: Steven Weinberg, Permanent Director, Jerusalem Winter Schools for Theoretical Physics, and Josey Regental Professor of Science, University of Texas at Austin; Grant period: March 1989-February 1990.)

History of Science Society $30,000
Worcester, Massachusetts 01609

For a special issue of *Osiris* on "Big Science." (Project director: Arnold Thackray, Editor, *Osiris;* Grant period: July 1989-December 1992.)

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

Partial support of the first national symposium on frontiers of science. (Project director: William Spindel, Senior Staff Officer for Special Projects; Grant period: January 1989-August 1989.)

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

For a project to evaluate the applicaton of DNA technology in forensics. (Project director: John E. Burris, Executive Director, Commission on Life Sciences; Grant period: October 1989-November 1990.)

National Foundation for History of Chemistry $30,000
Philadelphia, Pennsylvania 19104

Partial support of a conference on the history of modern chemical sciences and technologies. (Project director: Seymour H. Mauskopf, Professor of History, Duke University; Grant period: May 1989-June 1990.)

The Planetary Society $30,000
Pasadena, California 91106

Partial support of research for the 1994 Mars Mission. (Project director: Louis Friedman, Executive Director; Grant period: March 1989-September 1989.)

Rensselaer Polytechnic Institute **$25,000**
Troy, New York 12180

Support of a workshop on mathematical modeling and associated ethical problems. (Project director: William A. Wallace, Professor, Decision Sciences and Engineering Systems; Grant period: January 1989-December 1989.)

University of California, Irvine **$17,000**
Irvine, California 92717

For a conference on "The Effective Content of Mathematical Models in the Social Sciences". (Project director: R. Duncan Luce, Director, Irvine Research Unit in Mathematical Behavioral Sciences; Grant period: July 1989-October 1990.)

University of Chicago **$15,000**
Chicago, Illinois 60637

Partial support of a US-USSR symposium on algebraic geometry. (Project director: J. Peter May, Chairman, Department of Mathematics; Grant period: June 1989-December 1989.)

Education in Science, Technology, and Management

In this section we report on the eighth full year of the Foundation's New Liberal Arts Program. The program aims for a greater presence within the undergraduate liberal arts curriculum of quantitative reasoning and concepts of modern technology.

Also described below are a series of activities intended to increase public understanding of science and technology: the production of educational materials to accompany a television series on revolutionary developments in the life sciences; programs for science journalists; the Sloan Science Book Series; faculty workshops on nuclear weapons and arms control; and special exhibits at science museums. Two trustee grants support work with college mathematics teachers to help incorporate more effective use of the computer in their classrooms.

Summer institutes and fellowships continue as mainstays of the Minorities in Public Management Program. This program for students interested in careers in the public sector concludes in 1990 and explorations have been undertaken to identify possible directions for a new minority program.

Finally, we list a collection of officer grants supporting conferences, workshops, books, and curriculum development projects in science and engineering education.

New Liberal Arts

Annual reports since 1982 have chronicled the activities undertaken as part of the New Liberal Arts Program. They have all aimed to help undergraduate colleges offer their liberal arts students greater contact with quantitative reasoning throughout the curriculum and a better understanding of the basic concepts of modern technology.

The program began with small planning grants to 30 independent liberal arts colleges. Major awards of $250,000 subsequently went to 10 of the colleges, and presidential discretionary grants of $25,000 to the other 20 that had taken part in the first round of competition. Since then, grants have gone to a small number of universities, to many of the same 20 colleges that received discretionary grants, and to a dozen historically black institutions. All participating colleges were invited to submit proposals for renewal grants. The first renewals were made in 1985 and, as reported below, the process of reviewing renewals continued in 1989. The preparation of textbooks and other written materials based on successful new liberal arts courses, suitable for dissemination to interested faculty members at participating colleges and elsewhere, has become an important component of the program.

An advisory committee of the following persons continued to assist the Foundation in all phases of the New Liberal Arts Program:

Elting E. Morison, Professor Emeritus, Massachusetts Institute of Technology, Chairman of the Committee

David P. Billington, Professor of Civil Engineering, Princeton University

Nannerl O. Keohane, President, Wellesley College

William Kessen, Professor of Psychology, Yale University

C. Dwight Lahr, Professor of Mathematics, Dartmouth College

John G. Truxal, Distinguished Teaching Professor, Department of Technology and Society, State University of New York, Stony Brook

Trustee Grants in the New Liberal Arts

We were aware from the beginning of the New Liberal Arts Program that the educational reform we were inviting colleges to undertake could only succeed if they had the patience and staying power necessary to effect a fundamental change in the undergraduate curriculum. That meant the Foundation, too, had to commit itself for the long term and had to be ready to continue its support of the colleges that entered the program, provided they were making good progress. Certain conditions for renewal grants were stipulated, including a careful evaluation of activities under the first grant, plans for further faculty and course development and exposure of students to topics in technology, and a commitment from the colleges (with the exception of the historically black institutions) for matching funds.

Twenty-one colleges have received renewal grants in past years. The following colleges and universities participating in the program met the required conditions and received renewal grants, with amounts as indicated, in 1989:

Brandeis University **$170,000**
Waltham, Massachusetts 02254

(Project director: Charles A. Ziegler, Lecturer in Anthropology; Grant period: January 1990-December 1992.)

Claremont University Center **$350,000**
Claremont, California 91711

(Project directors: William P. Banks, Professor of Psychology, Pomona College, and Granville C. Henry, Professor of Mathematics and Philosophy, Claremont McKenna College; Grant period: July 1989-August 1992. Note: This grant supports New Liberal Arts activities at five Claremont colleges: Claremont McKenna, Harvey Mudd, Pitzer, Pomona, and Scripps.)

Middlebury College **$150,000**
Middlebury, Vermont 05753

(Project director: Jane Margaret O'Brien, Associate Provost and Associate Professor of Chemistry; Grant period: July 1989-August 1992.)

Reed College **$150,000**
Portland, Oregon 97202

(Project director: John Tomsich, Professor of History and Humanities; Grant period: June 1989-August 1992.)

Savannah State College **$75,000**
Savannah, Georgia 31404

(Project director: Gaye H. Hewitt, Associate Professor, Department of Social and Behavioral Sciences; Grant period: September 1989-August 1992.)

A Resource Center for the New Liberal Arts Program, located at the State University of New York, Stony Brook, was established in 1985. The Center has carried out many functions of vital importance to the Program: maintaining contact with project directors and faculty members at the NLA colleges; organizing summer faculty workshops; editing, publishing, and distributing the *NLA News*, a monthly newsletter devoted to the NLA Program; collecting and disseminating syllabi, teaching modules, monographs, and other course materials developed at the colleges and universities taking part in the program; administering the special-leave grant program; and representing the NLA Program to the outside world by contributing to publications, participating in professional meetings and conferences, and by other outreach activities.

Research Foundation of State University of New York **$280,000**
Albany, New York 12201

Three separate activities are supported: special-leave grants for 1990-91 ($138,600); a New Liberal Arts Visitor Program ($31,400); and a 1990 Northeastern New Liberal Arts Conference ($110,000).

Special-leave grants offer partial support for faculty members to spend up to an academic year on full-time curriculum projects. The Steering Committee for the SUNY-Stony Brook Resource Center, administrative agent for this grant program, reformulated the guidelines for these competitive awards to emphasize preparation of written course materials, including books for the New Liberal Arts Series (see below). The current grant will support six special-leave awards for 1990-91.

The New Liberal Arts Visitor Program is a new component of our effort to disseminate the results of the program to other colleges. Five faculty members from colleges distributed in different geographical regions, each well acquainted with the history and accomplishments of the program, will serve as visiting lecturers and consultants. They will make visits during the year to colleges and universities requesting information about the program and interested in curriculum development along New Liberal Arts lines.

The 1990 Northeastern Conference is another activity for dissemination of information about the New Liberal Arts to faculty members at colleges and universities beyond those that have been direct participants in the program. This grant provides for 60 participants from institutions in New Jersey, New York, and the five New England states. Leadership in organizing and conducting the conference and judging the proposed follow-on curriculum projects, for which modest funds are also provided by the grant, is in the hands of a committee chaired by Professor Truxal. The conference will emphasize four main topics of wide interest in higher education and in which there have been notable developments within the New Liberal Arts program: (1) science courses for the nonmajor; (2) introductory courses in applied mathematics and quantitative methods; (3) courses on single technologies suitable for liberal arts students; and (4) student projects and clinics. (Project directors: John G. Truxal, Distinguished Teaching Professor of Technology & Society, and Marian Visich, Jr., Associate Dean, College of Engineering & Applied Sciences, SUNY-Stony Brook; Grant period: July 1989-December 1991.)

Princeton University **$75,000**
Princeton, New Jersey 08544

The work of four Princeton faculty members has been supported under the New Liberal Art program: David Billington (Civil Engineering); Michael Mahoney (History of Science); Robert Mark (Architecture); and John Mulvey (Engineering/Applied Science). Their research on structures and machines, the development of software engineering, pre-modern building technology, and large-scale computer models for industrial and government policy-makers is at a point where it can be prepared in the form of books and monographs for New Liberal Arts courses. The current grant supports these writing projects. (Project director: David P. Billington, Professor of Civil Engineering; Grant period: January 1990-December 1990.)

An Officer Grant in the New Liberal Arts

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

(Project director: Frank P. Satlow, Executive Editor, The MIT Press; Grant period: January 1990-September 1991.)

Publication of books resulting from New Liberal Arts projects is an important way to spread new liberal arts themes and to make more likely the teaching of program-related courses by faculty at colleges throughout the country. A New Liberal Arts Series has therefore been established. All books in the series will be jointly published by The MIT Press and McGraw-Hill Publishing Company. A distinguished Editorial Advisory Board with the following members has been extremely helpful in getting this publication program underway and establishing high standards:

John G. Truxal, Distinguished Teaching Professor, Department of Technology and Society, SUNY-Stony Brook, Chairman

Joseph Bordogna, Alfred Fitler Moore Professor and Dean, School of Engineering and Applied Science, University of Pennsylvania

Robert W. Mann, Whitaker Professor of Biomedical Engineering, Massachusetts Institute of Technology

Merritt Roe Smith, Professor of The History of Technology, Massachusetts Institute of Technology

J. Ronald Spencer, Associate Academic Dean and Lecturer in History, Trinity College

Allen B. Tucker, Jr., Professor of Computer Science, Bowdoin College

The first four books published in the series are:

Light, Wind, and Structure: The Mystery of the Master Builders by Robert Mark

The Age of Electronic Messages by John G. Truxal

Medical Technology and Society: An Interdisciplinary Perspective by Joseph D. Bronzino, Vincent H. Smith, and Maurice L. Wade

Understanding Quantitative History by Loren Haskins and Kirk Jeffrey

Additional books are being prepared. Our grant is a modest subvention to enable the publishers to continue to include experimental and innovative books in the series and to have them attractively priced.

New Liberal Arts course materials in the form of monographs and extended syllabi have also been published. Further information about titles in these series is available from the New Liberal Arts Resource Center at SUNY-Stony Brook.

Science Book Program

Under this program, initiated in 1975, the Foundation invited outstanding scientists to write about their experiences and lives in science. Authors were encouraged to reflect on all aspects of their professional work and to write in such a way as to give laymen a better sense of what a life is like when it is devoted to science.

The following books have appeared in the series:

Disturbing the Universe by Freeman Dyson

Advice to a Young Scientist by Peter B. Medawar

The Youngest Science by Lewis Thomas

Haphazard Reality by Hendrik B. G. Casimir

In Search of Mind by Jerome Bruner

A Slot Machine, A Broken Test Tube by S. E. Luria

Enigmas of Chance by Marc Kac

Rabi: Scientist and Citizen by John S. Rigden

Alvarez: Adventures of a Physicist by Luis W. Alvarez

Making Weapons, Talking Peace by Herbert F. York

The Statue Within by François Jacob

In Praise of Imperfection by Rita Levi-Montalcini

What Mad Pursuit by Francis Crick

Memoirs of an Unregulated Economist by George J. Stigler

Astronomer by Chance by Sir Bernard Lovell

Models of My Life by Herbert A. Simon and *The Joy of Insight: a Life in Physics* by Victor F. Weisskopf will be published in 1991. Other books are in preparation, but no new authors are being commissioned and the series will be completed over the next two years.

In all aspects of this book program, the Foundation was ably assisted during 1989 by the following advisory committee:

Michael Bessie, Publisher, Cornelia & Michael Bessie Books, Chairman

Howard H. Hiatt, Professor of Medicine, Harvard Medical School and Harvard School of Public Health

Eric R. Kandel, University Professor of Physiology and Psychology, Columbia University

Daniel Kevles, Professor of History, California Institute of Technology

Robert Merton, University Professor Emeritus and Special Service Professor, Columbia University

Paul Samuelson, Institute Professor of Economics, Massachusetts Institute of Technology

Robert Sinsheimer, Chancellor Emeritus, University of California at Santa Cruz

Steven Weinberg, Josey Regental Professor of Science, University of Texas at Austin

Stephen White, Foundation Officer (retired), writer

Nuclear Weapons and Arms Control

The Foundation's activities in this area continued to be quite limited. The main purpose was to help college and university faculty members respond effectively to the very large number of undergraduates interested in instruction on the technology of nuclear weapons, the history of arms control, and national security policy. Holding faculty workshops on these topics at a number of sites around the country has proved to be an attractive and effective way to serve this purpose. Three of the four trustee grants reported in this section supported a last round of workshops. The fourth, for support of the 39th Pugwash Conference, also serves to broaden public understanding of nuclear and other world issues.

Massachusetts Institute of Technology — **$200,000**
Cambridge, Massachusetts 02142

University of California, San Diego — **$125,000**
La Jolla, California 92093

University of Miami — **$130,000**
Coral Gables, Florida 33124

Starting in 1983, we have made grants to MIT for annual summer workshops on nuclear weapons and arms control for college and university faculty members who are teaching courses and seminars on issues of the nuclear age and are interested in deepening their understanding of these complex subjects. In 1984,

a second such workshop was organized in San Diego, mainly for participants from the West. Since few faculty members from the southern states attended these summer workshops, a third intensive workshop was started in Miami early in 1986. These three grants supported a final set of workshops held on the east and west coasts during the summer of 1989 and one in Miami early in 1990. (Project directors: Jack Ruina, Professor of Electrical Engineering (MIT), Herbert F. York, Director Emeritus, Institute on Global Conflict and Cooperation, (UC, San Diego), Behram N. Kursunoglu, Director, Center for Theoretical Studies, (U. of Miami); Grant periods: February 1989-September 1990 (MIT and UC, San Diego), June 1989-June 1990 (U. of Miami).)

American Academy of Arts and Sciences **$75,000**
Cambridge, Massachusetts 02138

This grant partially supported the 39th Pugwash Conference on Science and World Affairs. The purpose of the Pugwash Conference (the name is taken from the location of the first meeting in 1957 in the village of Pugwash, Nova Scotia) has been to bring together, from around the world, influential scientists, scholars, and public figures concerned with reducing the danger of nuclear war. Pugwash priorities have now been extended to include a new emphasis on the interactions of environment, development, and security. The 39th conference was held in Cambridge, Massachusetts in July 1989, the first in the United States since 1961. (Project director: John P. Holden, Chairman, 39th Pugwash Conference and Professor, Energy and Resources Group, University of California, Berkeley; Grant period: April 1989-December 1989.)

Trustee Grants in Education in Science, Technology, and Management

The Computer Museum **$250,000**
Boston, Massachusetts 02210

New York Hall of Science **$262,000**
Corona, New York 11368

These two grants support the design and building of new exhibits. The Computer Museum will develop a new landmark exhibit centered on a giant, two-story replica of a personal computer. This Walk-Through Computer will create a complete environment designed to provide a basic understanding of the functions and operations of the various components of a modern computer. The New York Hall of Science is planning a major exhibit, "Hidden Kingdoms," to provide access to the microscopic realm and thus to the basis of biological science. Visitors will use hands-on modules involving new microscopic technologies, interactive computer animations, and photomicrographs. Our support will complete the development of the module on viruses. (Project directors: Oliver B.R. Strimpel, Executive Director, The Computer Museum, and Alan J. Friedman, Director, New York Hall of Science; Grant periods: November 1989-October 1990 and December 1989-December 1991.)

WGBH Educational Foundation **$400,000**
Boston, Massachusetts 02134

WGBH, Boston's public television station, has under development a project entitled "Life: Cracking the Code," a series of eight one-hour TV programs on the revolution in the life sciences. The series will also form the centerpiece for a college-level telecourse involving a broad array of ancillary print materials: a faculty guide, student study manual, and an anthology of selected articles on biotechnology and medicine. Overall direction is in the hands of WGBH's NOVA unit, producer of many award-winning science documentaries. MIT's Whitehead Institute for Biomedical Research is collaborating in all phases of the project. Our grant will be used mainly for components of the project other than TV production, i.e., for preparation, production, and distribution of the accompanying educational materials for colleges and universities. (Project director: Paula S. Apsell, Executive Producer, NOVA; Grant period: June 1989-December 1991.)

Cold Spring Harbor Laboratory **$150,000**
Cold Spring Harbor, New York 11724

This grant and the one following, as well as those to two science museums and WGBH described above, reflect the Foundation's interest in promoting the public understanding of science and technology. Previous grants to Cold Spring Harbor have supported workshops on scientific topics for selected groups of Congressional staff and science journalists. Topics have included: DNA technology in medicine, radon in the home, new reproductive technologies, and assessing environmental health risks. Participants have valued getting a quick but thorough review of a scientific topic with policy implications or news value. Our grant will extend this program for another three years. (Project director: Jan A. Witkowski, Director, Banbury Center; Grant period: July 1989-June 1992.)

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

A 1987 grant supported the establishment at the Harvard School of Public Health of a fellowship program for journalists. Three journalists who cover public health issues are selected each year to pursue projects and courses of study during a nine-month residency at Harvard. The program has been deemed an unqualified success by the participating fellows and by the faculty and graduate students of the HSPH. This grant renews our support for two additional years. (Project director: Jay Winsten, Director, Center for Health Communications, Harvard School of Public Health; Grant period: July 1990-June 1992.)

Dartmouth College **$82,000**
Hanover, New Hampshire 03755

University of North Carolina **$75,000**
Chapel Hill, North Carolina 27599

These grants support faculty workshops to encourage use of the computer as a teaching tool in the college mathematics classroom. Participants will be offered a week-long experience in which they will see demonstrations of teaching with a computer, have ample opportunity to experiment with a wide variety of software, and be able to practice using the computer in teaching a class. Each workshop participant will be required to have available a suitably equipped classroom along with departmental approval to redesign an existing course and to experiment with computer use in the classroom during the 1990-91 academic year. (Project directors: John G. Kemeny, Emeritus Professor of Mathematics and Computer Science, Dartmouth, and William H. Graves, Professor of Mathematics and Director, Institute for Academic Technology, UNC; Grant period: November 1989-October 1990.)

University of California, Berkeley **$175,000**
Berkeley, California 94720

A 1988 grant to Berkeley supported the first six-week summer program for minority students with outstanding mathematics records in their first two years of college study. Minorities are severely underrepresented among college majors in the physical and mathematical sciences. Our grant funded the experimental program in the expectation that carefully presented seminars on special topics in mathematics and study with peers selected in a national competition, together with counseling and other supportive summer activities, will lead more of these students to continue as majors and thus result in a growing number of minority students bound for graduate study in mathematical sciences. The current renewal grant supports a second such program planned for summer 1990.

Also covered by this grant is the planning by Uri Treisman of a research project to study the influences on students in their choice of mathematics and science, initially as a field of study and ultimately as a career. He sees this as pilot work that will lead to a plan for a broader national study of issues concerning career choices of college students. (Project directors: Leon A. Henkin, Professor of Mathematics, and Philip Uri Treisman, Director, Charles A. Dana Center for Mathematics and Science Education; Grant period: January 1990-December 1990.)

Program for Minorities in Public Management

During 1989 the Foundation continued to cooperate with the Association for Public Policy Analysis and Management (APPAM) in a program to increase the flow of minority students into high-quality graduate schools of public management. This is the ninth and last year of the program, whose history has been described in previous annual reports. Summer institutes for minority students between their junior and senior years in college, one component of the program, were concluded in 1988.

Post-Senior Year Summer Institutes **$567,000**

These intensive seven-week summer programs are restricted to students of high promise who have successfully completed one of the post-junior year institutes and who have been accepted by an APPAM school for graduate study the following fall. The subjects studied are economics, mathematics, and expository writing, all aimed at helping the student succeed in first-rate graduate programs. The two post-senior year institutes in 1989 were held, as in previous years, at Harvard ($450,000 for 77 students) and at the Rand Graduate School ($117,000 for 18 students):

Harvard University
Cambridge, Massachusetts 02138
(Project director: Ronald F. Ferguson, Associate Professor, John F. Kennedy School of Government.)

Rand Corporation
Santa Monica, California 90406
(Project director: Charles Wolf, Jr., Dean of the Rand Graduate School.)

Duke University **$2,560,000**
Durham, North Carolina 27706

The third component of our program for minorities in public management is fellowship support for those students who successfully complete one of the summer institutes and enroll in an APPAM graduate program. The Foundation meets the cost of their first year of graduate school. In the student's second year (almost all are in two-year Master's programs) support is provided by the graduate institution. In 1989-90, the ninth and last year for this fellowship program, there were 153 fellows enrolled in 22 APPAM graduate schools. Slightly more than

half were women; fifty percent were Black, thirty percent Hispanic, and most of the remainder were Asian, with a few American Indians. As in past years, this grant was administered by Duke University on behalf of the participating APPAM schools. (Project director: Dante Noto, Assistant Treasurer, APPAM; Grant period: July 1989-July 1990.)

Graduate School of Political Management $207,000
New York, New York 10010

New School for Social Research $225,000
New York, New York 10011

New York University $225,000
New York, New York 10011

Both the New School and NYU have recently started training programs at the master's level specifically aimed at managers of non-profit organizations. The curricula are similar to those of public management programs, but include courses concerned with such special aspects of non-profits as dealing with trustees, managing volunteer work forces, philanthropic law, and fund-raising. The corresponding program at the Graduate School of Public Management is designed for those who want to manage campaigns and includes course work in polling, campaign finance, lobbying, advertising, and ethics. Our grants will pay the tuition for minority students in these programs. (Project directors: F. Christopher Arterton, Dean, GSPM; Richard Schaffer, Dean, NSSR; and Howard Newman, Dean, Graduate School of Public Administration, NYU; Grant periods: July 1989-December 1992.)

Officer Grants in Education in Science, Technology, and Management

American Academy of Arts & Sciences $15,000
Cambridge, Massachusetts 02138

Support for publication of a report on The Tritium Factor. (Project director: Jeffrey Boutwell, Staff Director of The Committee on International Security Studies; Grant period: April 1989-November 1989.)

Bay Area Video Coalition, Inc. $25,000
San Raphael, California 94915

Support for a documentary film on the life of Leo Szilard. (Project director: Helen Weiss, Producer; Grant period: June 1989-March 1990.)

Bowdoin College $20,000
Brunswick, Maine 04011

For curriculum development in computer science. (Project director: Allen B. Tucker, Professor and Chair, Department of Computer Science; Grant period: June 1989-December 1990.)

Consortium for Mathematics and its Applications $25,000
Arlington, Massachusetts 02174

For a conference on the teaching of geometry at the college level. (Project director: Solomon A. Garfunkel, Executive Director; Grant period: October 1989-September 1990.)

Educational Foundation for Nuclear Science $27,500
Chicago, Illinois 60637

Support for a series of articles on nuclear weapons production. (Project director: Len Ackland, Editor, *Bulletin of the Atomic Scientists*; Grant period: February 1989-February 1990.)

Greater Washington Educational Telecommunications Associations, Inc. $30,000
Arlington, Virginia 32206

Support for a television program on George Shultz. (Project director: Gerald Slater, Executive Vice President; Grant period: January 1989-March 1989.)

Harvard University $15,000
Cambridge, Massachusetts 02138

Partial sponsorship of "The Changing University and the Education of Scientists and Engineers: An International Workshop." (Project director: Dorothy S. Zinberg, Lecturer in the Science, Technology and Public Policy Program; Grant period: January 1990-August 1990.)

Harvey Mudd College $29,500
Claremont, California 91711

For review and evaluation of the core engineering curriculum. (Project director: Anthony Bright, Professor of Engineering; Grant period: June 1989-December 1990.)

Howard University **$30,000**
Washington, D.C. 20059

Support for minority student internships in public management. (Project director: O. Rudolph Aggrey, Director, Patricia Roberts Harris Public Affairs Program; Grant period: February 1989-December 1990.)

Lawrence University **$24,000**
Appleton, Wisconsin 54912

For a conference on computational physics in the undergraduate curriculum. (Project director: David M. Cook, Professor of Physics; Grant period: January 1990-December 1990.)

Massachusetts Institute of Technology **$28,000**
Cambridge, Massachusetts 02139

For the development of interactive computer displays to help teach quantum mechanics and atomic physics. (Project director: Edwin F. Taylor, Senior Research Scientist, Department of Physics; Grant period: July 1989-December 1990.)

Oberlin College **$25,000**
Oberlin, Ohio 44074

Support for a study of the undergraduate major in economics. (Project director: Hirschel Kasper, Professor of Economics; Grant period: May 1989-December 1989.)

Rockefeller University **$10,000**
New York, New York 10021

Additional support for completion of a book on Niels Bohr. (Project director: Abraham Pais, Professor of Physics; Grant period: November 1989-June 1990.)

Rockefeller University **$8,000**
New York, New York 10021

Support for a scientific biography of physician Sir Archibald Edward Garrod. (Project director: Alexander G. Bearn, Professor Emeritus; Grant period: January 1989-January 1991.)

Competitiveness/Economics

A new Foundation focus on industrial competitiveness led to a number of major grants approved in the latter half of 1989. The goal of this program is to contribute to understanding of the basic forces making for American economic prosperity in the increasingly competitive world economy. The program, still under development, is further described in the section of this report entitled "Programs and Interests of the Foundation, Summer 1990."

As part of this new focus, our ongoing support of research in economics will become an important part of the competitiveness program which will, however, also contain major new elements. The trustee and officer grants described below reflect the fact that 1989 has been a transition year in which this shift in emphasis was just begun.

Trustee Grants in Competitiveness

University of California, Berkeley **$2,972,250**
Berkeley, California 94720

Scholars from a variety of disciplines, especially economics, management, and engineering, at the University of California at Berkeley, the Technology and Economic Growth Program at Stanford University's Center for Economic Policy Research, Columbia University, the Harvard Business School, and the Sloan School of Management of MIT, have joined together to carry out a research program on industrial competitiveness and relative U.S. performance in the international economy. Working with the consortium will be major American companies, including General Electric, General Motors, Hewlett Packard, IBM, and Xerox. The entire program, involving workshops, faculty exchanges, graduate training, conferences, and a publication series, will be overseen by the Consortium on Competitiveness and Cooperation at Berkeley's Haas School of Business, directed by Professor David Teece. Research on how organizations and management affect and are affected by technological progress and on the factors influencing productivity growth at the level of the firm, the industry, and the nation will be pursued as part of the program. The Consortium will disseminate its findings widely to government and industry and seek to influence the professional and graduate training of the managers, engineers, and social scientists who will be dealing with these issues in the future. (Project director: David J. Teece, Director, Center for Research in Management, and Mitsubishi Bank Professor of International Business and Finance; Grant period: January 1990-December 1993.)

National Academy of Engineering Fund **$600,000**
Washington, D.C. 20418

This project will study the technological aspects of global production and information flow, and assess the impact of this global interdependence on U.S. national interests. The kind of questions that arise include: how will international coopera-

tion and international competition affect direct national support of U.S. commercial technology?; what is the nature of this support in other nations?; how do companies (and countries) capture returns on globally available technology?; how does foreign direct investment affect U.S. technological capability? These issues and others will be the topics of symposia to be held by the NAE over the next three years, during which time panels of NAE members and participants from industry, management and economics will conduct more detailed policy studies. They will focus on two major subjects: public policies and private practices for controlling and benefiting from international flows of technology; and domestic technology policy options in a global economy. It is expected that these studies will produce reports with policy recommendations. (Project director: Bruce R. Guile, Director; Grant period: January 1990-December 1992.)

United Nations Association of the USA **$100,000**
New York, New York 10017

The Association's Economic Policy Council, as part of a study entitled "Competing in a Global Market: The Challenge to Business and Labor," is taking a new look at formal labor-management cooperation. The aim is to understand better why such cooperation remains so limited despite widespread support for the idea and the claims made on its behalf. Interviews are planned with shop stewards, local presidents, grievance chairmen and others on the labor side, as well as with supervisors, managers, and vice-presidents for operations on the management side. The group will then develop policy recommendations toward the end of raising U.S. competitiveness through better human resource management systems. (Project director: Steve Sleigh, Research Consultant; Grant period: October 1989-September 1990.)

Officer Grants in Competitiveness

Brown University **$30,000**
Providence, Rhode Island 02912

Support for a conference on the changing skills required by workers entering the job market and the "mismatch hypothesis." (Project director: Frank Levy, Professor of Public Affairs, University of Maryland; Grant period: November 1989-October 1990.)

Carnegie-Mellon University **$26,000**
Pittsburgh, Pennsylvania 15213

Support for a research project on "Productivity, Flexibility and Product Quality Differences Associated with the Use of Programmable Machine Tools." (Project director: Maryellen Kelley, Associate Professor of Management, School of Urban and Public Affairs; Grant period: January 1989-January 1990.)

Harvard University **$23,600**
Cambridge, Massachusetts 02138

Support for a conference on the results of a study on the gap between average and best-practice productivity in various industries in different countries. (Project director: Richard E. Caves, Professor of Economics and Business Administration; Grant period: July 1989-December 1990.)

National Academy of Sciences **$28,000**
Washington, D.C. 20418

Support for a bilateral dialog on symmetrical access to precompetitive research in Japan and the United States. (Project director: Martha C. Harris, Director, Office of Japan Affairs, National Research Council; Grant period: April 1989-April 1990.)

Trustee Grants in Economics

Carnegie-Mellon University **$255,000**
Pittsburgh, Pennsylvania 15213

The CMU Political Economy Program offers courses taught by economists and political scientists as part of the Ph.D. program in economics and the M.S. programs in industrial administration and urban and public affairs. A substantial research program is underway combining the economist's modeling techniques and the political scientist's analysis of policy processes. Research topics include government size and growth, decisions to vote or take collective action, mobility of citizens among jurisdictions, community development and land use controls, utility regulation, taxes, and tariffs. This grant will support junior faculty released time, summer stipends, and graduate student fellowships. (Project director: Allan H. Meltzer, Professor of Political Economy and Public Policy; Grant period: February 1989-June 1992.)

Cornell University **$60,000**
Ithaca, New York 14853

University of Colorado Foundation, Inc. **$90,000**
Boulder, Colorado 80309

Since 1985, the Foundation has had a program in behavioral economics, which is now operated and funded jointly with the Russell Sage Foundation. The purpose of the program is to support research in economics that develops and tests models using a broader range of behavioral theories than the traditional maximization assumptions of classical economics. The following advisory committee assisted the Foundation in reviewing 1989 research proposals: Robert Abelson (Yale),

William J. Baumol (Princeton), Howard Raiffa (Harvard Business School), and Thomas Schelling (Harvard). Two projects were recommended for funding. Professor Frank will use data from a survey of Cornell graduates to test the theory that people will accept lower compensation for work that meets with social approval, a theory that goes back to Adam Smith but has seldom been tested. At Boulder, Professors McClelland (psychology) and Schulze (economics) will examine a nonoptimal decision rule they call the "maximin strategy" in which people, faced with uncertainty, behave as if the worst outcome will occur, ignoring the probabilities of other alternatives almost entirely. They therefore tend to make choices that minimize the worst outcome. As part of a larger project involving field studies on environmental hazard valuation, complementary laboratory experiments will be carried out with our grant in order to pin down the conditions under which maximin strategies are adopted. (Project directors: Robert H. Frank, Professor of Economics, Cornell, and Gary H. McClelland, Associate Professor of Psychology, Colorado; Grant period: July 1989-July 1991.)

London School of Economics and Political Science **$150,000**
London WC2A, 2AE, England

Until the 1970's, unemployment rates in most of Europe were much lower than in North America. In the past decade, however, high unemployment has been one of the most pressing problems of the European Community, at a time when unemployment rates outside the Community have been lower and falling. A number of explanations for this high unemployment have been advanced by economists, but there has been no agreement on which are the most relevant. Partially supported by this grant, researchers from twelve European countries will be brought together and use a common framework to examine the role of a number of possible causal factors on unemployment in each of their countries. Two working conferences are planned together with a final meeting to bring together and draw conclusions from the country studies. (Project director: Richard Layard, Professor; Grant period: April 1989-December 1992.)

Manpower Demonstration Research Corporation **$90,000**
New York, New York 10016

Recent research has demonstrated how difficult it is to obtain credible assessments of the effectiveness of employment and training programs. Yet demands for greater accountability increase as more government funds are allocated for such programs, often directed at welfare recipients. Experiments using random assignment of eligible program participants into experimental and control groups provide reliable estimates of program impact, but these research designs interfere with program operations, are burdensome to carry out, and require denial of services to those in the control group. One strategy for testing new empirical assessment techniques that do not employ random assignment is to apply them to data generated for an experiment and then to compare the new estimates to the experimental estimates. MDRC's Demonstration of State Work/Welfare Initiatives

provides a uniquely appropriate data base for such a research project. It contains information on more than 50,000 people, generated from experimental evaluations of welfare employment programs in eight states. These data will be used to develop and test nonexperimental methods of estimating the impact of programs on employment, earnings, and welfare status. (Project director: Daniel Friedlander, Senior Research Associate; Grant period: October 1989-April 1991.)

Massachusetts Institute of Technology **$133,000**
Cambridge, Massachusetts 02139

MIT's economics department proposes to make visiting appointments to social scientists from disciplines such as political science, psychology, and sociology. These visitors would reside for a year in the economics department to teach subjects in their discipline to economics faculty and graduate students, direct a workshop on topics related to the interface between economics and their discipline, and work with faculty members in the department interested in their field. Our grant will start this interdisciplinary teaching and research between economics and other social sciences by supporting the visit of a political scientist, Howard Rosenthal of Carnegie-Mellon, to the MIT economics department during 1989-90. (Project director: Paul L. Joskow, Professor of Economics; Grant period: February 1989-February 1991.)

National Bureau of Economic Research, Inc. **$150,000**
Cambridge, Massachusetts 02138

For the past three years, the Foundation has financed a major program of research on empirical macroeconomics at the NBER. A key element of this program has been the Annual Research Conference on Applied Macroeconomics. These annual conferences have encouraged empirical research on macroeconomics by commissioning papers by outstanding economists. They have also served to encourage serious debate by bringing together economists of many different schools. Rapid publication of the annual conference volume by The MIT Press has helped to communicate results very widely in the United States and abroad. This grant renews support of the program for two more years. (Project director: Martin Feldstein, President; Grant period: July 1989-July 1991.)

National Bureau of Economic Research, Inc. **$150,000**
Stanford, California 94305

The NBER will examine differences in tax structure between Canada and the United States in order to evaluate both current and future pressures for harmonization of tax rates and bases in the two countries, particularly in light of the Canada-U.S. Free Trade Agreement. The project also aims to examine comparative tax reform experience between the two countries, evaluating similarities and differences in both processes and outcomes, and assessing longer term implications. It is planned to publish project papers in a special issue of the *National Tax Journal*. (Project

directors: John B. Shoven, Professor of Economics, Stanford University, and John Whalley, Professor of Economics, The University of Western Ontario; Grant period: April 1989-April 1991.)

Princeton University **$308,561**
Princeton, New Jersey 08544

This grant supports a three-year study of business pricing behavior based on a large number of detailed interviews with actual price setters. In macroeconomics in general, and in the study of business cycles in particular, one of the paramount questions is why industrial prices react so sluggishly to the cycles of boom and bust. Why is it that qualities like production and employment move a lot while prices move a little? Theories abound, but this study breaks new ground by asking the people who set prices why they think prices are sticky over business cycles. The objectives of the study are twofold: (1) To narrow the range of admissible theorizing by exposing practitioners to the theories (translated into plain English) and seeing how they react. Which ideas make sense to actual price setters and which describe what really goes on? (2) Since in all likelihood several theories will receive some support from the survey, it is important to learn which kinds of firms display which kinds of behavior. What bearing do characteristics like firm size, industry, etc., have on the way price decisions are made? The study will thus test theories against the realities of industrial practice. (Project director: Alan S. Blinder, Professor of Economics; Grant period: December 1989-December 1992.)

Resources for the Future **$250,000**
Washington, D.C. 20036

Earlier applications of benefit-cost analysis were to water resources development projects—dams, locks, irrigation systems—of a "bricks and mortar" nature. The outputs of those projects were generally marketable, local in geographic scope, immediate in time, and certain in nature. Now, however, benefit-cost analysis is being asked to inform decisions of a wholly different sort. These include the proposed regulation of so-called "greenhouse gases," chemical carcinogens and mutagens, contaminants harmful to ecosystems, and pollutants causing aesthetic damages such as visibility impairment. For these problems, impacts are highly uncertain, often global in scope, delayed in time, and non-market in nature. This project will describe the current state-of-the-art in benefit-cost analysis, assess its ability to deal with these new problems, identify opportunities for improvement, and draw overall conclusions. (Project director: Paul R. Portney, Director, Center for Risk Management; Grant period: June 1989-July 1991.)

University of Western Ontario **$170,000**
London, Ontario N6A 5C2

In 1986, the University of Western Ontario received one of the competitively-awarded grants for a workshop in international economics. Its economics depart-

ment has few equals in terms of the number of scholars working on aspects of international economics and the diversity of their research interests, which range from the role of international trade in the historical development of nations to the international effects of fiscal deficits and the consequences of multinational investment. They are now training some of the best young international economists. This grant renews the workshop program for another two years. (Project director: James R. Melvin, Professor of Economics; Grant period: July 1989-June 1991.)

Officer Grants in Economics

Brookings Institution **$25,000**
Washington, D.C. 20036

Support for a conference on Alternative Trade Strategies for the United States in the 1990's. (Project director: Charles L. Schultze, Director, Economic Studies Program; Grant period: August 1989-August 1990.)

Columbia University **$23,913**
New York, New York 10027

For a special issue of the *Journal of Labor Economics*. (Project director: David E. Bloom, Professor of Economics; Grant period: July 1989-July 1991.)

Harvard University **$25,000**
Cambridge, Massachusetts 02138

Support for the second half of the Latin American Debt Conference. (Project director: Shirley Williams, Acting Director, Institute of Politics, JFK School of Government; Grant period: April 1989-October 1989.)

Houston Area Research Center **$10,000**
The Woodlands, Texas 77381

Partial support for a conference and edited book on U.S./Mexico Industrial Integration. (Project director: Jurgen Schmandt, Director, Center for Growth Studies; Grant period: October 1989-June 1990.)

Massachusetts Institute of Technology **$20,000**
Cambridge, Massachusetts 02139

Support for publication of volume six of the *Collected Scientific Papers* of Paul A. Samuelson. (Project director: Paul A. Samuelson, Professor of Economics; Grant period: January 1989-January 1993.)

Princeton University $2,200
Princeton, New Jersey 08544

Support for East European economists to attend a conference in Prague. (Project director: Richard E. Quandt, Professor of Economics; Grant period: January 1989-June 1989.)

University of Chicago $25,000
Chicago, Illinois 60637

For a study of the Japanese stock market. (Project director: Kenneth R. French, Professor of Finance; Grant period: February 1989-June 1990.)

University of Michigan $20,000
Ann Arbor, Michigan 48109

Support for a research conference to evaluate the economic impact of the Tax Reform Act of 1986. (Project director: Joel B. Slemrod, Director, Office of Tax Policy Research, School of Business Administration; Grant period: January 1989-January 1990.)

University of Michigan $25,000
Ann Arbor, Michigan 48109

Partial support for conversion into computer-readable files of information from the 1935-36 Survey of Cost of Living of Industrial Workers in the U.S. (Project director: Jerome M. Clubb, Executive Director, Inter-University Consortium for Political and Social Research; Grant period: March 1989-March 1990.)

University of Rochester $30,000
Rochester, New York 14627

For support of a study of regulation policies, 1979-89. (Project director: Paul MacAvoy, Dean, William E. Simon Graduate School of Business Administration; Grant period: April 1989-December 1990.)

University of Wisconsin $10,000
Madison, Wisconsin 53706

Support for an issue of *Focus* on "Approaches to Analyzing Poverty: Summary of the Conference in Honor of Robert J. Lampman." (Project director: Robert H. Haveman, Professor of Economics; Grant period: March 1989-June 1990.)

Other National Problems

Problems associated with industrial competitiveness were the subject of grants summarized in the preceding section of this report. Here we first describe our continuing program on the effects of immigration to the United States, and then turn to 1989 grants supporting work on other national problems: new arrangements for international security; the civil justice system and the economy, especially as related to issues raised by new scientific and technological advances; the deteriorating state of the career Federal service; and space policy.

Both competitiveness and many other national problems of interest to the Foundation are discussed in the section of this report entitled "Programs and Interests of the Foundation, Summer 1990."

Immigration

Over the past several years, the Foundation has been providing support at a moderate level for research on immigration issues, principally those involving labor force impacts. In 1987, we held the first competition for research grants on the economic causes and consequences of immigration to the United States. Of particular interest were the macroeconomic effects of immigration, both in the short-to-medium-term future and over the longer term. Included were studies of effects on employment, unemployment and labor productivity, as well as of new U.S. immigration law.

A second round of this competitive research program on immigration was held in 1989. A distinguished outside advisory committee of the following persons assisted the Foundation in reviewing proposals and in all other aspects of this competition:

Leon Bouvier, Visiting Professor of Biostatistics and Epidemiology, Tulane University

Daniel Hamermesh, Professor of Economics, Michigan State University

Mark Killingsworth, Professor of Economics, Rutgers University

Eleven projects were recommended and are listed below as follows: grantee institution and amount of grant; title of research project; principal investigator(s); grant period.

Brown University $54,957
Providence, Rhode Island 02912

"The Substitution of Immigration for Internal Migration" (Project director: Michael J. White, Associate Professor of Sociology; Grant period: February 1990-January 1992.)

Center for Cultural and Technical Interchange Between East and West, Inc. — $86,100
Honolulu, Hawaii 96848

"A Comparative Longitudinal Study of Occupational Patterns Among Recent Asian Immigrants" (Project directors: James T. Fawcett and Robert W. Gardner, Research Associates, East-West Center Population Institute; Grant period: October 1989-September 1991.)

College of the Holy Cross — $25,370
Worcester, Massachusetts 01610

"Immigrant Wealth Compared to Native Wealth" (Project director: Richard J. Sullivan, Assistant Professor of Economics; Grant period: January 1990-December 1990.)

Harvard University — $15,500
Cambridge, Massachusetts 02138

"Migration Incentives, Migration Types: The Role of Relative Deprivation" (Project director: Oded Stark, Director, Migration and Development Program; Grant period: November 1989-April 1990.)

National Opinion Research Center — $104,535
Chicago, Illinois 60637

"Effects of the Immigration Reform and Control Act of 1986: Mexican Immigration to the United States" (Project directors: Katharine M. Donato, Research Associate, and Douglas S. Massey, Director, Population Research Center; Grant period: January 1990-December 1991.)

University of California, Davis — $65,152
Davis, California 95616

"Merchants of Labor: Farm Labor Contractors in California Agriculture" (Project directors: Philip L. Martin, Professor, and J. Edward Taylor, Assistant Professor of Agricultural Economics; Grant period: January 1990-December 1991.)

University of California, Santa Barbara — $73,000
Santa Barbara, California 93106

"Immigration and Welfare" (Project directors: George J. Borjas, Professor of Economics, and Stephen J. Trejo, Assistant Professor of Economics; Grant period: November 1989-October 1991.)

University of Chicago — $50,361
Chicago, Illinois 60637

"Immigration and the U.S. Labor Market" (Project director: Robert Topel, Professor of Economics and Industrial Relations; Grant period: April 1990-March 1991.)

University of Michigan — $25,000
Ann Arbor, Michigan 48109

"Wages and Employment of Legal Migrants, Illegal Migrants, and Immigrants: A Comparison of Cross Sectional and Multiyear Experiences" (Project director: Sherrie A. Kossoudji, Assistant Professor of Economics; Grant period: January 1990-December 1990.)

University of Southern California — $36,000
Los Angeles, California 90089

"A Comparative Analysis of the Economic Characteristics of Undocumented Mexican Immigrants" (Project director: David M. Heer, Professor of Sociology and Associate Director, Population Research Laboratory; Grant period: January 1990-August 1990.)

Urban Institute — $66,000
Washington, D.C. 20037

"IRCA and the Labor Market Consequences of Immigration to the United States" (Project directors: Frank D. Bean, Director, Population Studies Center, and Elaine Sorensen, Research Associate; Grant period: November 1989-October 1991.)

Trustee Grants

Global Outlook Education Institute — $50,000
Palo Alto, California 94301

A 1988 officer grant supported the beginning of a study of the changes now occurring in Soviet thinking about international security. Interviews held in Moscow yielded rich material on the diverse views of Soviet officials and scholars. This additional grant will support brief visits to the Institute of Soviet scholars and officials as well as work to complete a book, *Soviet New Thinking About International Security*. (Project director: Gloria Duffy, President; Grant period: February 1989-August 1990.)

Boston University **$156,000**
Boston, Massachusetts 02215

Two related themes will be explored in this project: appropriating the benefits and managing the risks of scientific and technological advances, with special reference to the field of biotechnology. The first topic concerns the role of intellectual property law (patents, trade secrets, copyrights) and the law governing technology licensing in assuring commercialization of scientific and technological advances for national economic benefit. The second theme deals with the role of federal regulation and alternatives to regulation (tort law, insurance, voluntary restraints) for managing the health and environmental risks of advances in biotechnology and their commercial applications. Participants will include scholars from law, biology and medicine, science policy, and social science, together with researchers and managers from government agencies and the private sector. (Project director: Michael S. Baram, Director, Center for Law and Technology and Adjunct Professor of Law, Boston University School of Law; Grant period: July 1989-June 1991.)

Manhattan Institute for Policy Research, Inc. **$90,000**
New York, New York 10021

Over the past two decades, U.S. courts have become deeply involved in determining the merits of complex scientific arguments involved in liability or regulatory matters. This grant supports the development of an edited volume of papers on the use of scientific evidence in the courtroom. Each chapter is intended to offer a dispassionate appraisal of the quality of scientific testimony (on all sides) and of jury or judicial determinations that are already on the record in established case law. The contributors will carefully review court records and then make appraisals of the strengths and weaknesses of scientific testimony and evidence and of ultimate court determinations. Planned topics include: contraceptive safety; fallout from atomic weapons tests; polio vaccines; hazardous waste dumps; high voltage transmission lines; and the design of light aircraft and car frames. The results of the volume would be reported initially at a conference for lawyers, scientists and journalists. (Project director: Peter W. Huber, Senior Fellow; Grant period: July 1989-September 1990.)

National Commission on the Public Service **$50,000**
Washington, D.C. 20006

A 1987 grant partially supported the Commission's work to develop an action program designed to arrest and reverse the present deteriorating state of the career Federal service. This supplemental grant will be used for activities designed to persuade Congress and the President to implement the recommendations made in the Commission's 1989 report. (Project director: L. Bruce Laingen, Executive Director; Grant period: November 1989-November 1990.)

University of Colorado Foundation, Inc. **$300,000**
Boulder, Colorado 80309

This grant supports research to be carried out within the University's Center for Space and Geosciences Policy by a research group in which a varied collection of specialties are brought together: aerospace engineering; astrophysics and planetary science; economics; space science policy; and political science. Topics to be explored include the development of policies to encourage study of important scientific and technological space problems; the Space Station and an assessment of its future, and the U.S. space launch system. Space policy seminars will be organized and an annual workshop involving outside experts will be held to review ongoing research and as a means of disseminating project results. (Project director: Radford Byerly, Jr., Director, Center for Space and Geosciences Policy; Grant period: April 1989-July 1991.)

Officer Grants

Center for Strategic and International Studies **$30,000**
Washington, D.C. 20006

Support for a study on space policy. (Project director: David Abshire, President; Grant period: January 1989-December 1989.)

Foundation for International Studies on Peace and Security **$30,000**
9728 HA Groningen

Support for a 1989 European-American Summer Program on International Security and East-West Relations. (Project director: H. W. Tromp, Director, Polemilogisch Instituut, Ruksuniversiteit, Groningen, The Netherlands; Grant period: March 1989-March 1990.)

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

For a workshop to consider expanded US-Soviet cooperation in the social and behavioral sciences. (Project director: Paul C. Stern, Study Director, Commission on Contributions of Behavioral and Social Science to the Prevention of Nuclear War, National Research Council; Grant period: June 1989-December 1989.)

National Research Council **$25,000**
Washington, D.C. 20418

Support for a study of issues in the international protection of intellectual property rights. (Project director: Victor Rabinowitch, Executive Director; Grant period: July 1989-June 1990.)

Tufts University $10,055
Medford, Massachusetts 02155

Partial support for a book on lessons for the U.S. from Western European experience with return migration policies. (Project director: Rosemarie Rogers, Professor of International Politics; Grant period: December 1989-November 1990.)

Additional Officer Grants

Collected here are miscellaneous officer grants that do not fit into any specific program of the Foundation and thus have not found a place elsewhere in this report.

Brooklyn Law School $10,000
Brooklyn, New York 11201

Supplemental support for costs of data processing required to complete research on equitable property distribution at divorce. (Project director: Marsha Garrison, Professor of Law; Grant period: January 1989-December 1989.)

Committee of Concerned Scientists, Inc. $30,000
New York, New York 10001

Partial support of an experimental program for refugee scientists. (Project director: Dorothy Hirsch, Executive Director; Grant period: July 1989-December 1990.)

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

A membership contribution. (Project director: James A. Joseph, President.)

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

A membership contribution. (Project director: Jeanne Bohlen, Vice President, Membership and Development.)

Massachusetts Institute of Technology $20,000
Cambridge, Massachusetts 02139

For design and study of a financing program for prospective college students. (Project director: Katherine H. Hanson, Executive Director, Consortium on Financing Higher Education; Grant period: March 1989-February 1990.)

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

A membership contribution. (Project director: Barbara Bryan, Executive Director.)

Population Resource Center $30,000
New York, New York 10021

Support for briefings of community foundations on the 1990 Census. (Project director: Jane S. De Lung, President; Grant period: April 1989-March 1990.)

Programs and Interests of the Foundation Summer 1990

Programs and Interests of the Foundation
Summer 1990

The Foundation's current programs and interests can be summarized under the same headings used in the main part of this annual report:

(1) Science and Technology

(2) Education in Science, Technology, and Management

(3) Competitiveness/Economics

(4) Other National Problems

In this section, we will give as complete a picture as possible of the current directions and interests of the Foundation.

Science and Technology

This traditional area for the Foundation will continue to be supported at a high level.

Fellowships account for expenditures of more than $3 million annually. Detailed information can be found in this annual report about the Sloan Research Fellowship Program (page 4) and the Doctoral Dissertation Program (page 8).

We are open to proposals for new awards or grants that reflect the changed world in which the U.S. finds itself. For example, fellowships for travel to centers of excellence abroad, whether in science or technology, become more important in a world in which the U.S. is no longer the single dominating technical power.

The Foundation's program of direct support of research in science and technology, given the dominating role of government agencies such as the National Science Foundation and the National Institutes of Health, is mainly in areas that are significant but do not fit into the disciplinary or program orientation of the agencies, or are otherwise neglected. Two current examples are our cross-disciplinary programs in molecular evolution (page 9) and population sciences (page 14). Fellowships are an important component of the molecular evolution program. Already approved for 1990 are plans for the third round of postdoctoral fellowships, as well as a second competition for sabbatical supplement awards.

We are interested in identifying other such areas of research in science, mathematics, or technology that are worthy of support, but not yet adequately recognized or funded. We explicitly include computer science in our areas of possible interest.

Support of the infrastructure of science and technology, and projects leading to a better understanding of the working of science and technology as a system, are also of interest. Recent grants reflecting these aspects of the Foundation's emphasis on science and technology have gone to the Association of American Universities in support of a Congressional-University Colloquium to study effective and appropriate ways to strengthen the infrastructure for university-based research, and to the National Academy of Sciences for continued support of the NAS-NAE-IOM Government-University-Industry Research Roundtable as a forum for discussion of national science and technology policy issues.

Scholarly work in the history of science and of technology is also of interest. This explicitly includes the history of major modern technical events such as, for example, the development of fiber optics. The sociology of science and technology is under exploration as yet another area within which a Foundation role may be identified.

Education in Science, Technology, and Management

Support of education in these traditional areas of Foundation interest has been an important part of the Sloan program from the start.

Andrew Carnegie, with his support of free libraries, helped many people who wanted to learn, by making it possible for them to get books, and to educate themselves. New technologies today, videotape, interactive optical disk, and networks, may make it possible to learn in new ways outside the classroom as well as to facilitate learning within it. This use of new technology in learning is an area in which we are interested, especially in helping people to educate themselves.

This may be learning from textual or graphical material, or learning from other people through bulletin boards and networking. The problems here are many and go well beyond the difficulty of creating suitable and interesting material. They can involve issues like the cost of creating material and finding an adequate distribution channel to the thin and scattered, but growing population of potential users.

Two recent grants have been made in this area: (1) California Institute of Technology, for research on information retrieval abilities of children and the development of computer interfaces to libraries for exploration of science materials from home or any location where access to a computer is available; and (2) Interactive Video Industry Association, for publication and distribution of a book exploring the impact of multimedia and interactive video technology.

Scientific and engineering manpower is another area of long term interest. We are interested in understanding how people choose their vocation or profession, especially, but not only, those thinking of careers in science and engineering. A related interest concerns the methods currently in use for forecasting supply and demand of scientists and engineers.

We expect that a better understanding of the influences on all students in their choice of mathematics, science, or engineering, initially as a field of study and then as a career, is very worthwhile, and we plan to support research in this area. New knowledge may eventually suggest strategies for developing action programs, including ones focused on minorities. Our plan is to start by supporting research designed to yield understanding. This work will require detailed observation and interviews with students and also with those who influence them at various key points in their decision-making about study and careers. A planning grant along these lines has been made (see page 30) and another to study attrition among science and engineering undergraduate majors was awarded the University of Colorado in 1990.

The education of minorities for careers in science, engineering, and management has been a long-standing interest of the Foundation. Our program in support of minority students preparing for careers in public management (see page 31) will conclude in 1990. The program is being continued, in slightly modified form, by the Ford and Rockefeller Foundations.

In developing a new minority program, we plan to proceed along the following lines: (1) Minorities are especially under-represented in the physical and mathematical sciences. We want to learn in some detail why so few minority students are earning doctoral degrees in these areas. But we will also act on the knowledge we have now. A recent grant to Arizona State University supplied additional resources to encourage and assist Hispanic students to enter graduate programs in the physical and mathematical sciences at universities throughout the country. (2) In engineering and management our experience suggests the value of working with a relatively small number of colleges and universities with exemplary programs for minority students, and providing them with support for enlarging and improving their efforts. Grants of this sort have recently been made to Georgia Institute of Technology and Stanford University for their minority programs in engineering. (3) Special secondary schools, like the North Carolina School for Science and Mathematics, with highly selected students and excellent programs and records of accomplishment, can play an important role in preparing minority students for careers in science, mathematics, and engineering. We are exploring what the Foundation might do to help.

Women are also under-represented in the physical and mathematical sciences. We are interested in understanding this problem better and formulating a program to support the entry of more women into these fields. A recent officer grant has gone to University of Michigan for a preliminary study of factors influencing women to do advanced studies and research in the mathematical and physical sciences.

Education in quantitative reasoning and technology for nonspecialists has long been a goal of the New Liberal Arts Program (see page 21). Books, monographs, and syllabi for a large number of new or revised NLA courses,

emphasizing quantitative reasoning and technology, are now available and more are being prepared. These teaching materials need to be brought to the attention of faculty members at colleges and universities throughout the country, so almost all of the ongoing work will be on dissemination. One conference, in the Northeast, was held for this purpose (see page 24); four others are planned for 1990 and early 1991 in other regions.

The Science Book Program (see page 26) will be completed over the next two years. New ways need to be found to reach out and make science and technology less mysterious and more attractive to the general public.

Competitiveness/Economics

The goal of this major new program is to contribute to the understanding of the basic forces making for American economic prosperity in the increasingly competitive world economy. We believe we are dealing with long-term issues that are vital to the country and will be with us for decades to come. We will support the evolution of an academic community that can understand these issues in a realistic way.

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, trade policy, the role of government scientific and technical activities, and so on. All of these are eligible for our competitiveness program.

As part of this new focus, we plan to evolve our ongoing program in economics toward issues relating to competitiveness. Economics will become a significant part of the competitiveness program which will, however, also contain major new elements.

The new competitiveness program was launched with two major grants made in December 1989, supporting work of the five-university Consortium on Competitiveness and Cooperation, headquartered at the University of California, Berkeley, and of the National Academy of Engineering. (See pages 35-36 for details.) The cooperation of major American companies with the Consortium effort was sought and obtained. This reflects our strong belief that work in these areas is best informed by direct contact with industry. Subsequently a major grant was given to the Berkeley Roundtable on the International Economy, for research in manufacturing competitiveness and for a study of the pharmaceutical industry in the U.S., Europe, and Japan. Smaller and more individual proposals are also welcome.

Within the new program we are exploring support of industry studies. Industries vary enormously from each other in their methods of manufacture, in

the type and education of their work force, in their ability to generate or assimilate new technology, and in the extent and nature of foreign competition. Supporting centers or studies at an industry level is a possible way to proceed. We would hope to attract scholars in engineering, management, and economics, together with industry leaders, to study issues arising in a given industry.

Another dimension we are exploring is education for work in American industrial production. We are interested in preparation for jobs and the continuing education of workers in manufacturing enterprises as well as, at the other end of the spectrum, understanding the new curricula in manufacturing engineering.

We are also considering the usefulness of fellowship programs, for faculty members or graduate students, involving an extended period of experience in a company's manufacturing department. Fellowships also might enable an engineer already employed in manufacturing to spend time in an appropriate university program.

Studies in the management of technology, ranging from transfer of technology within a firm to factors affecting R&D funding, are also of interest.

Other National Problems

We believe the Foundation should attempt to contribute to the major issues of our time, but in a way appropriate to its expertise and size. Usually we will need a special approach if we are to contribute to problems that everyone recognizes. We will only pursue work in those National Problems areas where such an approach can be evolved.

Drug abuse, for example, is an enormous problem which has resisted most efforts. While the possibilities of inhibiting supply and reducing demand have not been exhausted, alternatives to what is being done also need to be considered. Legalization in some form is an option that arises regularly and usually leads to heated discussion. Believing that the legalization discussion needs to be conducted on substantially firmer analytic and empirical grounds, we have funded a major three-year project to be carried out by the Rand Corporation within its Drug Policy Research Center. The primary goals of the study are: (1) to provide a framework for the debate on legalization by identifying the major factors that need to be considered, and (2) to determine what can be learned from experience in other countries and other times about the likely consequences of decriminalizing some or all of the commonly used illicit drugs. It is not intended that the study recommend for or against legalization. Rather it is an attempt to gather facts for a more informed debate.

The environment is a significant concern and sources of energy an important subtopic. Most sources contribute to global warming, whereas nuclear energy, which doesn't, has problems of its own. These are both real and also

problems of human perception. Much work has been done on the safety issues of nuclear power. We are interested in developing a greater understanding of the process by which people's perceptions about nuclear power are formed and influenced.

Despite widespread concern about the high level of litigation in the U.S., and about its impact on the economy, very little objective research has been done in the area. Instead the debates are dominated by the parties at interest. We are exploring these issues as a possible area for Foundation support. A grant in this area went to Boston University (page 46) and, more recently, to the Brookings Institution in support of a conference and publication on the effects of expanded liability law on innovation and safety.

In 1990 the Foundation held the second round of its research competition on the economic causes and consequences of immigration to the United States. (See page 43.) We continue to believe that objective analyses of immigration are both important and poorly supported. New approaches as well as ways the emerging results might reach a wider public are being explored.

We are also exploring a possible role for the Foundation in developing an understanding of the new economic, political, and strategic order of the future emerging as a result of the growing importance of Asia and the changes now occurring in Europe and the Soviet Union.

The Foundation will continue its tradition of a modest civic program in which selected projects of special interest to New York City are supported. Examples include 1989 grants for graduate scholarships to managers of non-profit organizations in New York City (page 32) and for a new exhibit at the New York Hall of Science (page 28), and a more recent 1990 grant to the Fund for the City of New York in support of public service awards for outstanding City employees.

Finally, officer grants enable the Foundation to respond quickly to proposals for many activities, such as workshops, symposia, and conferences, that fall within our 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.

Financial Review

Financial Review

The financial statements and schedules of the Foundation, which have been audited by Ernst & Young, independent auditors, appear on pages 62 to 83. They include balance sheets, statements of income, expenses and changes in fund balance and of changes in financial position, and schedules of management and investment expenses, investments, and grants and appropriations.

Investment and other income for 1989 was $34,376,400, an increase of $4,270,862 from $30,105,538 in 1988. After the deduction of investment expenses and provision for Federal excise tax from investment and other income, net investment income was $31,608,253 in 1989 as compared with $28,303,992 for the prior year. Investment expenses during 1989 totaled $1,643,847 of which $1,157,605 represented investment counsel fees. Provision for Federal excise tax amounted to $1,124,300. The total of these deductions from income in 1989 was $2,768,147 versus $1,801,546 in 1988.

The total of grants and appropriations authorized, net of grant refunds, and management expenses during 1989 was $23,423,159. This sum was $8,185,094 less than 1989 net investment income. Of this total, grants and appropriations authorized amounted to $21,204,103 while management expenses were $2,346,673. Since the Foundation's inception in 1934, the cumulative excess of grants and expenses over the Foundation's income has amounted to $18,208,476.

Grant and appropriation payments in 1989 were $17,227,448 compared with $25,003,190 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 1989 was $22,573,678, while in 1988 the amount was $29,060,773.

The market value of the Foundation's total assets was $622,070,457 at December 31, 1989 including investments valued at $621,582,329, as compared with total assets of $541,886,057 at December 31, 1988. A summary of the Foundation's investments at cost and market value at December 31, 1989 appears on page 67.

A listing of grants made during 1989, including grants and appropriations authorized and payments during the year, will be found on pages 79 to 83.

Report of Ernst & Young Independent Auditors

Board of Trustees
Alfred P. Sloan Foundation

We have audited the balance sheets of the Alfred P. Sloan Foundation as of December 31, 1989 and 1988, 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 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, 1989 and 1988, 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. The supplementary schedules of management and investment expenses for the years ended December 31, 1989 and 1988, investments at December 31, 1989 and grants and appropriations for the year then ended are presented for purposes of additional analysis and are not a required part of the financial statements of the Alfred P. Sloan Foundation. Such information has been subjected to the auditing procedures applied in our audits of the financial statements and, in our opinion, is fairly stated in all material respects in relation to the financial statements taken as a whole.

Ernst + Young

New York, New York
February 5, 1990

Balance Sheets

December 31, 1989 and 1988

	1989	1988
Assets		
Investments:		
Fixed income:		
Government and agency	$142,221,543	$138,867,707
Corporate and other	117,579,735	91,354,398
	259,801,278	230,222,105
Equity:		
General Motors Corporation	32,741,408	36,932,297
Other	213,989,828	192,645,042
	246,731,236	229,577,339
Other	16,438,947	11,250,000
Total investments (market value: $621,582,329 in 1989 and $541,085,952 in 1988)	522,971,461	471,049,444
Interest purchased	397,106	
Other	16,409	357,355
Cash	85,641	800,105
Total	$523,470,617	$472,206,904
Liabilities and Fund Balance		
Grants and appropriations unpaid	$ 20,649,424	$ 16,672,769
Other	105,774	94,209
Fund balance	502,715,419	455,439,926
Total	$523,470,617	$472,206,904

See accompanying notes to financial statements.

Statements of Income, Expenses and Changes in Fund Balance

For the years ended December 31, 1989 and 1988

	1989	1988
Investment Income:		
Dividends	$ 13,351,226	$ 11,681,604
Interest	20,972,043	18,419,656
Other	53,131	4,278
	34,376,400	30,105,538
Less:		
Investment expenses	1,643,847	1,352,546
Provision for Federal excise tax	1,124,300	449,000
	2,768,147	1,801,546
Net investment income	31,608,253	28,303,992
Grants and management expenses:		
Grants and appropriations authorized (net of grant refunds of $127,617 in 1989 and $97,570 in 1988)	21,076,486	19,824,235
Management expenses	2,346,673	2,170,646
Total	23,423,159	21,994,881
Grants and expenses less than income for the year	8,185,094	6,309,111
Net gain on disposals of securities	35,923,193	18,039,423
Assets received as remainderman of trust	3,167,206	
Net change in fund balance for year	47,275,493	24,348,534
Fund balance January 1	455,439,926	431,091,392
Fund balance at end of year	$502,715,419	$455,439,926

See accompanying notes to financial statements.

Statements of Changes in Financial Position

For the years ended December 31, 1989 and 1988

	1989	1988
SOURCE OF FUNDS:		
Investment income	$34,376,400	$30,105,538
Net gain on disposals of securities	35,923,193	18,039,423
Trust distribution and other	3,537,798	270,918
	73,837,391	48,415,879
APPLICATION OF FUNDS:		
Grant and appropriation payments (net of grant refunds of $127,617 in 1989 and $97,570 in 1988)	17,099,831	24,905,620
Management expenses	2,346,673	2,170,646
Investment expenses	1,643,847	1,352,546
Federal excise taxes	1,483,327	631,961
	22,573,678	29,060,773
INCREASE (DECREASE) IN FUNDS CONSISTING OF:		
Cost of investments	51,922,017	19,312,270
Interest purchased	397,106	(774,302)
Cash balances	(714,464)	645,099
Other	(340,946)	172,039
Net increase	$51,263,713	$19,355,106

See accompanying notes to financial statements.

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

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.

Investments purchased are carried at cost; for those received by gift or bequest, cost is market value at date of gift or bequest. Gain or loss on disposal of investments is determined generally on the basis of first-in, first-out cost, but in certain instances the identified lot basis is used. Net gain or loss on disposals is applied to the principal section of the fund balance. Grant 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 provides for purchase of annuities for employees. Retirement plan expense was $173,652 and $191,817 for 1989 and 1988, respectively.

4. LEASE

The Foundation's lease for its office space expires April 30, 1993. 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 was $564,309 in 1989 and $592,054 in 1988.

5. FUND BALANCE

Fund balance, at year end, is comprised of the following:

	1989	1988
Principal	$520,923,895	$481,833,496
Income—cumulative excess of grants and expenses over income from inception of the Foundation	(18,208,476)	(26,393,570)
Fund balance	$502,715,419	$455,439,926

Schedules of Management and Investment Expenses

For the years ended December 31, 1989 and 1988

	1989	1988
MANAGEMENT EXPENSES		
Salaries and employee benefits:		
Salaries	$1,154,091	$1,120,156
Employees' retirement plan and other benefits	379,518	387,517
Total	1,533,609	1,507,673
Rent	564,309	592,054
Program expenses	272,886	264,285
Office expenses and service	394,596	185,152
Reports and publications	13,077	18,537
Professional fees	54,438	49,824
Total management expenses	2,832,915	2,617,525
Less management expenses applicable to investments	486,242	446,879
Management expenses applicable to grant making	$2,346,673	$2,170,646
INVESTMENT EXPENSES		
Investment counsel fees	$1,157,605	$ 905,667
Management expenses applicable to investments	486,242	446,879
Total investment expenses	$1,643,847	$1,352,546

Schedule of Investments

December 31, 1989

SUMMARY	Cost	Market Amount	Market Percent of Total Investment
Fixed income:			
Government and agency	$142,221,543	$144,501,012	23.3%
Corporate and other	117,579,735	117,627,216	18.9
Total fixed income	259,801,278	262,128,228	42.2
Equity:			
General Motors Corporation	32,741,408	54,925,000	8.9
Other	213,989,828	286,207,845	46.0
Total equity	246,731,236	341,132,845	54.9
Other	16,438,947	18,321,256	2.9
Total investments	$522,971,461	$621,582,329	100.0%

FIXED INCOME	Principal	Cost	Market
Government and agency obligations:			
U.S. Treasury:			
8¾% Notes 5/31/91	$ 4,000,000	$ 3,985,280	$ 4,040,000
8¼% Notes 6/30/91	3,000,000	3,024,844	3,010,320
8¼% Notes 6/30/92	9,225,000	8,838,703	9,294,187
8¾% Notes 9/30/92	3,350,000	3,349,431	3,413,851
8¼% Notes 2/15/93	22,000,000	22,295,000	22,185,680
9⅜% Notes 4/15/96	7,950,000	8,398,688	8,466,750
8½% Notes 5/15/97	9,825,000	9,671,484	10,076,717
9% Notes 5/15/98	4,500,000	4,473,609	4,760,145
9¼% Notes 8/15/98	1,000,000	1,027,187	1,073,750
8⅞% Notes 2/15/99	15,275,000	15,776,212	16,091,296
11⅞% Bonds 11/15/2004	2,280,000	2,892,750	2,955,450
8⅛% Bonds 2/15/2019	7,780,000	8,261,762	8,536,138
Federal Home Loan Mortgage Corp.			
10% Notes 4/15/2013	6,000,000	5,955,000	6,202,500
Federal Housing Administration Mortgage Pools:			
7.43% 9/1/2022	9,646,265	8,766,044	8,564,050
7.43% 11/1/2022	9,555,137	8,450,324	8,483,146
Federal National Mortgage Association Mortgage Pools:			
9.80% 12/10/98	2,500,000	2,497,656	2,565,625
8½% 5/1/2002	74,327	72,457	72,399
8½% 7/1/2002	92,667	90,335	90,263
8% 8/1/2004	4,850,457	4,711,006	4,656,439
8½% 9/1/2004	172,870	168,522	168,386

Schedule of Investments

December 31, 1989
(continued)

FIXED INCOME		Principal	Cost	Market
Government and agency obligations (continued):				
Federal National Mortgage Association Mortgage Pools (continued):				
8½% 11/1/2004		$ 3,303,556	$ 3,220,451	$ 3,309,436
8½% 1/1/2019		512,152	487,185	491,184
8½% 8/1/2019		524,174	498,620	502,714
8½% 9/1/2019		848,896	807,512	814,142
8½% 10/1/2019		8,072,830	7,679,279	7,742,328
8½% 10/19/2019		422,648	402,044	405,345
Government National Mortgage Association Mortgage Pools:				
9% 10/15/2016		95,375	94,819	94,064
9% 11/15/2016		904,646	899,284	892,207
9% 12/15/2019		2,000,000	1,988,145	1,972,500
Student Loan Marketing Association 9.34% Notes 7/28/98		3,500,000	3,437,910	3,570,000
Total Government and agency obligations			$142,221,543	$144,501,012
Corporate and other:				
Short term:				
Interest bearing demand notes		34,564,000	34,564,000	34,564,000
Certificates of Deposit:				
Dai-Ichi Kangyo Bank, Ltd. 5.5% 1/26/90	(Yen)	250,000,000	1,761,893	1,737,110
Sumitomo Bank, Ltd. 10.68% 3/20/90		5,000,000	4,999,543	5,015,100
Time Deposits:				
Fuji Bank, Ltd. 6.25% 1/2/90	(Yen)	200,000,000	1,391,304	1,391,304
8.59% 1/2/90		7,661	7,661	7,661
Nippon Credit Bank, Ltd. 10.75% 1/2/90		990,000	990,000	990,000
Total short term			43,714,401	43,705,175
Long term:				
Associates Corp. North America 8.7% Notes 1/1/97		5,000,000	4,976,150	4,963,350
Bank of Tokyo, Ltd. 3.38% Convertible Bonds 3/31/2004		150,000	134,366	145,500
C.F.A.O. 6.25% Convertible Bonds 1/1/96	(French Francs)	463,500	93,610	149,062
Citicorp 10⅝% Notes 6/15/2010		3,800,000	4,186,726	4,024,542
Citicorp Person to Person, Inc. 12½% Subordinated Capital Notes 1/15/96		3,000,000	3,322,500	3,099,240

Schedule of Investments

December 31, 1989
(continued)

FIXED INCOME		Principal	Cost	Market
Corporate and other (continued):				
Long-term (continued):				
Cofir 10% Convertible Bonds 11/1/92	(Spanish Pesetas)	$ 3,200,000	$ 26,633	$ 29,137
Coles Myer Finance International, Ltd. 9.5% Convertible Bonds 7/24/97	(Australian Dollars)	150,000	129,761	127,079
Consolidated Natural Gas Co. 8¾% Notes 6/1/99		5,000,000	4,996,050	5,008,800
Dai-Ichi Kangyo Bank, Ltd. 3.88% Convertible Bonds 9/30/2004		150,000	153,750	147,188
Delta Airlines, Inc. 10.45% Lease Obligation 7/2/2007		2,823,298	2,823,298	3,027,987
Dresdner Bank AG 6.5% Bonds 3/18/96 (ex warrants)	(Deutschemarks)	51,000	24,503	28,425
Federal Express Corp. 10¾% Lease Obligation 5/1/2009		1,698,439	1,698,439	1,830,068
Ford Motor Credit Co. 12.20% Medium Term Notes 3/28/90		3,000,000	3,000,000	3,019,650
General Electric Capital Corp. 10.15% Notes 3/15/90		3,500,000	3,493,438	3,509,415
General Motors Acceptance Corp. 8⅜% Notes 5/1/97		3,000,000	2,977,771	2,983,500
Goodman Fielder, PLC 5% Convertible Bonds 7/4/97	(Sterling)	55,000	88,804	84,286
Household Financial Corp. 9% Notes 9/28/2001		5,000,000	4,981,350	4,948,300
Mitsubishi Bank 3.5% Convertible Bonds 3/31/2004		620,000	571,416	602,175
Mitsubishi Trust & Banking, Ltd. 2.75% Convertible Bonds 3/31/95	(Deutschemarks)	610,000	325,230	358,876
Mitsui Bank 2.63% Convertible Bonds 3/31/2003		400,000	404,000	413,600

Schedule of Investments

December 31, 1989
(continued)

FIXED INCOME	Principal	Cost	Market
Corporate and other (continued):			
Long-term (continued):			
Mobil Oil Canada, Ltd.			
8¾% Notes 2/15/93	$ 5,500,000	$ 5,496,526	$ 5,445,000
National Australia Bank			
10½% Notes 9/27/90	2,000,000	1,995,100	2,026,700
Northrop Corp.			
10% Notes 11/1/93	1,200,000	1,200,000	1,228,500
Pedernales Electric Coop Inc.			
10⅞% First Mortgage Bonds			
9/1/2017	3,000,000	3,340,680	3,337,500
Pennsylvania Power & Light Co.			
9¼% First Mortgage Bonds			
10/1/2019	5,000,000	5,000,000	5,027,100
Pioneer Concrete, Ltd.			
9.5% Convertible Bonds			
6/21/98 (Australian Dollars)	130,000	90,714	93,072
Province of Quebec			
8⅛% Sinking Fund Debentures			
6/1/97	6,000,000	5,797,860	5,827,500
Puget Sound Power & Light Co.			
8¼% First Mortgage Bonds 4/1/96	3,000,000	2,981,250	2,922,690
Southern Bell Telephone & Telegraph			
8½% Notes 8/1/2029	6,550,000	6,278,175	6,248,504
Sumitomo Bank, Ltd.			
2.625% Bonds			
3/31/94 (Deutschemarks)	1,032,144	961,074	923,769
Swedish Export Co.			
9.8% Notes 3/15/90	2,000,000	1,985,380	2,003,860
TNT Pacific Finance, Ltd.			
9% Convertible Bonds			
7/27/98 (Australian Dollars)	140,000	99,788	89,171
Miscellaneous:			
AMCOR, Ltd.			
9% Perpetual Notes			
(Australian Dollars)	150,000	118,874	116,533
BTR Nylex			
9% Perpetual Notes			
(Australian Dollars)	14,400	112,118	131,962
Total long term		73,865,334	73,922,041
Total corporate and other		117,579,735	117,627,216
Total fixed income securities		$259,801,278	$262,128,228

Schedule of Investments

December 31, 1989
(continued)

EQUITY	Number of Shares	Cost	Market
United States:			
Advanced Marketing Services	28,000	$ 351,500	$ 399,000
Alza Corp.	50,000	1,115,357	2,193,750
Ashton-Tate Corp.	86,000	2,073,500	1,053,500
Avnet, Inc.	95,000	3,032,750	2,945,000
Bairnco Corp.	17,000	421,749	303,875
Baltimore Gas & Electric Co., Inc.	92,000	2,986,145	3,174,000
Bank of New England Corp.	100,800	1,909,317	945,000
Bank of New York Co., Inc.	77,000	2,322,617	3,099,250
Becton Dickinson & Co., Inc.	47,100	2,554,223	2,914,312
Bio-Electric Systems, Inc.	6,250	89,570	204,687
Boeing Co.	55,500	2,016,019	3,295,312
Bowater, Inc.	77,000	2,782,903	2,127,125
Bristol Myers Co.	55,000	2,642,934	3,080,000
British Petroleum, PLC	35,000	1,890,350	2,288,125
Businessland, Inc.	50,000	547,937	462,500
C.P.C. International, Inc.	45,000	1,940,518	3,318,750
Caere Corp.	10,000	120,000	182,500
Capital Cities/ABC, Inc.	18,000	4,435,994	10,154,250
Carpenter Technology Corp.	6,800	328,463	323,850
Centerior Energy Corp.	235,000	3,728,070	4,846,875
Champion International Corp.	55,000	1,810,309	1,760,000
Charming Shoppes, Inc.	28,600	386,703	303,875
Charter One Financial, Inc.	13,000	232,375	230,750
Chemdesign Corp.	29,100	446,532	385,575
Citicorp	100,000	2,527,187	2,887,500
Clayton Homes, Inc.	62,500	548,668	546,875
Clean Harbours, Inc.	25,000	377,500	275,000
Coastal Corp.	80,000	2,443,410	3,970,000
Colonial Life & Accident Insurance Co.	18,400	276,500	423,200
Commercial Metals Co.	18,666	412,525	408,319
Concept, Inc.	21,000	234,894	225,750
Consolidated Rail Corp.	56,000	1,697,573	2,681,000
Country Lake Foods, Inc.	25,000	286,100	243,750
Crestar Financial Corp.	6,700	160,573	192,625
Cypress Semiconductor Corp.	40,000	411,117	395,000
Detroit Edison Co.	130,000	1,692,042	3,298,750
Digital Microwave Corp.	20,000	428,059	600,000
Dionex Corp.	10,300	305,675	275,525
Dress Barn, Inc.	20,000	289,875	225,000
Dreyfus Corp.	100,000	2,588,168	3,562,500
Dun & Bradstreet Corp.	36,045	1,097,175	1,658,070
E.I. du Pont de Nemours & Company	14,000	1,623,118	1,722,000
Echlin, Inc.	120,000	1,971,195	1,875,000
El Paso Electric Co.	30,000	292,500	255,000

Schedule of Investments

December 31, 1989
(continued)

EQUITY	Number of Shares	Cost	Market
United States (continued):			
Endevco, Inc.	40,000	$ 243,063	$ 225,000
Energen Corp.	11,000	248,577	221,375
Entergy Corp.	325,000	4,339,561	7,556,250
Excel Industries, Inc.	45,000	509,273	444,375
First Union Corp.	92,500	2,318,050	1,907,812
Forest Laboratories, Inc.	9,000	200,228	376,875
Gantos, Inc.	8,000	226,000	192,000
General Dynamics Corp.	24,000	1,098,711	1,077,000
General Electric Co.	58,800	1,487,040	3,792,600
General Motors Corp.	1,300,000	32,741,408	54,925,000
General RE Corp.	38,100	2,014,477	3,319,462
General Signal Corp.	75,000	3,524,998	3,618,750
Gillette Co.	65,400	2,688,645	3,212,775
Golden Poultry, Inc.	30,000	279,375	225,000
Goodyear Tire & Rubber Co.	58,200	3,022,302	2,531,700
Healthco International, Inc.	30,000	560,550	487,500
Healthsouth Rehabilitation Corp.	17,600	158,400	303,600
Hearthland Express, Inc.	18,000	263,500	306,000
Hilb Rogal & Hamilton Co.	12,000	155,655	276,000
Holly Corp.	12,000	355,855	310,500
ITT Corp.	50,000	2,341,558	2,943,750
Illinois Power Co.	142,000	2,201,853	2,662,500
Intel Corp.	51,000	1,285,964	1,759,500
International Business Machines Corp.	58,500	6,725,035	5,506,312
International Minerals & Chemical Corp.	69,700	2,964,719	3,633,113
J. J. Snack Foods Corp.	16,000	178,825	198,000
James River Corp. of Virginia	121,600	3,199,109	3,450,400
Jan Bell Marketing, Inc.	16,100	421,285	404,512
Johnson Controls, Inc.	39,200	1,191,234	1,264,200
Johnson & Johnson	60,000	2,671,184	3,562,500
Juno Lighting, Inc.	10,000	167,358	192,500
Kaydon Corp.	31,000	925,625	984,250
Kemper Corp.	82,700	1,905,211	3,886,900
KLA Instruments Corp.	34,000	375,000	297,500
LSI Lighting Systems, Inc.	30,750	235,750	426,656
La Petite Academy, Inc.	53,100	644,813	497,813
Legg Mason, Inc.	20,000	310,198	247,500
Limited, Inc.	119,000	2,221,532	4,165,000
Linear Technology, Inc.	38,000	453,750	394,250
Litton Industries, Inc.	24,100	2,168,861	1,861,725
Manor Care, Inc.	140,000	1,615,475	2,345,000
Mapco, Inc.	119,200	2,181,627	4,768,000
Martin Marietta Corp.	27,300	1,089,598	1,211,438
May Department Stores Co.	85,000	3,680,550	4,069,375
McCaw Cellular Communications, Inc.	11,200	417,200	428,400

Schedule of Investments

December 31, 1989
(continued)

EQUITY	Number of Shares	Cost	Market
United States (continued):			
McDonalds Corp.	50,600	$ 1,184,293	$ 1,745,700
Merck & Co., Inc.	22,900	1,636,461	1,774,750
Minnesota Mining and Manufacturing Co.	33,500	2,519,795	2,667,438
Monsanto Co.	25,000	2,378,337	2,884,375
Morgan (J. P.) & Company, Inc.	260,100	1,245,401	11,444,400
Morton International, Inc.	64,500	2,562,562	2,313,938
Mosinee Paper Corp.	10,000	221,250	177,500
National Commerce Bancorporation	15,000	348,777	354,375
Network Equipment Technologies, Inc.	11,000	268,109	346,500
New York Times Co.	33,500	893,452	887,750
Noble Drilling Corp.	40,000	228,750	370,000
Norsk Hydro, A.S., ADR	170,000	2,053,921	4,292,500
North Fork Bancorporation, Inc.	13,200	216,700	216,150
Nowsco Well Service, Ltd.	20,000	229,125	271,240
Pacific Gas & Electric Co.	100,000	1,579,774	2,200,000
Peoples Heritage Savings Bank	22,000	411,874	338,250
Pfizer, Inc.	38,100	2,207,410	2,647,950
Philip Morris Companies, Inc.	220,000	2,910,355	9,157,500
Phillips Petroleum Co.	93,000	2,144,580	2,348,250
Pinnacle West Cap Corp.	180,000	2,008,788	2,002,500
Puritan Bennett Corp.	17,000	423,700	412,250
Quaker Oats Co.	60,300	3,253,304	3,482,325
Ralston Purina Co.	32,000	1,743,132	2,656,000
Raytheon Co.	15,700	1,089,545	1,091,150
Regal Beloit Corp.	23,000	408,160	376,625
Respol, SA, ADR	91,000	1,694,428	2,093,000
Roosevelt Financial Group	25,000	338,749	306,250
Ryder Systems, Inc.	77,800	2,023,012	1,585,175
Sbarro, Inc.	26,000	488,051	876,000
Schlumberger, Ltd.	55,675	743,457	2,735,034
Schwab, Charles	16,000	142,670	222,000
Sequent Computer Systems	12,000	160,875	240,000
Shell Transport & Trading Company, PLC	142,500	2,672,895	6,911,250
Simpson Industries, Inc.	36,000	371,350	333,000
Standard Federal Bank	38,000	334,493	361,000
Steel Technologies, Inc.	39,200	443,400	362,600
SynOptics Communications Co.	9,000	171,000	227,250
Telecredit, Inc.	20,500	635,761	814,875
Texaco, Inc.	156,200	6,304,444	9,196,275
Thiokol Corp.	20,000	283,200	262,500
Trans World Music Corp.	18,000	400,250	450,000
Transcanada Pipelines, Inc.	85,000	1,215,500	1,232,500
Trinova Corp.	102,600	2,796,204	2,513,700
UNUM Corp.	84,500	1,724,907	4,056,000
Union Carbide Corp.	80,600	2,134,994	1,873,950

Schedule of Investments

December 31, 1989
(continued)

EQUITY	Number of Shares	Cost	Market
United States (continued):			
Unisys Corp.	61,400	$ 2,006,087	$ 905,650
U.S. West, Inc.	50,000	1,629,524	4,006,250
Versa Technologies, Inc.	20,000	289,300	250,000
W. H. Brady Co.	8,000	207,062	248,000
Warner-Lambert Co.	17,300	1,215,068	1,998,150
Werner Enterprises, Inc.	15,000	222,325	322,500
Australia and New Zealand:			
Atlas Steels, Ltd.	120,000	113,329	68,256
Australia and New Zealand Banking Co., Ltd. (warrants)	695	19,387	35,331
Broken Hill Proprietary Co., Ltd.	20,200	121,915	148,409
CSR, Ltd.	23,800	83,744	99,651
Comalco, Ltd.	27,500	94,430	86,900
Fletcher Challenge, Ltd.	93,952	239,132	236,854
Federal Republic of Germany:			
AG Fur Industrie Und Verkhrswsen, AG	351	110,933	161,267
Allianz Holding, AG	290	323,177	414,774
BASF, AG	1,750	264,656	307,579
Bayerische Vereinsbank, AG	550	106,848	127,485
Bilfinger and Berger Bauag, AG	361	81,932	148,616
Commerzbank, AG	742	102,787	130,828
Continental, AG	1,105	187,061	209,855
Douglas Holdings, AG	354	126,472	162,150
Dresdner Bank, AG	1,488	248,449	377,316
Henkel, AG	260	74,810	85,874
Hoechst, AG	656	99,835	112,667
Hoesch, AG	660	91,774	110,940
Mannesmann, AG	1,323	175,745	288,170
Munchener Ruckversicherungs, AG	194	151,047	276,326
Siemens, AG	721	198,412	306,175
Strabag Bau, AG	220	26,857	71,495
Thyssen, AG	664	83,831	106,914
Veba, AG	1,454	255,041	327,590
Viag, AG	440	66,653	90,829
Volkswagen, AG	1,141	220,224	364,070
France, Italy, Netherlands and Spain:			
Air Liquide (L'), SA	1,100	115,101	130,342
Auxiliare D' Enterprises, SA	575	94,978	103,686
Axa-Midi Assurances, SA	1,960	103,944	124,900
Banca Commerciale Italiana, S.p.A.	38,600	108,235	148,263
Banco Bilbao Vizcaya, SA	1,400	99,978	100,068
Bankinter, SA	2,000	150,260	164,125

Schedule of Investments

December 31, 1989
(continued)

EQUITY	Number of Shares	Cost	Market
France, Italy, Netherlands and Spain (continued):			
Beghin-Say, SA	1,450	$ 148,995	$ 179,806
Bouygues, SA	875	97,803	101,421
BSN-Gervais Danone, SA	1,400	161,948	186,626
C.M.B. Packaging, SA	3,300	106,251	135,268
Canal Plus, SA	1,000	103,821	131,755
Carrefour, SA	300	158,016	187,557
Cofir, SA	3,100	97,034	100,205
Compagnie Financiere De Suez, SA	2,600	170,020	199,268
Compagnie Generale D' Electricite, SA	2,360	176,469	218,675
Corporacion Mapfre, SA	1,000	54,432	75,393
Credit Foncier de France, SA	1,178	133,828	262,939
Credito Fondiario (Sezione Di), S.p.A	27,200	111,069	150,612
Cristaleria Espanola, SA	800	105,322	95,862
Eaux (Cie Generale Des)	628	187,123	252,552
Ebro Cia De Azucares y Alimentacion, SA	3,500	97,080	107,079
Endesa, SA	5,100	99,561	106,806
Fiat, S.p.A.	18,000	101,127	99,556
Generale Occidentale, SA	575	81,432	80,215
Hispamer, SA	3,500	173,407	162,531
I.F.I.L., S.p.A.	78,398	153,037	232,016
Iberduero, SA	17,100	101,997	105,410
KLM, NV	3,600	79,153	90,916
L'Oreal, SA	140	80,717	119,716
LaFarge Coppe, SA	360	98,282	98,645
Lloyd Adriatico, S.p.A.	8,000	104,175	110,193
LVMH Moet Hennessey-Louis Vuitton, SA	210	146,675	199,647
Michelin (Cie GLE Des Etabl)	3,675	107,504	105,068
Peugeot, SA	1,200	155,285	170,506
Pirelli Risp, S.p.A.	59,000	107,277	110,547
Royal Dutch Petroleum Co.	1,940	122,713	148,094
Saffa, S.p.A.	12,100	79,731	110,381
Saint Louis Bouchon, SA	400	94,971	108,504
St. Gobain, SA	1,607	153,511	180,731
Sanofi, SA	600	98,086	118,321
Sasib, SA	47,500	165,757	231,799
Sefimeg	1,538	107,642	137,740
Sirti, S.p.A.	15,400	106,873	150,909
Societe Generale, SA	2,630	207,540	240,069
Sovac-Credit Mobilier, SA	820	96,773	110,157
Stet, S.p.A.	28,500	68,924	108,504
Thomson, CSF, SA	3,300	113,378	86,958
Toro Assicurazioni, S.p.A.	14,630	212,594	251,030
Total Compagnie Francaise Des Petroles, SA	3,900	298,248	386,222
Unicem, S.p.A.	9,200	161,231	191,893
Valeo, SA	1,450	154,244	211,023

Schedule of Investments

December 31, 1989
(continued)

EQUITY	Number of Shares	Cost	Market
Hong Kong and Singapore:			
City Developments, Ltd. (warrants)	250,000	$ 797	$ 59,868
Dairy Farm International Holdings, Ltd.	380,000	149,288	413,784
Jardine Strategic Holdings, Ltd.	70,680	91,805	130,386
Japan:			
Asahi Glass, Ltd. (warrants)	225	62,697	87,414
Ashikaga Bank, Ltd.	29,400	259,354	327,235
Canon, Inc. (warrants)	25	56,375	70,156
Daiichi Pharmaceutical Co., Ltd.	13,000	269,632	260,452
Daiwa Bank, Ltd.	47,000	579,551	562,365
Fanuc, Ltd.	6,000	282,150	350,191
Fuji Photo Film Co., Ltd.	9,900	232,125	307,847
Fujitsu, Ltd.	15,000	171,823	157,565
Fujitsu, Ltd. (warrants)	16	65,038	50,000
Gunma Bank, Ltd.	16,000	130,438	155,826
Hankyu Corp. (warrants)	25	68,125	102,188
Hitachi, Ltd.	37,000	485,931	391,235
Hokuriku Bank, Ltd.	18,000	161,083	194,087
Honda Motor Co., Ltd.	10,000	109,194	127,304
Industrial Bank of Japan, Ltd.	7,000	246,961	310,678
Ito-Yokado Co., Ltd.	7,000	217,374	226,435
C. Itoh and Co., Ltd. (warrants)	22	66,413	107,800
Japan Air Lines, Ltd.	1,400	165,991	188,939
Joshin Denki Co., Ltd. (warrants)	26	59,150	76,050
Jujo Paper Co., Ltd. (warrants)	20	52,000	33,125
Kansai Electric Power Co., Inc.	7,000	224,257	244,452
Kawasaki Steel Corp.	52,240	283,239	297,995
Kinki Nippon Railway Co., Ltd. (warrants)	45	109,050	135,563
Kubota, Ltd.	17,000	129,608	153,739
Kumagai Gumi Co., Ltd. (warrants)	20	70,625	102,000
Kyocera Corp.	6,200	221,798	232,904
Kyushu Electric Power Co., Ltd.	7,000	226,959	201,113
Marudai Food Co., Ltd. (warrants)	35	66,288	70,000
Mitsubishi Heavy Industries, Ltd. (warrants)	56	143,550	141,750
Mitsubishi Petrochemical Co., Ltd.	16,500	172,674	169,878
Mitsui and Co., Ltd. (warrants)	15	85,875	96,375
Mitsui Petrochemical Co., Ltd.	15,000	181,065	176,348
Mitsui Real Estate Development Co., Ltd.	13,000	287,752	265,878
Mitsui Toatsu Chemicals, Inc.	17,000	118,994	111,875
Mitsui Trust and Banking Co., Ltd.	19,000	319,142	276,243
Nikon Kogaku Co., Ltd.	17,000	188,608	177,391
Nippondenso, Ltd. (warrants)	11	28,050	46,475
Nippon Meat Packers Co., Ltd.	15,000	250,221	232,696
Nomura Securities Co., Ltd.	25,000	749,187	598,261

Schedule of Investments

December 31, 1989
(continued)

EQUITY	Number of Shares	Cost	Market
Japan (continued):			
Odakyu Electric Railways, Ltd. (warrants)	21	$ 68,250	$ 72,647
Onoda Cement Co., Ltd. (warrants)	22	53,900	66,138
Osaka Gas Co., Ltd. (warrants)	28	97,061	85,225
Ryoyo Electro Co., Ltd.	5,000	110,297	140,870
Seino Transportation Co., Ltd.	11,000	177,787	205,078
Sekisui Chemical Co., Ltd. (warrants)	27	45,225	98,550
Sekisui House, Ltd. (warrants)	37	102,493	166,500
Settsu Corp. (warrants)	21	40,250	52,172
77th Bank, Ltd.	40,000	309,508	378,435
Shin-etsu Chemical, Ltd.	22,000	285,109	273,948
Sony Corp.	8,000	364,145	481,948
Sumitomo Corp. (warrants)	43	54,825	99,303
Sumitomo Electric Industries, Ltd.	19,000	227,137	224,696
Sumitomo Marine and Fire Insurance Co., Ltd.	16,000	173,467	176,974
Sumitomo Metal Industries, Ltd. (warrants)	20	91,000	89,750
Taisho Pharmaceutical Co., Ltd.	11,000	182,073	211,200
Takashimaya Co., Ltd. (warrants)	26	82,888	158,600
Tohuku Electric Power Co., Inc.	7,000	163,016	205,983
Tokio Marine and Fire Insurance Co., Ltd.	12,000	177,915	181,983
Tokyo Broadcasting Co., Ltd.	10,000	197,831	231,652
Tokyo Electric Power Co., Inc.	7,000	282,598	301,426
Tokyo Steel Manufacturing Co., Ltd.	14,000	343,726	510,330
Tonen, Ltd.	19,000	259,101	292,104
Toppan Printing Co., Ltd.	11,000	173,463	172,174
Toto Co., Ltd.	11,000	185,122	215,791
Toyota Motor Corp. (warrants)	40	179,300	177,000
Yamanouchi Pharmaceutical Col, Ltd.	2,000	53,322	47,861
Yamazaki Baking Co., Ltd.	15,000	167,304	240,000
Norway, Sweden and Switzerland:			
Hafslund Nycomed, A.S.	3,900	103,597	95,841
Kvaerner Free, A.S.	4,200	114,030	117,505
Schweizfrischer Bankgesellschaft, AG	42	88,427	111,168
Volvo, AG	1,400	101,056	100,129
Zurich Versicherungs, AG	71	87,968	89,839
United Kingdom:			
Barratt Developments, PLC	20,925	74,062	65,735
Cable & Wireless, PLC	3,900	30,091	34,807
Dixons Group, PLC	38,900	100,684	85,228
Glaxo Holdings, PLC	7,800	94,532	98,642
Hillsdown Holdings, PLC	15,525	74,593	72,031
Lonrho, PLC	34,800	132,758	180,522
Lucas Industries, PLC	7,088	79,130	73,651
Rolls Royce, PLC	27,000	78,776	58,503

Schedule of Investments

December 31, 1989
(continued)

	Number of Shares	Cost	Market
EQUITY			
United Kingdom (continued):			
Royal Insurance Holdings, PLC	13,500	$ 100,156	$ 125,924
Standard Telephones and Cables, PLC	18,200	103,866	71,834
Ultramar, PLC	28,080	141,895	168,734
Total equity		$246,731,236	$341,132,845
OTHER			
CIGNA Real Estate Fund "T" Limited Partnership	4,687	$ 4,686,947	$ 5,530,996
CIIF II Business Trust	2,250	2,250,000	2,416,596
Endowment and Foundation Realty, Ltd. JMB III	5,000	5,000,000	5,728,474
Endowment and Foundation Realty, Ltd. JMB IV	2,500	2,500,000	2,570,190
PCA Sammis Industrial Fund, Inc.	20,020	2,002,000	2,075,000
Total other		16,438,947	18,321,256
Total fixed income		259,801,278	262,128,228
Total investments		$522,971,461	$621,582,329

1989
Schedule of Grants and Appropriations

	Unpaid Dec. 31, 1988	1989 Authorized	1989 Payments	Unpaid Dec. 31, 1989
American Academy of Arts and Sciences	$ 50,000	$ 90,000	$ 140,000	—
American Association for the Advancement of Science	55,000	68,507	62,025	$ 61,482
American Institute of Physics	—	25,000	25,000	—
American Museum of Natural History	—	30,000	30,000	—
American Philosophical Society	—	27,000	27,000	—
American Physical Society	—	5,000	5,000	—
Arizona State University	—	25,000	12,500	12,500
Association for Symbolic Logic	—	60,000	30,000	30,000
Association of Governing Boards of Universities and Colleges	25,000	—	25,000	—
Bay Area Video Coalition, Inc.	—	25,000	25,000	—
Boston University	—	236,000	155,000	81,000
Bowdoin College	—	20,000	20,000	—
Brandeis University	62,500	195,000	75,000	182,500
Brookings Institution	200,000	25,000	150,000	75,000
Brooklyn Law School	—	10,000	10,000	—
Brown University	37,500	134,957	92,500	79,957
Bucknell University	100,000	—	50,000	50,000
California, University of	641,750	4,382,444	1,312,146	3,712,048
California Institute of Technology	162,500	171,818	219,068	115,250
California State University Fullerton Foundation, Inc.	—	18,693	—	18,693
Carleton College	50,000	—	50,000	—
Carnegie-Mellon University	—	308,200	138,200	170,000
Case Western Reserve University	—	25,000	12,500	12,500
Center for Cultural and Technical Interchange Between East and West, Inc.	—	86,100	43,000	43,100
Center for Strategic and International Studies	—	30,000	30,000	—
Center on Budget and Policy Priorities	50,000	—	50,000	—
Centre for Economic Policy Research	200,000	—	100,000	100,000
Chicago, University of	270,000	226,372	313,872	182,500
Claremont University Center	—	350,000	150,000	200,000
Cold Spring Harbor Laboratory	—	180,000	80,000	100,000
Colgate University	75,000	—	—	75,000
College of the Holy Cross	—	25,370	—	25,370
Colorado, University of	—	50,000	25,000	25,000
Colorado, University of, Foundation, Inc.	—	390,000	195,000	195,000
Columbia University	122,500	114,223	139,223	97,500
Committee of Concerned Scientists, Inc.	—	30,000	30,000	—

1989
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1988	1989 Authorized	1989 Payments	Unpaid Dec. 31, 1989
Computer Museum	—	$ 250,000	$ 250,000	—
Connecticut, University of	—	48,741	—	$ 48,741
Consortium for Mathematics and its Applications (COMAP)	—	25,000	25,000	—
Cooper Union for the Advancement of Science	$ 30,000	—	—	30,000
Cornell University	90,250	275,987	300,987	65,250
Council on Foundations, Inc.	—	24,700	24,700	—
Dartmouth College	—	82,000	82,000	—
Davidson College	50,000	—	50,000	—
Denver, University of	—	37,165	—	37,165
Duke University	482,000	2,585,000	1,743,500	1,323,500
Educational Foundation for Nuclear Science	—	27,500	27,500	—
Emory University	—	25,000	12,500	12,500
Florida, University of	25,000	—	25,000	—
Florida State University	12,500	25,000	25,000	12,500
Foundation Center	60,000	—	60,000	—
Foundation for International Studies on Peace and Security	—	30,000	30,000	—
Foundation for the Establishment of a Graduate School of Political Management, Inc.	—	207,000	69,000	138,000
Fund for the City of New York	30,000	—	30,000	—
Georgetown University	149,000	—	98,000	51,000
Global Outlook Education Institute	—	50,000	50,000	—
Greater Washington Educational Telecommunications Association, Inc.	—	30,000	30,000	—
Grinnell College	75,000	—	50,000	25,000
Harvard University	1,112,750	1,115,860	1,316,110	912,500
Harvey Mudd College	—	29,500	29,500	—
Hebrew University of Jerusalem	—	25,000	25,000	—
History of Science Society	—	30,000	30,000	—
Houston, University of	—	25,000	12,500	12,500
Houston Area Research Center	—	10,000	10,000	—
Howard University	—	30,000	30,000	—
Illinois, University of	65,250	25,000	77,750	12,500
Independent Sector	—	7,400	7,400	—
Indiana University Foundation	40,250	—	40,250	—
Institute for International Economics	375,000	—	125,000	250,000
International Association for Research in Income and Wealth	22,000	—	—	22,000

1989
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1988	1989 Authorized	1989 Payments	Unpaid Dec. 31, 1989
Iowa, University of	—	$ 25,000	$ 12,500	$ 12,500
Iowa State University	—	25,000	12,500	12,500
Johns Hopkins University	$ 25,000	8,995	33,995	—
Kansas State University	—	25,000	12,500	12,500
Lafayette College	100,000	—	—	100,000
Lawrence University	—	24,000	24,000	—
London School of Economics and Political Science	230,000	150,000	184,000	196,000
Louisiana State University	—	25,000	12,500	12,500
Manhattan Institute for Policy Research, Inc.	—	90,000	45,000	45,000
Manpower Demonstration Research Corporation	—	90,000	90,000	—
Marine Biological Laboratory	—	66,000	66,000	—
Maryland, University of	—	25,000	12,500	12,500
Maryland, University of, Foundation, Inc.	—	30,000	30,000	—
Massachusetts, University of	—	80,500	40,250	40,250
Massachusetts Institute of Technology	197,500	637,672	700,672	134,500
Mathematical Association of America	115,000	—	50,000	65,000
Medical and Health Research Association of New York City, Inc.	250,000	—	250,000	—
Memorial Sloan-Kettering Cancer Center	500,000	—	500,000	—
Miami, University of	—	130,000	130,000	—
Michigan, University of	112,500	202,666	224,916	90,250
Middlebury College	—	150,000	50,000	100,000
Minnesota, University of	248,000	40,603	223,103	65,500
Montana State University	—	25,000	12,500	12,500
Montreal, University of	12,500	—	12,500	—
Mount Holyoke College	60,000	—	35,000	25,000
National Academy of Engineering Fund	—	600,000	—	600,000
National Academy of Sciences	250,000	193,000	405,500	37,500
National Bureau of Economic Research, Inc.	150,000	300,000	325,000	125,000
National Commission on the Public Service	—	50,000	50,000	—
National Foundation for History of Chemistry	—	30,000	30,000	—
National Jewish Center for Immunology and Respiratory Medicine	—	80,500	40,250	40,250
National Opinion Research Center	—	104,535	—	104,535
National Research Council	150,000	25,000	125,000	50,000
New School for Social Research	—	225,000	75,000	150,000

1989
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1988	1989 Authorized	1989 Payments	Unpaid Dec. 31, 1989
New York Hall of Science	—	$ 262,000	—	$ 262,000
New York Regional Association of Grantmakers	—	7,125	$ 7,125	—
New York University	$ 25,000	550,000	212,500	362,500
North Carolina Agricultural & Technical State University	100,000	—	75,000	25,000
North Carolina, University of	12,500	75,000	87,500	—
North Carolina State University	—	80,500	40,250	40,250
Northwestern University	12,500	109,430	84,430	37,500
Oberlin College	75,000	25,000	75,000	25,000
Ohio State University	12,500	25,000	25,000	12,500
Oklahoma State University	12,500	25,000	25,000	12,500
Oregon, University of	12,500	16,610	29,110	—
Oregon State University	—	25,000	12,500	12,500
Pennsylvania, University of	122,500	39,580	149,580	12,500
Pennsylvania State University	40,250	50,000	65,250	25,000
Pittsburgh, University of	137,500	25,000	75,000	87,500
Planetary Society	—	30,000	30,000	—
Pomona College	60,000	—	35,000	25,000
Population Resource Center	—	30,000	30,000	—
Princeton University	160,000	725,201	411,390	473,811
Purdue University	—	25,000	12,500	12,500
Queen's University	40,250	—	40,250	—
RAND Corporation	375,000	117,000	242,000	250,000
Reed College	—	150,000	70,000	80,000
Rensselaer Polytechnic Institute	—	25,000	25,000	—
Research Foundation of State University of New York	400,000	321,525	420,425	301,100
Resources for the Future	—	250,000	125,000	125,000
Rice University	25,000	—	25,000	—
Rochester, University of	139,500	185,500	196,250	128,750
Rockefeller University	—	18,000	18,000	—
Rutgers University	25,000	17,000	42,000	—
Rutgers University Foundation	125,000	10,000	85,000	50,000
Salk Institute	25,000	25,000	37,500	12,500
Savannah State College	60,000	75,000	35,000	100,000
Showa University Research Institute for Biomedicine in Florida	40,250	—	40,250	—
Smithsonian Institution	150,000	258,000	150,000	258,000
Social Science Research Council	140,000	—	70,000	70,000
Societal Institute of the Mathematical Sciences	—	16,500	16,500	—
Southern California, University of	—	86,000	36,000	50,000
Spelman College	60,000	—	35,000	25,000

1989
Schedule of Grants and Appropriations
(continued)

	Unpaid Dec. 31, 1988	1989 Authorized	1989 Payments	Unpaid Dec. 31, 1989
Stanford University	$ 281,000	$ 89,749	$ 230,249	$ 140,500
St. Louis University	—	25,000	12,500	12,500
Swarthmore College	100,000	—	50,000	50,000
Temple University	—	25,000	12,500	12,500
Texas, University of	12,500	174,736	109,486	77,750
Texas A & M University	12,500	—	12,500	—
Toronto, University of	12,500	—	12,500	—
Trinity College	160,000	—	85,000	75,000
Tufts University	—	10,055	10,055	—
Tuskegee University	75,000	—	75,000	—
Union College	125,000	—	75,000	50,000
United Nations Association of the USA	—	100,000	100,000	—
Upjohn, W.E., Institute for Employment Research	65,000	—	65,000	—
Urban Institute	—	66,000	30,000	36,000
Utah, University of	—	50,000	25,000	25,000
Virginia, University of	12,500	38,000	38,000	12,500
Washington, University of	12,500	76,399	63,899	25,000
Washington University	52,750	—	52,750	—
Waterloo, University of	12,500	—	12,500	—
Wayne State University	—	147,000	—	147,000
Wellesley College	50,000	—	50,000	—
Western Ontario, University of	—	170,000	85,000	85,000
WGBH Educational Foundation	—	400,000	200,000	200,000
Whitehead Institute for Biomedical Research	—	50,000	—	50,000
Williams College	200,000	—	50,000	150,000
Wisconsin, University of	110,000	35,000	132,500	12,500
Yale University	25,000	138,090	125,590	37,500
Yeshiva University	12,500	—	12,500	—
Sloan Research Fellowships to be granted in ensuing year	2,250,000	—	—	2,250,000
Sloan Doctoral Dissertation Fellowships to be granted in ensuing year	1,000,000	50,000	—	1,050,000
Officer grant appropriation for grants in ensuing year	1,500,000	500,000	—	2,000,000
Book Program	260,797	—	53,128	207,669
Other appropriations for grants and related expenses	821,722	(331,213)	65,256	425,253
	16,672,769	21,337,795	17,361,140	20,649,424
Reduction for grant transfers		(133,692)	(133,692)	
	$16,672,769	$21,204,103	$17,227,448	$20,649,424

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1990 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 indus-

trial 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
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

ADMINISTRATIVE OFFICERS AND STAFF 1990-1991

Ralph E. Gomory
President

Stewart F. Campbell
Financial Vice President and Secretary

Arthur L. Singer, Jr.
Vice President

Hirsh G. Cohen
Program Officer

Leora Landmesser[1]
Christopher Sia[2]
Controller

Muriel P. Gaines[3]
Assistant Secretary

Maureen Gassman[4]
Assistant Secretary

Samuel Y. Gibbon, Jr.[5]
Program Officer

Samuel Goldberg[6]
Program Officer

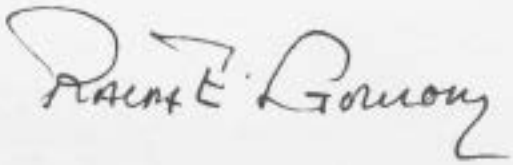
Michael S. Teitelbaum
Program Officer

Harry Weiner
Program Consultant

[1] Resigned October 9, 1990
[2] Effective October 9, 1990
[3] Retired June 30, 1991
[4] Effective June 18, 1991
[5] Effective March 11, 1991
[6] Retired December 31, 1990

PRESIDENT'S STATEMENT

The Foundation's grant program continues to change and evolve along the lines described in this report, and we look forward to further evolution in 1991. However, in 1991 all of us will miss the presence of Samuel Goldberg, who retired at the end of 1990. Samuel Goldberg has been a Program Officer since 1985, guiding and influencing many areas, especially the New Liberal Arts program. We, and many who work with the Foundation, will miss him but we are pleased he will continue as a consultant to our programs.



1990 GENERAL INFORMATION

INTRODUCTION

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 $28.1 million. The total assets at the end of 1990 were $612 million.

PROGRAMS AND INTERESTS

The main interests 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 make up a significant part of the Science and Technology Program. 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.

In the *Direct Support of Research*, the 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 example of this kind is the continuing cross–disciplinary program in Molecular Studies of Evolution. The Foundation has also started a small program to encourage mathematicians to play a role in the enormous task of pulling useful results from the mass of genetic data that will emerge from the Human Genome Project. The Foundation is open to other areas of research.

Support of the Research Infrastructure is another area of continuing interest. Examples are the support of conferences, workshops, or fellows programs, such as a 1990 grant given to the Association of American Universities for a special committee to study the problems of the research infrastructure of universities. Another example is a recent grant to the American Association for the Advancement of Science for a new fellowship program to bring industrial expertise to the White House Office of Science and Technology Policy. In 1990 a grant was also given to Harvard University for a research and fellows program that will focus on understanding industrial innovation processes and the possibilities they suggest for public policies.

The Foundation is interested in helping to foster a better ***Understanding of the Working of the University Research Process*** as a system. How many researchers are generated by the research process itself? Is the shortage of funds for individual investigators due to an increase in funds for big science or some other cause, or is it due to the ever increasing population of qualified researchers? Would more research funding help the situation, or would it lead to even more investigators being produced? What is the right number of researchers? This is an area characterized by few facts and much conviction today.

Another aspect of the Foundation's science program is the support of the ***History of Science and Technology***. The Science Book Series, which has produced autobiographical descriptions by leaders of modern science, will soon be brought to a close and a new series on technology will be started. Great technical events of our time such as the development of optical fibers, or of the laser and its long struggle to find applications, should be chronicled. These events need to be recorded in detail and made available and intelligible to an audience wider than scholars working in these areas. This is the goal of the new Technology Book Series.

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

The Sloan program in the ***New Liberal Arts*** can be regarded as an effort to inject an appreciation of technology into the curriculum of non-technologists. In 1991 this program will focus on conferences, meetings and other means aimed at disseminating results. As this major program winds down, other areas will be starting up.

One of these is ***Education Outside the Schools.*** The Foundation will emphasize, in various forms, education for those who want to educate themselves, or more generally, education outside the school system.

Two of the means that suggest themselves are self-education through the use of new technologies for independent learning, e.g., optical disks and multi-media, and learning through interacting with others. This second has been enormously facilitated by the possibility of computer networking in various forms.

There is also the question of ***Outreach*** to the large population that is less interested in science and technology. Use of television for outreach remains a possibility, as illustrated by a grant for "Great Projects in Engineering," a series aimed at public television viewers.

The problem of ***Science and Engineering Manpower*** has many dimensions. Concerns related to educating a future scientific and technical elite as well as educating the general population in scientific literacy are important. Understanding how and why people choose (or do not choose) to enter professions in science and technology, analyzing the presence of minorities and women in these fields, and examining the availability of education on key subjects such as manufacturing are examples of other aspects of the manpower issue which the Foundation is pursuing through a variety of approaches.

One initiative involves working with ***Special Schools*** such as the State of North Carolina's residential high school for science. The attempt here is to educate a small number of people at a very high level. In 1990 grants were given to this school and to similar ones in Illinois and Mississippi for programs that will increase the entry of minorities. For the future, the Foundation plans to see if other aspects of the special school effort can be helped and to extend this kind of program, along with other minority programs described below.

How and why do people ***Choose*** their vocation or profession? The knowledge that exists today gives us limited practical guidance on how people choose or how one would act to influence that choice. The Foundation began a program in this area in 1990. An MIT study on why students chose science and technology was funded. Another aspect of this problem is to understand those who choose these fields and then drop out. Examples of 1990 grants in these areas were a University of Colorado study of why a large percentage of science and engineering majors transfer to other fields within the first two years, and a Dartmouth College study of changes from science or engineering in early years based on an examination of high school record, quality of preparation, and early academic records (also involves Brown, Yale, and Cornell).

The education of managers has been a continuing interest of the Foundation. An important development in ***Management and Engineering Education*** is the invigoration of ***Manufacturing*** as a field for study and practice. In 1990 grants were made to MIT and Northwestern for master's programs in manufacturing. The basic ingredients of both the MIT and Northwestern master's program in manufacturing are joint participation by both the engineering and management schools of the university, students who already have a strong technology background, usually through a B.S. in engineering, and close cooperation and interchange with industry.

Today foreign nationals are major contributors to the nation's trained manpower. The Foundation's ***Immigration*** program will focus in the future on the flow of highly trained professionals in science and technology.

Minorities are especially underrepresented in the physical and mathematical sciences. The Foundation's plans include supporting research designed to yield an understanding of the causes. But it also includes key actions such as the special schools minority program mentioned above. In technology and management, the way ahead is straightforward. We plan to provide training of the highest quality to approximately 150 minority students per year. We will identify exemplary programs and provide them with support. In 1990, for example, we made grants to Stanford University, the Georgia Institute of Technology, and City College of New York, all of which have been exceptional in producing Black and Hispanic engineers. Similar grants were made to the management schools at UCLA and Northwestern to increase the number of Black and Hispanic M.B.A.s. These efforts will continue.

Women are still significantly underrepresented in our subject areas. We have work underway, and will continue to work, both to encourage the entry of women into science and technology through known means, such as mentoring, as in our grant to the Association for Women in Science, and through studying the special problems women confront in considering, entering or pursuing careers in science and technology. For example, a grant to the University of Michigan will support a study of the factors influencing women to do advanced study in the mathematical and physical sciences.

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 a competitive world economy.

The intention is to support the evolution of an academic community that can provide realistic research and education on American industry. The plan is to help build academic interests and structures that will maintain themselves over the long-term. As this occurs, it is expected that the observations, knowledge, and particularly the trained professionals, will also benefit American companies.

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, trade policy, international economics, the role of government scientific and technical activities and so forth. All of these areas are part of this program.

The Foundation's long-standing interest in ***Economics*** turned toward these matters in 1990. Grants were made to support William Baumol's and Edward Wolff's studies on productivity and for a National Research Council study of the role of computers in service industry productivity. In international economics a grant was given to the Institute for International Economics to examine the topic of reciprocity and retaliation in U.S. trade policy.

In 1991, there will be further explorations of the issues of ***Economic Growth, Trade, and Competitiveness***. This may involve a look at the role of large corporations as leaders in all three of these areas, the relations between these corporations and both their host and foreign countries, and their relations to small and medium sized companies. Another area for consideration relates to new major economic block formations—the U.S. and its hemisphere, Europe, and the Japan-Pacific Rim—and the implications for the U.S. economy.

One topic that is discussed at length but not studied in great detail is the alleged short-term attitudes of American business management. In 1990 a study was funded on the time horizons of investments in U.S. industry by the Harvard Business School and the Council on Competitiveness. In 1991, further research studies in this field will be funded.

A major new program on ***Industry Studies*** began in 1990, with grants to MIT and to Harvard and The Textile/Clothing Technology Corporation, for studies in the automobile and the textile and apparel industries. Concentration on a specific industry can be rewarding from a scholarly point of view, may attract young people to understand industrial issues in greater depth, and bring additional information to participants in the industry. Both of the initial studies in this program focus on manufacturing and both have a worldwide scope. They include social scientists, engineers, and business school faculty.

In 1991, new industry studies will be added. Industry candidates are the semiconductor, steel, and pharmaceutical industries, and perhaps a major service industry. In addition, an allied program that compares technology, management, human resources, and other matters across industries will be considered.

In another new effort, ***Training for Work,*** support was provided, in 1990, for the development of an apprenticeship training program in the metal fabrication industry in Pennsylvania, jointly with the U.S. Department of Labor and the State of Pennsylvania. This represents an effort to understand and, perhaps, affect the training of young people for work in industry. In 1991, the role of community colleges in training for work, both locally in their own communities and through new regional and national networks, may be a new area of interest.

In the area of ***Manufacturing*** in 1990, a grant was made to the Berkeley Roundtable for International Economics for a study, one part of which will further explore the dependence of service industries on manufacturing and, in another part, will measure manufacturing best practices as viewed internally in several industries.

Partial support was provided for a WGBH public television series dealing with manufacturing productivity and U.S. competitiveness. This is the first of Sloan's efforts toward wider public communication of industry and competitiveness issues.

Grants in the ***Management of Technology*** for 1990 included a study of business units within a single corporate environment that have followed technology strategies that produce successful or failed products, and a study of the management of manufacturing facility changes in an industry with a fast product cycle. In 1991, further studies of technology management within the total manufacturing process—product design and development and especially, the production process itself—will be considered.

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.

During the past year two grants of this nature were made: one relating to the problem of *Drug Abuse*, the other within the area of the *Environment*. The first was to the RAND Corporation for an evaluation of the contentious issue of decriminalization of drugs. The second was to the Woods Hole Oceanographic Institution for a study of the potential use of the deep oceans for waste retention.

In 1991 one or more studies of the underlying causes for the strongly negative public perception of nuclear power will be considered.

In addition to the four main areas the Foundation will continue its tradition of a *Civic* program and, as in the past, 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.

1990 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 research and related activities in molecular evolution, mathematics, population science, science and technology policy, the history of science and technology, and several other areas of interest. A substantial number of officer grants support special scientific symposia, workshops, and conferences.

The Foundation is open to proposals in new areas within the science and technology program. 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. Support of the infrastructure of science and technology, as well as projects leading to a better understanding of the working of science and technology as a system, are also of interest. Scholarly work in the history of science and technology is another area the Foundation is pursuing.

Sloan Research Fellowships **$2,250,000**

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 2500 scientists at over 180 colleges and universities and have accounted for expenditures of nearly $55 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 1990, the Foundation awarded Research Fellowships of $25,000 each, over a two year term, to 90 scholars at 51 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 Sims, Yale University

Mathematics: Dr. Barry Mazur, Harvard University; Dr. Richard B. Melrose, Massachusetts Institute of Technology; Dr. John Milnor, The Institute for Advanced Study

Neuroscience: Dr. Gerald D. Fishbach, Washington University; Dr. Bruce S. McEwen, The Rockefeller University; Dr. Robert H. Wurtz, National Eye Institute, NIH

Physics: Dr. Roger Dashen, University of California, San Diego; Dr. R. C. Dynes, AT&T Bell Laboratories; Dr. William Press, Harvard University

FELLOWSHIP RECIPIENTS

Arizona, University of
Physics: Wing Yim Tam

Boston University
Economics: Jeffrey A. Miron
Physics: R. Sekhar Chivukula

Brown University
Chemistry: Vernon E. Anderson
Physics: Gang Xiao

California Institute of Technology
Chemistry: Andrew G. Myers
Mathematics: Ursula Hamenstadt
Neuroscience: Kai Zinn
Physics: E. Sterl Phinney
Nai-Chang Yeh

California, University of, Berkeley
Chemistry: William H. Armstrong
Steven F. Pedersen
Economics: Eddie Dekel-Tabak
Physics: Kam-Biu Luk
Daniel S. Rokhsar

California, University of, Irvine
Chemistry: Vartkess A. Apkarian
Nancy M. Doherty
Frank J. Feher

California, University of, Los Angeles
Mathematics: Peter Petersen
Neuroscience: Utpal Banerjee
Dwayne D. Simmons
Physics: Shechao Feng

California, University of, San Diego
Physics: David B. Kaplan
Ann E. Nelson

California, University of, San Francisco
Neuroscience: Robert C. Malenka

California, University of, Santa Barbara
Mathematics: D. Darren Long
Neuroscience: Richard Ivry

Carnegie Mellon University
Chemistry: Charles L. Brooks

Chicago, University of
Mathematics: Kevin Corlette

City University of New York, City College
Mathematics: Thea Pignataro

Clemson University
Chemistry: Joseph W. Kolis

Columbia University
Chemistry: Charles M. Lieber

Connecticut, University of
Physics: Phillip L. Gould

Cornell University
Chemistry: Roger F. Loring

Dartmouth College
Neuroscience: Robert Alan Maue

Duke University
Mathematics: Mark A. Stern
Neuroscience: Stephen Nowicki

Georgia Institute of Technology
Physics: Mei-Yin Chou

Harvard University
Economics: Andrei Shleifer
Michael D. Whinston
Physics: Benjamin Grinstein

Illinois, University of, Chicago
Mathematics: Charles Knessl

Indiana University
Mathematics: Russell D. Lyons

Iowa, University of
Chemistry: James B. Gloer

Johns Hopkins University
Physics: Rosemary Wyse

Kansas, University of
Chemistry: Thomas A. Engler

Maryland, University of
Mathematics: Jeffrey David Adams
Physics: Frederick N. Skiff

Massachusetts Institute of Technology
Economics: Robert S. Gibbons
Mathematics: Ehud Hrushovski
Physics: Jacqueline N. Hewitt
Simon G. J. Mochrie

McMaster University
Physics: Bruce D. Gaulin

Michigan State University
Chemistry: Daniel G. Nocera

Michigan, University of
Mathematics: John R. Stembridge
Physics: Myron K. Campbell

Missouri, University of
Neuroscience: Allan Lee Harrelson

New York University
Mathematics: Thomas Y. Hou

Northwestern University
Chemistry: Joseph T. Hupp
Monica Olvera de la Cruz

Ohio State University
Mathematics: Luis Casian
Alice Silverberg

Oregon, University of
Neuroscience: William M. Roberts
Physics: James M. Valles

Pennsylvania State University
Mathematics: Ranee Kathryn Brylinski

Pennsylvania, University of
Chemistry: Donald H. Berry
William P. Dailey
Economics: Stephen P. Zeldes
Neuroscience: Dolan B. Pritchett

Princeton University
Neuroscience: Gregory A. Clark

Purdue University
Physics: David D. Nolte

Rochester, University of
Mathematics: Alan T. Greenleaf

Rutgers University
Chemistry: Edward Arnold
Mathematics: William Duke

Southern California, University of
Chemistry: Bruce E. Koel

Stanford University
Economics: Faruk Gul
Robert W. Staiger
Neuroscience: Thomas L. Schwarz

Texas, University of
Mathematics: John E. Luecke

Utah, University of
Chemistry: Charles A. Wight

Vanderbilt University
Neuroscience: Jeffrey D. Schall

Washington, University of
Mathematics: Paul G. Goerss
Neuroscience: Jonathon Howard
Physics: Stephen Roger Sharpe

Wayne State University
Chemistry: Joseph S. Francisco

Wisconsin, University of
Chemistry: Mark D. Ediger
Mathematics: Sigurd B. Angenent
Neuroscience: Laurence O. Trussell

Yale University
Neuroscience: David A. McCormick
Physics: A. Douglas Stone

1990 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 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 340 graduate students and have accounted for expenditures of just over $6 million. In 1990, awards covering full tuition plus a stipend of $13,000 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. Zvi Griliches, Harvard University; 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

Brandeis University
Mathematics: Lung Ying Fong

California Institute of Technology
Mathematics: Vojkan Jaksic

California, University of, Berkeley
Economics: Marc A. Van Audenrode
Mathematics: Kai A. Behrend
Gregory John Kuperberg
Stephen French Sawin

California, University of, Los Angeles
Economics: Pierluigi Balduzzi
Mathematics: David C. Butler
Charles Henry Conley

California, University of, San Diego
Economics: Jesus Gonzalo
Jong-Haak Hong

Carnegie Mellon University
Economics: Wouter J. den Haan

Chicago, University of
Economics: Chi-Wa Yuen

Columbia University
Economics: Ioanis Benopoulos

Cornell University
Mathematics: Martin Robert Bridson
Melanie A. Stein

Harvard University
Economics: Jonathan Gruber
Jonathan Morduch
Mathematics: Dan Abramovich
Jean-Francois Burnol
Henri Darmon

Indiana University
Mathematics: Keith Promislow

Johns Hopkins University
Mathematics: Michimasa Tanabe

Maryland, University of
Economics: Haiying Zhao

Massachusetts Institute of Technology
Economics: David M. Cutler
Jeffrey Zwiebel
Mathematics: Satish C. Reddy
Alan A. Thompson

Michigan, University of
Economics: Thomas Maloney
Timothy Waidmann
Mathematics: Shanshuang Yang

Minnesota, University of
Mathematics: Xinfu Chen

New York University
Mathematics: Stephanie F. Singer
Katarzyna Pietruska-Paluba

Northwestern University
Economics: David D. Augustin
Charles E. Miles

Pennsylvania, University of
Economics: Francis P. Bloch

Princeton University
Economics: Christoph Schmidt
Mathematics: Gabriel Fractman
Richard Schwartz

Rochester, University of
Economics: Miguel Gouveia

Stanford University
Economics: Andrew B. Bernard
Peter J. Klenow
Mathematics: Thomas James Hewett

Virginia, University of
Economics: Michael Palumbo

Washington, University of
Mathematics: Jun Yang

Wisconsin, University of
Economics: Kenneth Couch

Yale University
Economics: Samuel S. Kortum
Gyutaeg Oh
Mathematics: Bong H. Lian

In 1985, the Foundation identified molecular evolution as a field of science presenting dramatic potential for scientific advances, yet currently lacking in adequate financial support. The potential for new understanding of the fundamental processes of evolution has arisen from the development, over the past two decades, of the powerful techniques of molecular biology. For the first time, it is possible to study the history of evolution that is encoded in the genetic complement of different species. Such research can develop quite new sources of data and analysis, to be added to and compared with those arising from studies of the fossil record and from morphological comparisons. Together, these three complementary approaches offer the prospect of revolutionary new insights into the evolutionary origins of the earth's animal and plant kingdoms.

Because this is such a new and cross-disciplinary field of science, there are relatively few scientists possessing the necessary scientific background and training in both evolutionary biology and molecular biology. In 1987, the Foundation initiated an annual postdoctoral fellowship program that offers young molecular and evolutionary biologists the opportunity to develop the skills necessary for research in molecular evolution. In 1989, a parallel sabbatical supplement awards program was initiated to provide similar opportunities for more senior scientists. In addition, the Foundation has supported two intensive "schools" or "short courses" in molecular evolution, the first at the UCLA Molecular Biology Institute, the second at the Marine Biological Laboratory in Woods Hole. Over 200 participants have now benefitted from the intensive curricula of these two programs. Finally, the Foundation has supported a number of scientific conferences and symposia on particular topics central to molecular evolution.

During 1990, the following distinguished advisory committee continued to assist the Foundation in all aspects of this program:

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; **Allan C. Wilson**, Professor of Biochemistry, University of California, Berkeley.

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

In 1990, the fourth 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 1991.

Fellow: Sandra L. Baldauf, Department of Biology, Indiana University • *Host Institution and Senior Scientist:* Dalhousie University, Department of Biochemistry, Michael W. Gray • *Topic:* "Origin of an Unusual Algal Mitochondrial DNA: Accelerated Evolution or Horizontal Transfer?"

Fellow: Eric Cabot, Department of Biology, University of Rochester • *Host Institution and Senior Scientist:* University of Rochester, Department of Biology, Chung-I Wu • *Topic:* "RFLP Assisted High Resolution Mapping of Factors Responsible for Reproductive Isolation between Drosophila Species"

Fellow: Michael W.J. Crosland, Department of Entomology, University of California, Davis • *Host Institution and Senior Scientist:* University of California, Davis, Department of Entomology, Robert E. Page, Jr. • *Topic:* "The Genetic Structure of Californian Honeybee Populations Prior to Their Invasion by the Africanized Honeybee"

Fellow: Robert F. DuBose, Institute of Molecular Biology, University of Oregon • *Host Institution and Senior Scientist:* University of Oregon, Institute of Molecular Biology, Brian W. Matthews • *Topic:* "An Investigation into the Processes of Protein Evolution Using Bacteriophage Lysozyme as a Model System"

Fellow: Brian D. Farrell, Department of Entomology, University of Maryland & Smithsonian Institution • *Host Institution and Senior Scientist:* Cornell University, Section of Ecology & Systematics, Richard Harrison • *Topic:* "Molecular Phylogenetic Study of Insect/Plant Coevolution: Are the Interactions as Old as the Antagonists?"

Fellow: Scott R. Freeman, Department of Zoology, University of Washington • *Host Institution and Senior Scientist:* Princeton University, Department of Biology, Martin Kreitman • *Topic:* "Is There a Generation-time Effect in Rate of DNA Sequence Change?"

Fellow: Yoshinori Kumazawa, Department of Biological Sciences, Tokyo Institute of Technology • *Host Institution and Senior Scientist:* University of California, Berkeley, Department of Biochemistry, Allan C. Wilson • *Topic:* "The Evolution of Mitochondrial tRNAs in Birds"

Fellow: Katrina L. Mangin, Department of Ecology & Evolutionary Biology, University of Arizona • *Host Institution and Senior Scientist:* University of California, Santa Cruz, Division of Natural Sciences, Lynda Goff • *Topic:* "The Role of Lateral Gene Transfer in the Evolution of Endosymbioses in the Parasitic Red Algae"

Fellow: Joseph M. Quattro, Center for Theoretical and Applied Genetics, Cook College, Rutgers University • *Host Institution and Senior Scientist:* Stanford University, Department of Biology, Dennis A. Powers • *Topic:* "Evolution of the Lactate Dehydrogenase (Ldh) Gene in Chordates"

Fellow: Adam D. Richman, Department of Biology, University of California, San Diego • *Host Institution and Senior Scientist:* University of Oregon, Department of Biology, Michael Lynch • *Topic:* "Molecular Characterization of the Gametophytic Self-incompatibility Locus and its Application to the Study of Population Structure in Natural Populations of the Island Endemic Eschscholzia ramosa (Papaveraceae)"

Sabbatical Awards Program in Molecular Evolution **$300,000**

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 1990, the second round in the program. Grants will be made in 1991-1992.

Fellow: Robert A. Browne, Department of Biology, Wake Forest University • *Host Institution and Laboratory Director:* Harvard University, Department of Cellular and Developmental Biology, and Marine Biological Laboratory, J. Woodland Hastings • *Topic:* "Molecular Divergence of Sexual and Asexual Populations of Brine Shrimp (Artemia)"

Fellow: Rose Ann Cattolico, Department of Botany, University of Washington • *Host Institution and Laboratory Director:* University of Washington, School of Oceanography, Arthur R.M. Nowell • *Topic:* "Evolution of the Calvin Cycle"

Fellow: Andrew G. Clark, Department of Biology, Pennsylvania State University • *Host Institution and Laboratory Director:* University of California, Davis, Department of Genetics, Charles Langley • *Topic:* "Problems in Molecular Population Genetics of Drosophila"

Fellow: Da-Fei Feng, Department of Chemistry, Mesa College • *Host Institution and Laboratory Director:* University of California, San Diego, Center for Molecular Genetics, Russell F. Doolittle • *Topic:* "Estimating the Time of Divergence of Prokaryotic and Eukaryotic Organisms" and "Gene Cloning and DNA Sequence Determination of Eukaryotic Organisms"

Fellow: Christine Guthrie, Department of Biochemistry & Biophysics, University of California, San Francisco • *Host Institution and Laboratory Director:* University of California, Santa Cruz, Department of Biology, Harry F. Noller • *Topic:* "Molecular Evolution of the Spliceosome"

Fellow: Kermit Ritland, Department of Botany, University of Toronto • *Host Institution and Laboratory Director:* University of Washington, Department of Genetics, Joseph Felsenstein • *Topic:* "Molecular Inferences Involving Variability of Relationship"

Fellow: Thomas Uzzell, Museum of Natural History, University of Illinois • *Host Institution and Laboratory Director:* Washington University School of Medicine, Department of Genetics, Daniel L. Hartl • *Topic:* "Linkage Groups and Preliminary Physical Map of Rana Chromosomes: Steps in the Analysis of the Genetic and Molecular Basis of Natural Clonal Reproduction"

TRUSTEE GRANTS

Marine Biological Laboratory **$80,779**
Woods Hole, Massachusetts 02543

University of California, Los Angeles **$92,288**
Los Angeles, California 90024

To stimulate research in molecular studies of evolution, the Foundation is supporting two series of intensive "schools" or "short courses." One is at the Marine Biological Laboratory (MBL) in Woods Hole, and is directed mainly toward evolutionary biologists interested in learning the research potentials of molecular techniques. This school is a two-week session with approximately 60 participants, ranging from advanced doctoral candidates to full professors.

The second series of short courses is at UCLA Molecular Biology Institute, and is directed toward molecular biologists interested in evolutionary questions. This school is a one-week intensive introduction to the issues and techniques of evolutionary analysis using molecular data. The Foundation's 1990 grant will support the School in March 1991. (Project directors: Harlyn O. Halvorson, Director, MBL, and James A. Lake, Professor of Molecular Biology in Biology, UCLA; Grant periods: March 1990-February 1991 and November 1990-October 1993.)

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

Joshua Lederberg, the 1958 Nobel laureate in biology, has served with distinction as President of Rockefeller University from 1978-1990. He will now initiate an ambitious research program as a University Professor. There are two foci of his planned research agenda: first, experimental assessment of the degree to which the environment may influence the rate of mutation in a gene, and second, the development of an improved computer-based formal examination of micro- and molecular biology theories, especially those that have led to "egregious error." The Markey Charitable Trust will join with the Sloan Foundation in providing support. (Project director: Joshua Lederberg, Professor; Grant period: July 1990-December 1991.)

OFFICER GRANTS

Cold Spring Harbor Laboratory **$30,000**
Cold Spring Harbor, New York 11724

For support of a Cold Spring Harbor Laboratory symposium, "Evolution: From Molecules to Culture." (Project director: Jan A. Witkowski, Director, Banbury Center; Grant period: March 1990-February 1991.)

Rutgers University Foundation **$30,000**
New Brunswick, New Jersey 08903

For support of a series of symposia and workshops in molecular genetics and evolution. (Project director: Peter E. Smouse, Director, Program in Applied Genetics and Evolution; Grant period: January 1991-December 1993.)

TRUSTEE GRANTS

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

Massachusetts Institute of Technology **$300,000**
Cambridge, Massachusetts 02139

United States mathematicians and theoretical physicists have much to gain from extended contact with Soviet colleagues. Although the U.S. has mathematical visitors from all over the world, by and large we train them. The Soviets appear to be an exception—they are teaching us many new things. There is general agreement that the presence here of Soviet visitors can have a strong positive effect on U.S. mathematics and theoretical physics.

These three-year grants will support three Soviet visitors per year at Harvard and at MIT. Invitations will be extended only to research mathematicians and theoretical physicists of the highest quality. They will participate in research seminars, but will not be part of the teaching faculty. Visits will be for one to six months, with possible rare exceptions for a longer stay. Sloan support will be supplemented with funds contributed by Harvard and MIT for this visitor program. (Project directors: Wilfried Schmid, Professor of Mathematics, and Chairman, Mathematics Department, and Arthur Jaffe, Professor of Mathematics and Theoretical Science, Harvard University, and Robert MacPherson, Professor of Mathematics, and I.M. Singer, Institute Professor, MIT; Grant periods: October 1990-September 1993, and November 1990-October 1993.)

The Institute for Advanced Study **$128,800**
Princeton, New Jersey 08540

The School of Mathematics at the Institute plays a leadership role in mathematics research. For over thirty years this has almost all been in abstract mathematics, more recently, in fact, in the unifying movements between various branches of pure mathematics. This project marks a new venture for the Institute by moving into aspects of applied mathematics, in this case, modern fluid dynamical problems. Three outstanding senior applied mathematicians will be in residence at the Institute during the 1991-1992 academic year. At least six promising younger, but already acknowledged, people in the field will also come. In addition, some part of the selection of the temporary members who apply to the Institute will be devoted to theoretical and mathematical fluid dynamics researchers.

The funding from Sloan will go towards partial support of the year-long visitors. The Institute is bearing half of this cost and federal agencies will also contribute. A portion of the Sloan funding is ear-marked for a special, rather large open meeting in the spring of 1992 on fluid dynamics. (Project director: Thomas Spencer, Professor and Member, School of Mathematics; Grant period: August 1990-September 1992.)

National Academy of Sciences **$50,000**
Washington, D.C. 20418

The National Research Council's Board on Mathematical Sciences plans to prepare and distribute a series of state-of-the-art reports, each highlighting interactions between the mathematical sciences and a specific applied area. This grant will provide partial support for a report on mathematical problems in molecular biology. Molecular biology, including genome and protein structure, has been the subject of intensive recent research and federal focus. The report, although organized around biological topics, will emphasize the interaction between mathematical and biological science and explore new mathematical problems and a possible increasing role of mathematicians, statisticians, and computer scientists in research in this field. As such, it will complement the recent report of the NRC Board on Biology, "Mapping and Sequencing the Human Genome." (Project director: Lawrence Cox, Staff Director, Board on Mathematical Sciences; Grant period: May 1990-October 1991.)

National Academy of Sciences **$150,00**
Washington, D.C. 20418

The National Research Council's Board on Mathematical Sciences will conduct a study of doctoral programs in the mathematical sciences. It will focus on characteristics and quality of graduate programs, not on questions of supply and demand for mathematicians or on government and private funding for mathematics. Current

doctoral students are not developing the breadth of background in both pure and applied areas that would prepare them for the many careers now open not only in colleges and universities, but also in industry. Doctoral programs, as measured by the extent to which students are attracted to and complete graduate study, are not as successful as they might be. For example, the attainment rate for baccalaureate to doctoral degree is significantly lower for the mathematical than for the physical sciences.

A task force will be established to oversee the study. In addition to seeking data from departments, site visits will be conducted and interviews held with faculty and students. Recent Ph.D. graduates will be contacted. A report will summarize features of successful doctoral programs and include conclusions and recommendations for the consideration of both individual departments and professional societies. (Project director: Lawrence Cox, Staff Director, Board on Mathematical Sciences; Grant period: July 1990-December 1991.)

OFFICER GRANT

Rutgers University **$30,000**
New Brunswick, New Jersey 08903

Partial support for a part-time visiting appointment of Soviet mathematician I.M. Gelfand. (Project director: Joel L. Lebowitz, Director, Center for Mathematical Sciences Research; Grant period: August 1990-July 1992.)

TRUSTEE GRANT

University of Minnesota Foundation **$250,000**
Minneapolis, Minnesota 55455

The University of Minnesota will build upon its first three years of cross-disciplinary research in the Foundation's population sciences program by extending the scope of its work into analysis of public policy issues closely linked to demographic projections. This population and public policy effort will be organized around a core research project on the adequacy of assumptions used by the U.S. Government in developing its long-range demographic projections. Assessments will be offered as to the level and sources of accuracy/inaccuracy achieved by past projections, and a set of alternative future projections proposed. These will be combined with similar projection efforts for major countries. In all cases, serious attention will be paid to the political forces that may be causing government agencies, in the U.S. and abroad, to embrace unrealistic assumptions for their long-range demographic projections.

This award is the final grant in the Foundation's programmatic efforts to encourage cross-disciplinary research in the population sciences. (Project director: James W. Vaupel, Professor of Public Affairs and Planning, Humphrey Institute of Public Affairs; Grant period: July 1991-June 1994.)

TRUSTEE GRANTS

American Association for the Advancement of Science **$850,000**
Washington, D.C. 20005

This grant supports the development, over a four-year period, of a new Fellowship program that would make available to the White House Office of Science and Technology Policy (OSTP) the expertise of scientists and engineers with extensive industrial experience. The American Association for the Advancement of Science (AAAS) has a long history of operating Fellowship programs for scientists and engineers in key government agencies. The AAAS will develop this new Fellowship program along the lines of its existing programs for the Congress and the State Department. Two Fellows each year—one at a more senior and one at a more junior level—would serve on the OSTP staff, based upon competitive selection procedures involving a national competition. These Fellows would be required to take a leave of absence (without pay or benefits) from their employers, and would be subject to all applicable laws and standards regarding professional conduct and conflict of interest. (Project director: Albert H. Teich, Director, Directorate for Science and Policy Programs; Grant period: December 1990-November 1995.)

Harvard University **$750,000**
Cambridge, Massachusetts 02138

Two units of the John F. Kennedy School of Government at Harvard—the Science, Technology, and Public Policy Program and the Center for Science and International Affairs—have joined forces to launch a new three-year research program which will focus on new opportunities and roles for federal technology policies. It will concentrate on understanding industrial innovation processes and on the possibilities they suggest for public policies. This includes developing strategies for diffusing the results of R&D and other scientific and technological activity, formulating government investment strategies to enhance industrial technological accomplishments, and developing and applying evaluation criteria for effective and implementable science and technology policies.

A central aspect of this program is the development of research fellows who will be drawn from the academic community, government and industry. Through their research activities, their exposure to public policy issues, and their close collaboration with Harvard faculty, these fellows will have the opportunity to become scholar/practitioners skilled in science, technology, public policy and international affairs. (Project director: Lewis M. Branscomb, Director, Science, Technology and Public Policy Program, John F. Kennedy School of Government; Grant period: October 1990-September 1993.)

National Academy of Sciences **$450,000**
Washington, D.C. 20418

The NAS-NAE-IOM Government-University-Industry Research Roundtable has succeeded, over the past six years, in establishing itself as a unique organization in national science and technology policy. It has proven to be an open and effective forum for government leaders in science and technology to provide and to receive information and recommendations and, with academic and industry representatives, to engage in a three-way, ongoing discussion of major policy issues. The emphasis has been on understanding issues and, in particular, bringing forth the perspectives of the three sectors, rather than on making recommendations.

In the initial six-year period of formation, the Sloan Foundation has been a major contributor to the Roundtable. The Roundtable leadership has now put into place a new funding plan in which government science and technology agencies will play a prominent role, as will a unique plan for university-industry partnership contributions. The Sloan Foundation will continue support for the next two years as a transition to the new funding plan. (Project director: Don I. Phillips, Executive Director; Grant period: May 1990-October 1992.)

OFFICER GRANT

Rensselaer Polytechnic Institute **$5,000**
Troy, New York 12180

To continue a seminar for journalists on science and technology policy issues. (Project director: Herbert I. Fusfeld, Chairman, Advisory Board, Center for Science and Technology Policy, School of Management; Grant period: October 1990-September 1991.)

TRUSTEE GRANTS

Princeton University Press **$500,000**
Princeton, New Jersey 08540

This grant will enable Princeton University Press to publish almost all of Einstein's important scientific work as part of its Collected Papers of Albert Einstein project. The Sloan Foundation has made three grants in support of this project: $150,000 in 1978; $120,000 in 1981; and $280,150 in 1984. Two volumes have been published: Volume 1 (The Early Years, 1879-1902) and Volume 2 (Writings, 1902-1909). Both were favorably reviewed.

Now in charge of the project is a new team headed by Senior Editor Martin J. Klein, Higgins Professor of History of Physics at Yale University and Walter H. Lippincott, Director of Princeton University Press. This grant will support the additional work needed over the next four years to complete Volumes 3-7. Volumes 3-5 will be forwarded to Princeton University Press for copyediting by September 1992. These three volumes complete the Swiss years (1902-1914). Volumes 6 and 7 will contain Einstein's writings from his arrival in Berlin in the spring of 1914 through the year 1922. During these years he achieved the final form of the general theory of relativity, explored the physical consequences of his new theory of gravitation, and began his long series of attempts to create a unified field theory. These two volumes are expected to be ready for publication by the fall of 1994. With this grant of $500,000, Princeton University Press is prepared to guarantee the funding of the project's editorial offices through the completion of the work on Volume 7. (Project director: Walter H. Lippincott, Director; Grant period: January 1991-December 1994.)

University of California, Berkeley **$115,000**
Berkeley, California 94704

This grant supports the writing of a book by Charles Townes on the development of the laser and the applications in a wide range of fields. Townes plans to discuss the origins of quantum electronics in fundamental scientific research, development of the necessary basic ideas primarily in the university community, and then maser and laser development and applications in industrial laboratories. In Townes' view, the laser represents a

classic case of a technical development of widespread application coming rather unexpectedly from basic research and highlights the value of broad support for such research on the basis of likely but unforeseeable technological applications. This effort represents one of the first volumes in a new technology book series. (Project director: Charles Townes, Professor of Physics; Grant period: January 1991-December 1993.)

SCIENCE BOOK PROGRAM

Under this program, initiated in 1975, the Foundation invited outstanding scientists to write about their experiences and lives in science. Authors were encouraged to reflect on all aspects of their professional work and to write in such a way as to give laymen a better sense of what a life is like when it is devoted to science.

The following books have appeared in the series:

Alvarez: Adventures of a Physicist by Luis W. Alvarez

In Search of Mind by Jerome Bruner

Haphazard Reality by Hendrik B. G. Casimir

What Mad Pursuit by Francis Crick

Disturbing the Universe by Freeman Dyson

The Statue Within by François Jacob

Enigmas of Chance by Marc Kac

In Praise of Imperfection by Rita Levi-Montalcini

Astronomer by Chance by Sir Bernard Lovell

A Slot Machine, A Broken Test Tube by S. E. Luria

Advice to a Young Scientist by Peter B. Medawar

Rabi: Scientist and Citizen by John S. Rigden

Models of My Life by Herbert A. Simon

Memoirs of an Unregulated Economist by George J. Stigler

The Youngest Science by Lewis Thomas

The Joy of Insight: A Life in Physics by Victor F. Weisskopf

Making Weapons, Talking Peace by Herbert F. York

In all aspects of this book program, the Foundation was ably assisted, during 1990 as the series neared completion, by the following advisory committee:

Michael Bessie, Publisher, Cornelia & Michael Bessie Books, Chairman of the Committee; **Howard H. Hiatt**, Professor of Medicine, Harvard Medical School and Harvard School of Public Health; **Eric R. Kandel**, University Professor of Physiology and Psychology, Columbia University; **Daniel Kevles**, Professor of History, California Institute of Technology; **Robert Merton**, University Professor Emeritus and Special Service Professor, Columbia University; **Paul Samuelson**, Institute Professor of Economics, Massachusetts Institute of Technology; **Robert Sinsheimer**, Chancellor Emeritus, University of California at Santa Cruz; **Steven Weinberg**, Josey Regental Professor of Science, University of Texas at Austin; **Stephen White**, Foundation Officer (retired), writer.

OFFICER GRANTS

Carnegie Institution of Washington **$30,000**
Washington, D.C. 20005

Support of the Bush Centennial Symposium. (Project director: Maxine F. Singer, President; Grant period: July 1990-December 1991.)

Massachusetts Institute of Technology **$25,585**
Cambridge, Massachusetts 02139

Support for a conference on the impact of Thomas Kuhn's ideas on the history and philosophy of science. (Project director: Paul G. Horwich, Professor, Department of Linguistics and Philosophy; Grant period: January 1990-December 1990.)

Tufts University **$30,000**
Medford, Massachusetts 02155

Support for work on a biography of J. Robert Oppenheimer by Martin Sherwin. (Project director: Martin Jay Sherwin, Professor of History and Director, Nuclear Age and Humanities Center; Grant period: January 1990-June 1990.)

University of Maryland Foundation **$8,000**
Adelphi, Maryland 20783

Support for a series of oral histories with Donald Cotter and other individuals important to the Nuclear History Program. (Project director: Jennifer Sims, American Coordinator, Nuclear History Program; Grant period: July 1990-September 1990.)

SCIENCE AND TECHNOLOGY INFRASTRUCTURE

TRUSTEE GRANT

Association of American Universities **$115,915**
Washington, D.C. 20036

The AAU is launching a Congressional-University Colloquium aimed at finding effective and appropriate ways to strengthen the infrastructure for university-based research. This project grows out of an alarming increase in the practice of earmarking funds for university research facilities, by-passing the process of competitive merit review. The disquiet over this development—universities aggressively lobbying their congressmen to introduce private bills for research installations—has come to be shared by many members of Congress and university leaders. They believe that it distorts science agency missions and undermines the goal of seeking the highest quality science for the public's investment. But the underlying need must be addressed. Most presidents of research universities feel an urgent need to deal with the consequences of twenty years of underfunding the capital needs of science in the university. The Colloquium will respond to this growing dissatisfaction with the distortions and inadequacies of the earmarking approach to it. A report aimed at Congress, the Executive Branch, leaders of academia, and the American people will be prepared and disseminated by the end of 1990. Sloan Foundation support will be matched by a grant from the Andrew W. Mellon Foundation. (Project director: Robert M Rosenzweig, President; Grant period: February 1990-December 1990.)

OFFICER GRANTS

American Academy of Arts and Sciences **$25,000**
Cambridge, Massachusetts 02138

Support of a Project on Research Resources Redeployment. (Project director: Kosta Tsispis, Principal Research Scientist, Science Technology and Society Program, Massachusetts Institute of Technology; Grant period: July 1990-January 1991.)

Cornell University **$6,500**
Ithaca, New York 14853

Support of US-USSR interaction in experimental solid state physics. (Project director: Donald F. Holcomb, Professor of Physics; Grant period: November 1990-October 1991.)

Library of Congress **$11,000**
Washington, D.C. 20540

For support of a review of the Library's resources and services in science and technology. (Project director: Prosser Gifford, Director of Scholarly Programs; Grant period: October 1990-March 1992.)

Marine Biological Laboratory **$30,000**
Woods Hole, Massachusetts 02543

Partial support of the Program of Science Writing Fellowships. (Project director: Byron H. Waksman, Visiting Scientist at Harvard University, and Adjunct Professor of Pathology, NYU; Grant period: August 1990-September 1993.)

Rensselaer Polytechnic Institute **$2,000**
Troy, New York 12180

Partial support for attendance at a meeting on "Science and Technology for the Future of Europe." (Project director: Herbert I. Fusfeld, Chairman, Advisory Board, Center for Science and Technology Policy, School of Management; Grant period: September 1990-December 1990.)

Rutgers University Foundation **$7,000**
New Brunswick, New Jersey 08903

Partial support of the May 1990 Statistical Mechanics Meeting. (Project director: Michael Aizenman, Professor of Mathematics and Physics, Courant Institute, New York University, and Eugene Speer, Professor of Mathematics, Rutgers University; Grant period: March 1990-June 1990.)

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

To support a workshop on "Glasses, Biomolecules, and Evolution" at the Santa Fe Institute. (Project director: Hans Frauenfelder, Professor of Physics, and Robert D. Young, Professor of Physics, University of Illinois; Grant period: May 1990-December 1990.)

SETI Institute **$8,400**
Mt. View, California 94043

Travel expenses for the Third International Bioastronomy Symposium in Paris. (Project director: Thomas Pierson, Executive Director; Grant period: May 1990-September 1990.)

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

Partial funding of a study on university-industry-government laboratory relations in Europe now and after 1992. (Project director: Walter E. Massey, Vice President for Research and for Argonne National Laboratory; Grant period: March 1990-December 1990.)

EDUCATION IN SCIENCE, TECHNOLOGY, AND MANAGEMENT

The Foundation' program in this traditional area of support reflects a broad scope of interests. One of these is science and engineering manpower which encompasses a variety of important issues, such as: educating a future scientific and technical elite, understanding how and why people choose or do not choose to enter professions in science and technology, 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 to education outside the classroom or school system. The focus is on education, through new technologies, for those who want to educate themselves. This interest extends to outreach to the general population through television programs aimed at public television viewers.

The program in the New Liberal Arts was concluded in 1990, with the final group of renewal grants made to participating colleges. Over its nine years of operation, the New Liberal Arts program pursued many activities to enhance the presence of quantitative reasoning and concepts of modern technology in the undergraduate liberal arts curriculum. By the end of 1990, expenditures totaled over $21 million, with major grants (and renewals in most cases) awarded to 36 colleges, including a dozen historically black institutions, and to 14 universities. Emphasis has now shifted to conferences, meetings, and the dissemination of results throughout the country.

SPECIAL SECONDARY SCHOOLS, TRUSTEE GRANTS

Fund for the Advancement of Science and Mathematics Education in North Carolina — $278,000
North Carolina School of Science and Mathematics
Durham, North Carolina 27715

The Illinois Mathematics and Science Academy Fund for the Advancement of Education — $250,000
Aurora, Illinois 60506

The Mississippi School for Mathematics and Science — $250,000
Columbus, Mississippi 30701

As part of the Foundation's interest in minorities, these grants have been made for programs to increase minority enrollment. Each school has very high standards for applicants, a challenging curriculum, and a first-rate and dedicated faculty. Students are taking rigorous courses in mathematics, physics, chemistry, biology, and computer science and are engaged in exciting experimental work, almost always in laboratories well-equipped by industrial supporters of the school. Although the schools have established programs for minority enrollment and retention, they are committed to extending them.

All will reach out to identify promising minority students in grade 7 and work with them until the year they are ready to apply for admission. School coordinators and mentors will be organized, parents will be involved, and special educational programs for participating students and their teachers will be held on selected weekends during the year and for extended periods during the summer. These schools will continue to work with the students after eighth and ninth grades. (Project directors: John Friedrick, Director, (NCSSM), LuAnn Smith, Director of Admissions (IMSA), and Katherine Bunch, Coordinator of Admissions and External Relations, (MSMS); Grant periods: July 1990-August 1992, (NCSSM), and January 1991-September 1994 (IMSA and MSMS).)

ENTRY AND RETENTION, TRUSTEE GRANT

University of Colorado Foundation — $42,847
Boulder, Colorado 80306

National studies have shown that, over a twenty year period, student interest in science and engineering has steadily declined. This is not only true for beginning freshmen but, in addition, science and engineering have the largest losses during the undergraduate years of all fields of study. Over 50% of all science majors shift into non-science. The engineering losses are somewhat smaller but still greater than other fields. In both cases, shifts into other fields occur primarily during the first or second years. This grant will support an initial, small study to begin the process of understanding, in some depth, the reasons for switching. The researchers, who are sociologists experienced in ethnographic methods, will interview students in four Colorado universities and colleges who have recently switched from science or engineering or decided to stay past the second year. They will also interview faculty and advisors. There will be attention paid to minority and women students but the study will not be specifically focused on them. (Project director: Elaine Seymour, Professor of Sociology and Member, Bureau of Sociological Research; Grant period: February 1990-December 1990.)

ENTRY AND RETENTION, OFFICER GRANTS

Dartmouth College — $30,000
Hanover, New Hampshire 03755

A study on the entry and retention of undergraduate students in the sciences. (Project director: A. Christopher Strenta, Director of Institutional Research; Grant period: October 1990-October 1992.)

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

Support of a study as to Why Students Choose to Study Science/Engineering. (Project director: John S. Carroll, Professor of Behavioral and Policy Sciences, Sloan School of Management; Grant period: July 1990-September 1991.)

Operations Research Society of America $30,000
Baltimore, Maryland 21202

For dissemination of a career video tape and kit. (Project director: Carl M. Harris, President; Grant period: October 1990-September 1991.)

University of Texas at Austin $29,150
Austin, Texas 78712

For a study of the Emerging Scholars Program. (Project director: Robert E. Boyer, Dean, College of Natural Sciences; Grant period: June 1990-September 1991.)

MINORITIES AND WOMEN, TRUSTEE GRANTS

Arizona State University $268,000
Tempe, Arizona 85287

Project 1000, now in its third year, has made an excellent start in recruiting Hispanic students for graduate study. The project makes contact with Hispanic undergraduates throughout the country. It encourages and facilitates their application to graduate programs at over 50 cooperating public and private doctoral-granting universities.

This grant supports a special effort to concentrate on Hispanic students interested in graduate study in science, mathematics, and engineering. Intensive work with feeder colleges and universities and with Hispanic science and engineering organizations will be undertaken, including the identification and training of local academic counselors and faculty members who will serve as mentors of promising Hispanic undergraduates. On-site consultations and counseling on the Graduate Record Examination and other aspects of applying to graduate school will be provided. The project's goal is to steadily increase the number of students filing applications for and completing graduate study in mathematics, science, and engineering. Students making contact with the Project will be carefully tracked and important data about the history of these students will be recorded as part of the project. (Project director: Gary D. Keller, Executive Director, Project 1000, and Arizona Board of Regents' Professor; Grant period: May 1990-August 1993.)

Association for Women in Science $400,000
Washington, D.C. 20005

The Association for Women in Science (AWIS), founded in 1971, has 3500 members organized in 35 regional chapters. Its stated mission is to improve educational and employment opportunities for women in all fields of science. This grant will support a large-scale program to be carried out through AWIS chapters across the country, in which established women scientists will periodically meet face-to-face both with younger women who are undergraduates considering science as a career field, and with graduate students already committed to pursuing advanced academic degrees in science. AWIS has already demonstrated that it is particularly good at mentoring young women interested in science. Our support will enable 400 of its members to meet with 1200 such students over the next three years to provide encouragement, information, and advice, all aimed at reducing attrition rates among women students of science and thus increasing the number of women scientists. These meetings will be at times one-on-one, but also will include luncheons, panels, workshops, and lectures. (Project director: Stephanie Bird, President; Grant period: July 1990-June 1993.)

Georgia Institute of Technology $300,000
Atlanta, Georgia 30332

Stanford University $300,000
Stanford, California 94305

The engineering programs at Stanford University and the Georgia Institute of Technology are among the best in the country. Both schools already rank highly as producers of Black and Hispanic bachelors of science in engineering. This is a result of commitment on the part of the leaders of both institutions, a set of effective support services for minority students, and the presence at both schools of full time minority administrators. This grant will be used to expand and improve such measures as pre-college outreach to nearby junior high and high schools, summer orientation programs for incoming students and their parents, work experience in

engineering firms as part of the undergraduate curriculum, student participation in faculty research projects, and individual and group tutoring in key courses. These have been shown to be effective in retaining students as engineering majors. (Project directors: Norman Johnson, Assistant to the President, Georgia Institute of Technology, and Noe' Lozano, Associate Dean for Student Affairs, and Director of Minority and Affirmative Action Programs; Grant periods: June 1990-June 1993.)

Research Foundation of The City University of New York **$300,000**
New York, New York 10003

Last year, 104 Black and Hispanic students were awarded the bachelor's degree in engineering from City College, one of the largest totals in the nation. The goal of this grant is to raise the number of Blacks and Hispanics earning professional engineering degrees from City College to 150 per year within a few years. Sloan will aid efforts to reduce student drop out. The proposed techniques for reducing attrition are familiar and known to work: peer tutoring, summer study, a group study center, career orientation sessions, close monitoring of academic performance coupled with rapid feedback. In addition, City's Department of Mathematics has developed an enriched calculus series, based on the research of Professor Uri Treisman of the University of California, Berkeley, which has already improved the success rate of the school's minority engineering students and shows promise of further progress. (Project director: Charles B. Watkins, Dean of Engineering; Grant period: October 1990-December 1993.)

MINORITIES AND WOMEN, OFFICER GRANT

University of Michigan **$29,800**
Ann Arbor, Michigan 48109

For preliminary study of factors influencing women to do advanced studies and research in the mathematical and physical sciences. (Project director: Donald J. Lewis, Professor of Mathematics; Grant period: February 1990-December 1990.)

CURRICULUM AND MATERIALS, TRUSTEE GRANT

The Consortium for Mathematics and its Applications (COMAP) **$158,000**
Arlington, Massachusetts 02174

This grant supports the writing of an introductory undergraduate textbook and the preparation of a videotape of short geometry segments as a supplement. The text will directly treat the exploration of geometric concepts, objects, and applications rather than viewing geometry as emerging from some axiomatic framework. Opportunities for students to discover for themselves the many aspects of geometry and ways geometric methods are used in mathematics and other scientific disciplines will be emphasized. Video is a natural medium for presenting such a visual subject as geometry and its applications. To enhance the textbook, three geometry video segments will be produced as part of a larger collection of mathematical videos. (Project director: Solomon A. Garfunkel, Executive Director; Grant period: January 1991-April 1993.)

CURRICULUM AND MATERIALS, OFFICER GRANTS

Interactive Multimedia Association **$29,900**
Washington, D.C. 20001

Support for publication and distribution of a book on interactive multimedia. (Project director: Joan C. Cash, Executive Director; Grant period: May 1990-October 1990.)

Northwestern University **$15,000**
Evanston, Illinois 60208

Support for a book on cell and molecular biology. (Project director: Boyce Rensberger, Science Editor, The Washington Post; Grant period: September 1990-August 1991.)

MANUFACTURING, TRUSTEE GRANTS

Massachusetts Institute of Technology **$400,000**
Cambridge, Massachusetts 02139

Three years ago, faculty in the schools of management and of engineering at M.I.T. joined forces to launch an experimental program to focus training on manufacturing, as a corrective to emphasis in many MBA programs on finance and marketing. The Leaders for Manufacturing Program confers two separate degrees on its graduates: the master of science in management and the master of science in engineering. The academic program is of two years duration, including summers, and includes an extensive internship in a manufacturing firm. The next step in its evolution is the creation of a group of core courses that combine the technological and the managerial aspects of manufacturing. Sloan funds will provide released time and summer support for faculty engaged in the development of those courses. The curriculum development project will be directed by the program's co-leaders, H. Kent Bowen, Ford Professor of Engineering, and Thomas L. Magnanti, Eastman Professor of Management Science. (Project director: H. Kent Bowen, Co-Director, Leaders for Manufacturing Program; Grant period: July 1990-June 1993.)

Northwestern University **$332,000**
Evanston, Illinois 60208

The basic ingredients of both the MIT and Northwestern master's programs in manufacturing are joint participation by both the engineering and management schools of the university, students who already have a strong technology background, usually through a B.S. in engineering, and close cooperation and interchange with industry. At Northwestern, Sloan funds will mainly support curriculum development by teams made up of engineering faculty and management faculty, and student fellowship support. The program will be developed by the Kellogg Graduate School of Management, under Dean Donald P. Jacobs, and the Robert R. McCormick School of Engineering and Applied Science, under Dean Jerome B. Cohen. (Project director: Donald P. Jacobs, Dean, J.L. Kellogg Graduate School of Management; Grant period: December 1990-December 1993.)

MINORITIES AND WOMEN, TRUSTEE GRANTS

Northwestern University **$300,000**
Evanston, Illinois 60208

University of California, Los Angeles **$300,000**
Los Angeles, California 90024

The master of Business Administration programs at the J.L. Kellogg Graduate School of Management at Northwestern, and the John E. Anderson School of Management at UCLA will receive support to expand and improve their efforts in training Black and Hispanic students. If successful, these efforts will result in increased minority enrollments, fewer drop-outs, and a larger flow of well-trained minority managers into the nation's economic life. The proposed interventions are supportive rather than remedial. They include three-week review sessions in the August prior to the start of regular classes, stronger ties between students and faculty members and between students and established minority managers, closer attention to early warning signs of student academic difficulties, and dissemination to minority communities of information about careers in management. (Project directors: Donald P. Jacobs, Dean, J.L. Kellogg Graduate School of Management, Northwestern, and Carol Scott, Associate Dean, UCLA; Grant periods: July 1990-June 1993.)

TRUSTEE GRANTS

California Institute of Technology **$300,000**
Pasadena, California 91125

Project SEED (Science for Early Education Development), organized in 1987 by a team of Caltech scientists working with elementary school teachers, has explored the use of classroom computers to enhance science teaching in elementary grades K-5. The ability of the computer to simulate real-world science not easily studied in the classroom has been emphasized. Simulations and supplementary curriculum materials that have been developed have attracted wide interest among teachers and principals in the Pasadena and Los Angeles School Districts. More than 4,000 students at eight schools (private and public) are now participating in project SEED. As a logical next step, the project plans to focus on helping children obtain more information on science or other subjects about which they want to learn. Various computer interfaces to school and community libraries will be developed that are specifically matched to the information retrieval abilities of children. This software, designed for independent use and not bound to classroom-based activities, will allow children to explore a library's science materials from home or from any location where access to a computer is available. (Project director: James A. Bower, Assistant Professor, Division of Biology; Grant period: June 1990-September 1993.)

ETV Endowment of South Carolina **$1,000,000**
Spartanburg, South Carolina 29302

With the enthusiastic sponsorship of the National Academy of Engineering and the National Science Foundation, a major six-part documentary series designed for national broadcast via PBS will examine the historical role of engineering in society, especially large-scale projects which have dramatically altered humanity's relationship to nature including transportation systems, bridges and tunnels, irrigation and desert reclamation, and power generation. From the Roman aqueducts to space exploration, GREAT PROJECTS will show how engineers have worked throughout history to meet humanity's most basic needs and how engineering can continue to serve mankind for the future. The series will include material on integrated circuits, computers, modern telecommunications and biotechnology—topics which extend the concept of GREAT PROJECTS to modern categories of engineering achievements. The final program will outline engineering challenges for the future. (Project director: Daniel Polin, Producer, GREAT PROJECTS Film Company; Grant period: June 1990-June 1993.)

Technology Center of Silicon Valley **$235,000**
San Jose, California 95113

This technology center distinguishes itself from other science/technology museums in both its exhibits and program of activities: exhibits concentrate on state-of-the-art technologies; programs emphasize a strong interaction of young students with industry scientists and engineers. Sloan support will help fund the operation of the following three out-of-school programs: (1) Technology Challenge, an annual engineering design competition held as part of the Santa Clara Science and Engineering Fair. Participation has grown each year for three years from 40 teams and 100 students in 1988 to 85 teams and over 200 students in 1990. (2) Saturday seminars and laboratory experiences in biotechnology, superconductivity, microelectronics, robotics, and space. Specially equipped labs are set aside for these activities which are expected to reach 1600 students in the first year of operation. (3) A summer program involving youngsters in one-week projects with industry experts and including visits to industrial laboratories. In the first summer 300 students will be selected to participate. (Project director: Jan Berman, Director of Programs and Exhibits; Grant period: October 1990-December 1991.)

OFFICER GRANT

Wentworth Institute of Technology **$10,000**
Boston, Massachusetts 02115

Support for a summer school in applied technology. (Project director: Cathleen G. Spirer, Director, Division of Management Science; Grant period: December 1990-December 1991.)

NEW LIBERAL ARTS

The many activities undertaken as part of the Foundation's New Liberal Arts Program have been described in annual reports dating from 1982. They all have aimed to achieve a greater presence within the undergraduate liberal arts curriculum of quantitative reasoning and concepts of modern technology.

Grant-making in the program was concluded in 1990, its ninth full year of operation. Attention has now shifted to the dissemination of positive results of the NLA program to faculty members at colleges and universities throughout the country. As reported below, producing and distributing course materials (books, monographs, syllabi) continued as an important part of the program. Also, a major grant was made in support of regional NLA conferences, publication of the monthly NLA News, and other dissemination activities to be organized and carried out by the Stony Brook NLA Resource Center over the next two years.

As in the past years, a distinguished advisory committee assisted the Foundation in all phases of the New Liberal Arts Program:

Elting E. Morison, Professor Emeritus, Massachusetts Institute of Technology, Chairman of the Committee; **David P. Billington**, Professor of Civil Engineering, Princeton University; **Nannerl O. Keohane,** President, Wellesley College; **William Kessen**, Professor of Psychology, Yale University; **C. Dwight Lahr**, Professor of Mathematics, Dartmouth College; **John G. Truxal**, Distinguished Teaching Professor, Department of Technology and Society, State University of New York, Stony Brook

TRUSTEE GRANTS

From the beginning, the Foundation committed itself to the support of a relatively small number of colleges through not only the period of initial NLA grants, but also, assuming good progress, through renewal periods. Certain conditions for renewal grants were stipulated, including a careful review of activities under the first grant, plans for further faculty and course development and exposure of students to topics in technology, and a commitment from the college (with the exception of the historically black institutions) for matching funds.

Twenty-seven colleges have received renewal grants of various amounts in past years. The following historically black colleges participating in the program met the required conditions and received renewal grants in 1990:

Bennett College **$50,000**
Greensboro, NC 27401

(Project director: R. Lee Ponting, Professor of Mathematics; Grant period: July 1990-December 1992.)

Dillard University **$50,000**
New Orleans, LA 70122

(Project director: Winona R. Somervill, Professor, Division of Social Sciences; Grant period: July 1990-December 1992.)

Morris Brown College **$50,000**
Atlanta, GA 30314

(Project director: Silas Bassey Edet, Professor of Mathematics; Grant period: July 1990-December 1992.)

Paine College **$50,000**
Augusta, GA 30901

(Project director: Reuben Kesler, Jr., Professor of Mathematics; Grant period: July 1990-December 1992.)

THE STONY BROOK RESOURCE CENTER

The Stony Brook Resource Center for the New Liberal Arts has played a central role in the program since its establishment in 1985. Faculty workshops, meetings, and conferences have been organized; visits to participating colleges have been made and contacts with project directors and faculty members maintained; the special-leave grant and NLA visitor programs have been administered; NLA publications, including newsletters, course syllabi, and monographs have been prepared and widely distributed; and information about the program has been provided to colleges and universities throughout the country as well as to many gatherings of interested persons at national and regional meetings of professional societies. The following grants support the work of the Stony Brook Center.

Research Foundation at State University of New York **$225,000**
Albany, New York 12201

This grant supports the preparation, publication, and distribution of NLA monographs and extended syllabi. The monograph series was initiated to encourage the publication of important teaching materials by professors participating in the program. Each monograph, typically about 100 pages, focuses on a single topic involving quantitative reasoning or technology. At the time of this grant the first eight monographs were published: on feedback/automation; information theory; probability examples; vaccines and risk; expert systems; computer music; Fulton and Morse; and the electrification of Los Angeles. Seventeen additional monographs are to be produced.

Extended syllabi are descriptions of successful new courses developed within the NLA program. Each includes items normally part of a course syllabus, but also some selected supplements such as descriptions of teaching experiences, homework assignments, sample exams and student projects, and sources of available laboratory or other teaching materials. They are designed to help faculty at other institutions undertake similar course developments. Six extended syllabi were available at the time this grant was approved. The grant will enable a planned series of 25 extended syllabi to be completed.

Finally, this grant provided for the seventh and final meeting of NLA project directors, held on the campus of Wellesley College on August 10-11, 1990. All arrangements for this meeting, as for those in past years, were made by the Stony Brook Center. (Project directors: John G. Truxal, Distinguished Teaching Professor, and Marian Visich, Jr., Associate Dean, College of Engineering Applied Sciences, SUNY-Stony Brook; Grant period: April 1990-June 1992.)

The following grant supported additional work of the Stony Brook Center for a final two years, by which time formal activities under NLA grants will be very nearly completed at all participating colleges.

Research Foundation at State University of New York **$450,000**
Albany, New York 12201

As the NLA program draws to a close, dissemination activities will be emphasized. The monthly newsletter, NLA News, will continue to be published and distributed through May 1992. This grant also supports four additional regional NLA conferences to be held in Ohio, California, Texas, and Georgia, each modeled on the successful Hartford, CT March 1990 Northeast conference. They are designed to distribute information about the new liberal arts to faculty members at colleges and universities beyond those that have been direct participants in the program. The grant also provides modest funds to support some post-conference curriculum development activities by groups of faculty attendees. All work of the Stony Brook Center associated with the editing, printing, and distribution of the additional NLA monographs and extended syllabi (see above) is supported by this grant. Presentations at regional and national professional meetings and conferences, correspondence with faculty and visits to colleges interested in the NLA program, and distribution of NLA course materials will continue as major activities of the Center. (Project directors: John G. Truxal, Distinguished Teaching Professor, and Marian Visich, Jr., Associate Dean, College of Engineering & Applied Sciences, SUNY-Stony Brook; Grant period: September 1990-August 1992.)

NEW LIBERAL ARTS BOOK SERIES

Publication of books resulting from New Liberal Arts projects continues as an important way to spread new liberal arts themes and to make more likely the teaching of program-related courses by faculty at colleges throughout the country. A New Liberal Arts Series, with books jointly published by The MIT Press and McGraw-Hill Publishing Company, was inaugurated in 1989. The following distinguished Editorial Advisory Board continued to give valuable assistance to the Foundation and the publishers during the second full year of the book program:

John G. Truxal, Distinguished Teaching Professor, Department of Technology and Society, SUNY-Stony Brook, Chairman of the Committee; **Joseph Bordogna**, Alfred Fitler Moore Professor, School of Engineering and Applied Science, University of Pennsylvania; **Robert W. Mann**, Whitaker Professor of Biomedical Engineering, Massachusetts Institute of Technology; **Merritt Roe Smith**, Professor of the History of Technology, Massachusetts Institute of Technology; **Allen B. Tucker, Jr.**, Professor of Computer Science, Bowdoin College

By the end of the 1990, five books were published in the series:

Light, Wind, and Structure: The Mystery of the Master Builders by Robert Mark

The Age of Electronic Messages by John G. Truxal

Medical Technology and Society: An Interdisciplinary Perspective by Joseph D. Bronzino, Vincent H. Smith, and Maurice L. Wade

Understanding Quantitative History by Loren Haskins and Kirk Jeffrey

Personal Mathematics and Computing by Frank Wattenberg

Additional titles are under preparation. Further information about the book series as well as about all other NLA written materials is available from the New Liberal Arts Resource Center at SUNY-Stony Brook.

ECONOMIC GROWTH AND INDUSTRIAL COMPETITIVENESS

The goal of this program is to deepen understanding of the basic forces contributing to American economic prosperity in an increasingly competitive world economy. These are primarily long-term issues that are vital to the country and will be with us for decades to come. The Foundation is supporting the evolution of a field of study in the academic community that can address these issues in a more focused and realistic way.

The subjects involved here include manufacturing (both processes and management), 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, trade policy, the role of government scientific and technical activities, and so on. All of these are eligible for our competitiveness program. As part of this new focus, the ongoing program in economics is emphasizing issues relating to competitiveness such as productivity.

The new competitiveness program was launched with two major grants made in December 1989, supporting work of the five university Consortium on Competitiveness and Cooperation, headquartered at the University of California, Berkeley, and of the National Academy of Engineering. The cooperation of major American companies with the Consortium effort was sought and obtained. This reflects our strong belief that work in these areas is best informed by direct contact with industry. Subsequently a major grant was given to the Berkeley Roundtable on the International Economy, for research in manufacturing competitiveness and for a study of the pharmaceutical industry in the U.S., Europe, and Japan. Smaller and more individual proposals are also welcome.

Within the new program we have initiated support for industry studies. Industries vary enormously from each other in their methods of manufacture, in the type and education of their work force, in their ability to generate or assimilate new technology, and in the extent and nature of foreign competition. For example, in 1990 the Foundation made grants to study the automobile industry and the textile industry and hopes to make others in 1991. We hope to attract scholars in

engineering, management, and economics, together with industry leaders, to study issues arising in other industries as well.

Another dimension we are exploring is education for work in American industrial production. The interest in this area spans a range of issues from preparation for jobs and the continuing education of workers in manufacturing enterprises to developing new curricula in manufacturing engineering and management.

Studies in the management of technology, ranging from transfer of technology within a firm to factors affecting R&D funding, are also of interest.

TRUSTEE GRANTS

Massachusetts Institute of Technology **$2,063,877**
Cambridge, Massachusetts 02139

MIT, through its Center for Technology, Policy and Industrial Development, will extend and enhance the study of the automobile industry that began with the International Motor Vehicle Program (IMVP). This effort calls for study in four areas.

Best practice production systems: This part of the project will focus on a continuation of already established useful measures of quality, efficiency and human resource use so as to explore changes over time; a new intensive study of best practices product conception and design as the front end of the production process; detailed measurements of quality, efficiency, etc. (as in the IMVP assembly plant study) extended upstream to subsystem suppliers and other major component producers; and a study of the impact of new materials (plastics, composites, ceramics, etc.) on best practices for manufacturing.

Best practices in response to renewed environmental concerns: Can auto design and manufacture that satisfy new environmental concerns produce better (cost, quality) products than just regulation conforming products? What are the product development processes that will be appropriate? How should public policy be reshaped to provide less adversarial relationships?

Technology: How is technology being introduced, linearly or in all production stages in parallel? What are the costs and benefits of each mode? What are the strategies of U.S. companies and foreign counterparts to optimize obtaining and using new technology? What will be the effect of intelligent highway programs on auto design and production? How will U.S. and foreign companies and governments cooperate and compete?

Lean Production: Lean production means Toyota-like production—a pull system, just-in-time, continuous quality control, worker and team flexibility, continuous improvement etc. In the IMVP, it measured up as the best practice. Should American car makers move to a lean production system? If so, how is its entry being handled? What

lessons have been learned? How should organizations and management respond?

This study involves the Sloan School and the School of Engineering. It also involves continuous contact with U.S. and foreign automobile companies and their suppliers. The project includes a seminar series that discusses research results of this group, the results of studies at other universities, and presentations from industry. Research reporting will be done as a continuous series of reports, papers and presentations. (Project director: Daniel Roos, Director, Center for Technology Policy and Industrial Development; Grant period: July 1990-October 1993.)

Massachusetts Institute of Technology **$150,000**
Cambridge, Massachusetts 02139

A phenomenon which may retard innovation is the barrier to data transmission such as proprietary protection, skills that are not encoded for easy replication (bicycle-riding), and opaque indexing of material, inhibiting compatibility between transmitter and receiver. Eric von Hippel calls this phenomenon "sticky data."

This project will explore the impact of sticky data on the innovation process empirically. von Hippel and two Ph.D. candidates in the Sloan School will examine patterns of data transfer between firms in an industry, between users and manufacturers of products in selected fields, and between manufacturers and their suppliers. (Project director: Eric von Hippel, Professor, Sloan School of Management; Grant period: January 1991-December 1994.)

National Research Council **$150,000**
Washington, D.C. 20418

This study will focus on the contributions computers make (or do not make) to service productivity and how it is or should be measured. It will consider the transformation of service functions that have brought about new services or much improved service quality (ATM, express mail). The study will proceed in three phases: (1) a review of computers and productivity as already studied and also as seen by service industry experts, and a consideration of measurement approaches; (2) an analysis of the effects of transforming business processes on productivity

measurements; and, finally, (3) a study of the implications of the study results for computer science and engineering and for service business effectiveness. The topic of the contributions of computers is a controversial one among those who study productivity growth. While this study may not resolve finally all of the issues, it will bring service sector business managers, computer experts, and economists together to better understand the issues. It will deliver useful feedback information to the computer science and systems community on just where their technology is of key importance. (Project director: Marjorie S. Blumenthal, Executive Director; Grant period: December 1990-October 1992.)

The Textile/Clothing Technology Corporation(TC)² **$1,375,167**
Raleigh, North Carolina 27603

(TC)², is an organization of companies of the textile and apparel industry, formed to increase American competitive capabilities. This grant provides support for (TC)² to establish a center for the study of the industry at Harvard. The studies will have two characteristics: they will explore topics that are beyond the present scope of (TC)²'s own technology demonstration and development programs; and they will provide scholarly research and public presentation of the research results in a fashion not now part of (TC)²'s activities. The Harvard research plans include work in labor relations and training, technology, the management of new production and marketing methods, and manufacturing process control. Professors John Dunlop of the Kennedy School, Fred Abernathy of the Division of Applied Science, and Kim Clark of the Business School will direct each of the three components. They will also lead a unifying seminar that covers all of the topics. The plan includes provision for short and long term visitors from textile and apparel companies, retailers and manufacturing equipment suppliers as well as other academics. (TC)² will form an advisory committee composed of representatives of member companies, the key unions, and Professors Dunlop, Abernathy, and Clark. (TC)² will provide access to data, management information, and business discussions from its members. The results of the research will be widely presented, published in books, scholarly journals, and more general publications. Intellectual property that is derived from the studies will be

used in the best interests of the American public. (Project director: Frederick H. Abernathy, Professor of Engineering, Harvard University; Grant period: July 1990-October 1993.)

OFFICER GRANTS

Boston University **$25,000**
Boston, Massachusetts 02215

To compare foreign-owned companies in U.S. with their American counter-parts. (Project director: Peter B. Doeringer, Professor of Economics, Harvard University; Grant period: December 1990-May 1991.)

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

To examine U.S and foreign directions in computer design, imaging, networking and software and related future potential organizational activities. (Project director: Charles H. Ferguson, Professor, MIT Center for Technology Policy and Industrial Development; Grant period: October 1990-September 1991.)

TRAINING AND EDUCATION, TRUSTEE GRANT

MANTEC, Inc. **$593,000**
York, Pennsylvania 17405

Skilled workers make a difference in industrial competition and their future availability is in question. This project addresses one approach for providing new skilled workers. The project will test an adaptation of the European apprentice system to American youth, schools, and companies. The industry selected for this project, machine tooling and fabrication, is a critical one to a large number of both major and minor industrial products. High school students will work at a company, be trained by the company, and, at the same time, continue their formal education through high school and into a community college. The company training and the courses in the high schools and community college will be developed as a statewide curriculum. In this way the apprenticeship will produce qualified, skilled workers, available for employment anywhere in the state. MANTEC will provide overall project management for a program that will take place in four regions of Pennsylvania centered on Erie, York, Pittsburgh and Philadelphia. The Sloan Foundation is providing support, together with the U.S. Department of Labor and the State of Pennsylvania, for the development phase. This phase involves training of school teachers and company mentors, development of a curriculum in the schools and in the company training programs, and orientation for the participants, students, teachers, mentors, and administrators. (Project director: Robert W. Coy, Jr., Director of Technology Department; Grant period: November 1990-February 1993.)

MANUFACTURING AND TECHNOLOGY, TRUSTEE GRANTS

Rensselaer Polytechnic Institute **$129,983**
Troy, New York 12180

This project will study the role of business management and business strategy in the entry and continuing use of technology in products themselves and in the manufacturing process. Professor Joseph Morone has observed that within a single firm, some

technologically dependent products succeed and some fail. Morone's approach is to do several case studies within a firm and to study several firms. He will look for technology strategies and policies in business units and at the firm level that lead to success or to failure. (Project director: Joseph Morone, Assistant Professor, School of Management and Associate Director, Center for Science and Technology Policy; Grant period: May 1990-October 1992.)

Rensselaer Polytechnic Institute **$173,638**
Troy, New York 12180

The concept of a short product cycle is one of the key notions emerging in new approaches to industrial production. Susan Sanderson of the Rensselaer Management School has begun the study of the product design strategies and practices that have enabled some consumer electronic products to move into the market place in fast cycles combined with a continuous broadening across consumer requirements. She has, for example, traced the history of the design practices used in the Sony Walkman series of products. Sanderson has proposed to add to this kind of analysis an examination of the effect of fast cycle product design and multi-product market offerings on the manufacturing capabilities required to actually produce a continuously enhanced set of products. Her intention is to collect data on other consumer electronic products and related professional products (e.g. home camcorders and t.v. studio video cameras) to assess the relationship between design and manufacturing. (Project director: Susan Walsh Sanderson, Associate Professor, School of Management and Research Associate, Center for Science and Technology Policy; Grant period: June 1990-October 1992.)

University of California, Berkeley **$1,062,400**
Berkeley, California 94720

The Berkeley Roundtable on the International Economy (BRIE) has been involved in competitiveness issues since the early eighties. They were among the first to draw attention to issues in manufacturing, the role of key technologies, and the effects of trade policy and trade actions on competitiveness. BRIE will pursue two projects, one on manufacturing and key technologies and the other on biotechnology and the

pharmaceutical industry. In the first, they will extend work discussed in their book *Manufacturing Matters* with case studies on the relation between manufacturing and the services directly dependent on manufacturing. The second project is a study of the pharmaceutical industry in the U.S., Europe, and Japan, observed from the BRIE point of view—technology, manufacturing, and trade policy. As a counterpart they will consider biotechnology both in its new relation to pharmaceuticals and its future relationship to older industries—food and chemical. (Project director: Stephen S. Cohen, Professor, Berkeley Roundtable on the International Economy; Grant period: May 1990-October 1993.)

WGBH Educational Foundation **$2,000,000**
Boston, Massachusetts 02134

WGBH plans a four-hour prime time public television series to explore whether U.S. manufacturing can compete in the new global marketplace. Against the backdrop of mounting public anxiety about the flood of imported goods and foreign investment in the United States, WGBH will address the critical issue of U.S. competitiveness in a series of documentaries. This new series, which will be broadcast in early 1992 by more than 320 PBS stations nationwide, will foster a public dialogue about the impact of manufacturing on our economy. It will show that U.S. manufacturing is at a crossroads: that the system we evolved for making things, which until recently was the envy of the world, no longer works in a world full of able and aggressive competitors selling quality products. The series will explore how our industries, our government and our society are responding to this change in order to secure a position of strength as we approach the new economic order of the 21st Century. (Project director: Linda Garmon, Producer, NOVA; Grant period: June 1990-June 1993.)

MANUFACTURING AND TECHNOLOGY, OFFICER GRANTS

American Academy of Arts and Sciences — $20,000
Cambridge, Massachusetts 02138

Support for a conference on Computer Integrated Manufacturing Project. (Project director: Robert U. Ayres, Director, Computer Integrated Manufacturing Project, International Institute for Applied Systems Analysis; Grant period: June 1990-June 1991.)

University of Chicago — $24,725
Chicago, Illinois 60637

Field research on best practices in the management of product development. (Project director: Willard Zangwill, Professor, Graduate School of Business; Grant period: August 1990-July 1991.)

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

Support for research on the comparative performance of Japanese-owned manufacturing establishments in the United States. (Project director: Richard C. Levin, Professor of Economics; Grant period: July 1990-July 1991.)

MANUFACTURING AND MANAGEMENT, TRUSTEE GRANT

Institute for Circadian Physiology — $300,000
Boston, Massachusetts 02215

Biological (or circadian) clocks in the human brain are programmed by evolutionary history to a regular schedule of nighttime sleep and daytime activity. Disrupting this pattern leads to fatigue, reduced productivity, human error, accidents, ill-health and impaired quality of life. Yet such circumstances of work apply to increasingly large numbers of U.S workers, including more than 20 million who work shifts around-the-clock. Among these are many in critical or dangerous jobs: nuclear power,

refinery and chemical plant operators; nurses and doctors; airline pilots and truck drivers; military personnel; tanker captains; continuous-process manufacturing operators; and so forth. This grant supports research focused on real-world applications of scientific understanding to improve the productivity and safety of shift-work operations in the U.S. economy. (Project director: Martin C. Moore-Ede, President and Director; Grant period: November 1990-October 1993.)

MANUFACTURING AND MANAGEMENT, OFFICER GRANT

Vanderbilt University — $20,762
Nashville, Tennessee 37203

Support for a conference on Time-Based Competition: Speeding New Product Design and Development. (Project director: Joseph D. Blackburn, Associate Dean for Academic Affairs; Grant period: January 1991-October 1991.)

TRUSTEE GRANTS

New York University **$438,000**
New York, New York 10011

In 1989 William Baumol and Edward Wolff, professors of economics at NYU, published their landmark book, *Productivity and American Leadership: The Long View* (MIT Press). They are now at work on volumes two and three of a trilogy on long-term productivity growth. This grant will support their research and writing for the next five years. The importance of productivity growth and its inherently long-run character has motivated Baumol and Wolff to embark on a protracted and painstaking study of the phenomenon which will enable economists and other interested groups to understand more fully the influences that determine its magnitude, its intertemporal patterns, and the public policies that promise to be effective in encouraging its rise. The first of the three volumes projected for the project (MIT Press 1989) contains a complete review and analysis of the available long-period productivity data for the industrialized countries. The second volume will focus on the feedback property of long-run productivity growth. The third volume will be devoted to an analysis of the role of the entrepreneur. (Project directors: William J. Baumol, and Edward N. Wolff, Professors of Economics; Grant period: October 1990-September 1995.)

University of California, Los Angeles **$170,000**
Los Angeles, California 90024

University of Chicago **$170,000**
Chicago, Illinois 60637

University of Pennsylvania **$170,000**
Philadelphia, Pennsylvania 19104

For the past fifteen years the Foundation has been supporting economics workshops at the leading graduate departments in universities across the country. The first two rounds were in microeconomics. The third round during the past five years has been in open-economy macroeconomics in recognition of the fact that the U.S. economy can no longer be fruitfully studied outside of a global context. This award provides three final renewal grants for the workshop program. (1) The UCLA workshop, under the direction of Professor Edward Leamer, has been emphasizing research on applied issues in international trade and international finance related to the effects of economics policies on income distribution. (2) Chicago's workshop, under the direction of Professor Michael Mussa, has work under way by graduate students and junior faculty on a variety of topics in international economics and international business. And (3) Penn's workshop, under the direction of Professor Wilfred Ethier, also is working on a range of economic problems, each related in an important way to the openness of national economics. With these final renewals, the workshop program will be concluded. Round Three will have totalled approximately $4.3M in grants, will have financed 55 (11x5) workshop years, will have provided graduate fellowships for about 275 students, and will have supported numerous books, articles and dissertations by students and junior faculty members. (Project directors: Edward E. Leamer, Professor of Economics, UCLA, Michael L. Mussa, William H. Abbott Professor of International Business, University of Chicago, and Wilfred J. Ethier and Guillermo A. Calvo, Professors of Economics and co-directors of the International Economics Research Center, University of Pennsylvania; Grant periods: July 1990-June 1992.)

University of Chicago **$50,361**
Chicago, Illinois 60637

Using data from the 1970 and 1980 Censuses of Population, this research seeks to resolve an ongoing debate in the immigration research literature: Have earlier cohorts of immigrants to the United States earned more than recent cohorts because of substantial earnings growth via intragenerational assimilation, or because earlier immigrants possessed higher average talent and skill levels than more recent immigrant groups? (Project director: Robert Topel, Professor or Economics and Industrial Relations; Grant period: April 1990-March 1991.)

OFFICER GRANT

Michigan State University **$28,242**
East Lansing, Michigan 48824

Support for a book by Daniel S. Hamermesh on Labor Demand. (Project director: Daniel S. Hamermesh, Professor of Economics; Grant period: April 1990-August 1991.)

TRUSTEE GRANTS

The Brookings Institution **$50,000**
Washington, D.C. 20036

This Brookings Institution project focuses upon the argued negative or positive impacts for technological innovation and safety that may have resulted from the significant expansion of liability law over the past two decades. A principal rationale for efforts by numerous judges to expand tort liability has been the argument that the threat of expanded liability damages would improve the safety, in both design and manufacturing, of existing new products. Critics have argued that notwithstanding very large costs of liability insurance, litigation and judgments, this safety improvement has not occurred while new product innovation has been deterred. The focus of the Brookings study is upon 6 industries: pharmaceuticals, medical practice, aircraft manufacture, automobile manufacture, machine tools, and chemicals. For each industry, two papers have been commissioned from leading experts, one on the impacts of tort liability upon the industry, the second regarding safety. (Project directors: Robert E. Litan, Director, Center for Economic Progress and Employment, The Brookings Institution, and Peter Huber, Senior Fellow, Manhattan Institute; Grant period: May 1990-January 1991.)

The Brookings Institution **$182,620**
Washington, D.C. 20036

International trade and investment flows reflect the behavior of firms. However, the effects of exchange rates on trade and investment have mainly been studied using aggregate data on prices, costs, investment and trade flows. These aggregative approaches have not been particularly accurate in forecasting trade and investment behavior. Moreover, they have been unable to distinguish between hypotheses about firm behavior which have important implications for policy. Many questions need to be studied: Do U.S. firms behave differently from foreign firms in pricing their products? Are these pricing decisions different in the U.S. and other markets? How do firms forecast exchange rates? Do they try to hedge by diversifying sourcing or do they try to maximize profits in the short run by shifting sourcing when relative costs differ? What determines the differences in responses among firms and industries?

A Brookings study, led by Professor Paul Krugman of MIT and Robert Lawrence of the Brookings staff, will try to answer these questions by directly examining firm behavior. The pricing, marketing, and sourcing responses of U.S. and foreign firms to exchange rate fluctuations in the 1980s will be studied using surveys, interviews, and firm and industry data. The purpose will be to provide policymakers with an appreciation of the real world determinants of these decisions in a regime of fluctuating exchange rates. (Project director: Charles L. Schultze, Director, Economics Studies Program; Grant period: February 1990-March 1992.)

Foundation for American Economic Competitiveness **$624,183**
Washington, D.C. 20006

The idea that underinvestment or short term investment in U.S. industry has been a major contributor to the worsening competitiveness position is widely discussed. However, this issue has received little careful analysis. Factors often cited are the high cost of capital, executive compensation practices, institutional investment practices, and so forth. The Council on Competitiveness and the Harvard Business School (HBS) have begun a study which considers many of the key questions of investment practices in the U.S., Europe, and Japan on a comparative basis. The study will produce a large set of papers (18) with a total of twenty-four authors from the HBS and other universities. A survey of corporate executives on the investment practices of their firms is being done. Research on the behavior of institutional investors, venture capitalists, and lenders will be done as well as capital budgeting practices, compensations and reward systems, non-financial influences on decisions, takeover and restructuring effects etc. The result will appear as published articles and in book form. The Council on Competitiveness will lead further outreach efforts in Washington with the administration and the Congress. The Council itself consists of leading business representatives and it has formed an advisory group to assist the work and help in the outreach program. (Project director: Michael Porter, Professor, Graduate School of Business Administration, Harvard University; Grant period: January 1991-April 1992.)

The American Assembly $30,000
New York, New York 10027

American Assembly on "Impact of Tort Liability on Progress and Innovation in Medicine, Science, and Industry." (Project director: Daniel A. Sharp, President; Grant period: April 1990-September 1990.)

Center for Strategic and International Studies $25,000
Washington, D.C. 20006

Support for the project, "Integrating Technology for National Strength." (Project director: S. Lawrence Kocot, Fellow, International Security Studies; Grant period: March 1990-February 1991.)

Center for Strategic and International Studies $25,000
Washington, D.C. 20006

Support for a project on the Strengthening of America. (Project director: David M. Abshire, President; Grant period: September 1990-December 1991.)

Institut Français des Relations Internationales (IFRI) $30,000
6, rue Ferrus (F), 75683 Paris Cedex 14, France

Support for a research program on European industrial competitiveness. (Project director: Pierre Jacquet, Associate Director; Grant period: June 1990-December 1990.)

University of Rochester $29,325
Rochester, New York 14627

Support for a conference on research issues related to changing competitive conditions in Europe that will affect U.S manufacturers. (Project director: Uday S. Karmarkar, Director, Center for Manufacturing and Operations Management; Grant period: December 1990-December 1991.)

University of Texas at Austin $12,500
Austin, Texas 78712

Partial support for a comparative study of immigration policies in the United States and Australia. (Project director: John Higly, Director, Edward A. Clark Center for Australian Studies; Grant period: December 1990-July 1991.)

TRUSTEE GRANTS

The Diebold Institute for Public Policy Studies, Inc. $500,000
New York, New York 10016

The objective of this study is to analyze and compare U.S. and European approaches to major new infrastructure services. The two infrastructure service systems that will serve as the special topics for the study are the changes in the transportation system that will come about through the introduction of information technology to vehicle and road monitoring and control systems and the provisions of new medical information on a national basis (for example shared patient and hospital records, national HMO data base systems, etc.) In both of these, European and U.S. planning and projects are underway. The study will compare these approaches, and it is the opportunity for U.S learning that is the major motivation for support of the study. (Project director: John Diebold, President; Grant period: November 1990-March 1993.)

Institute for International Economics $236,000
Washington, D.C. 20036

Frustration with the slow pace of multilateral negotiations to reduce trade barriers has led the United States to use its economic leverage to unilaterally pressure trading partners to open their markets to U.S. exports. The Institute for International Economics is planning a major new study to explore the efficiency of United States threats of retaliation to liberalize foreign barriers to U.S. goods. The study will examine whether and under what circumstances U.S. market-opening efforts have been successful. It will also assess whether these efforts have encouraged progress in the multilateral Uruguay Round negotiations and, ultimately, whether their continued use will be compatible with effective cooperation with the other major economic superpowers in the world economy. (Project director: C. Fred Bergsten, Director; Grant period: January 1991-March 1992.)

OFFICER GRANTS

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

Support for a survey of MIT faculty and staff about their interactions with domestic and foreign industry. (Project director: Eugene B. Skolnikoff, Professor of Political Science, Center for International Studies; Grant period: January 1991-December 1991.)

Princeton University $7,200
Princeton, New Jersey 08544

Support of a conference on the East European Transformation Problem. (Project director: Richard E. Quandt, Professor of Economics; Grant period: July 1990-June 1991.)

Social Science Research Council $30,000
New York, New York 10158

Support of a Soviet and East European Economics Workshop. (Project director: Herbert S. Levine, Professor of Economics, University of Pennsylvania; Grant period: August 1990-September 1991.)

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.

Drug abuse, for example, is an enormous problem which has resisted most efforts. While the possibilities of inhibiting supply and reducing demand have not been exhausted, alternatives to what is being done also need to be considered. Legalization in some form is an option that arises regularly and usually leads to heated discussion. Believing that the legalization discussion needs to be conducted on substantially firmer analytic and empirical grounds, we have funded a major three-year project to be carried out by the RAND Corporation within its Drug Policy Research Center. It is not intended that the study recommend for or against legalization. Rather it is an attempt to gather facts for a more informed debate.

The Foundation is exploring other areas such as energy and the environment where a new approach can enhance an understanding of complex issues. In 1991, the Foundation will consider proposals that examine the negative public perception of nuclear power.

TRUSTEE GRANTS

The RAND Corporation **$1,000,000**
Santa Monica, California 90406

The discussion of various forms of drug legalization or decriminalization has so far generated little systematic analysis. It has largely been conducted through very broad and speculative assertions about the consequences of changing the legal status of drugs. Advocates emphasize the presumed reductions in crime, improved health for those who are drug dependent and lessened intrusions into civil liberties; the opponents emphasize the probable massive increase in drug use and dependence, the inherent dangers of the drugs (particularly crack) and assert that crime would not decline. Both sides generally admit that there can be little certainty about the consequences of drug legalization. In casting around for some basis to project those consequences, the experiences of other nations and other times with different legal and regulatory regimes for serious drugs can play an important role.

The RAND Corporation will conduct a three-year study to analyze the variety of experiences with changes in the legal status of drugs in twentieth century industrial societies. The primary goals of the study are: (1) to provide a framework for the debate on legalization by identifying the major factors that need to be considered when evaluating the consequences of legalization, and (2) to determine what can be learned from experience in other countries and other times about the likely consequences of decriminalizing some or all of the commonly used illicit drugs. It is not intended that the study recommend whether drugs should be legalized; rather it is to allow for a more informed debate on this crucial issue. (Project director: Peter H. Reuter, Senior Economist; Grant period: March 1990-March 1993.)

Woods Hole Oceanographic Institution **$240,000**
Woods Hole, Massachusetts 02543

The problem of what to do with waste—solid and sewage and industrial—is severe. Landfill sites are disappearing, and dumping into the sea has significant and obvious problems. One alternative which needs to be more fully understood is the use of the deep ocean floor as a depository for waste material, owing to its stable dynamic conditions and low temperatures. Vertical transport rates from the 4,000 meter plus depths are on the order of 1,000 years. However, much more needs to be known about these physical conditions and their biological and chemical counterparts. Studies need to be made of the effect of new materials or dynamic disruptions on the chemical and biological environment of the ocean floor. In addition, research is required into modes of waste transportation to the deep ocean sectors and the monitoring methods that will be needed. This grant supports a year of planning these technical programs and the related regulatory and policy studies. (Project director: Derek W. Spencer, Senior Scientist, Department of Chemistry; Grant period: November 1990-February 1992.)

OFFICER GRANTS

Brown University $30,000
Providence, Rhode Island 02912

Support for a conference on Cuba Between The Superpowers. (Project director: James G. Blight, Senior Research Fellow, Center for Foreign Policy Development; Grant period: October 1990-September 1991.)

Massachusetts Institute of Technology $15,000
Cambridge, Massachusetts 02139

Support of a conference on Energy and the Environment in the 21st Century. (Project director: Jefferson W. Tester, Director, Energy Laboratory; Grant period: March 1990-June 1990.)

Population Reference Bureau, Inc. $30,000
Washington, D.C. 20005

Analysis of new data on Asian Americans. (Project director: William P. O'Hare, Director of Policy Studies; Grant period: February 1990-July 1990.)

SPECIAL PROJECTS

TRUSTEE GRANT

Foundation for Research in Economics and Education $150,000
Santa Monica, California 90403

James Q. Wilson is one of the country's foremost thinkers and scholars in the field of public management. He has written landmark studies of several public agencies—primarily in the field of law enforcement—and has recently published a culminating volume, *Bureaucracy*, which synthesizes two decades of analysis of how public agencies work. Now he will undertake a new project, extending over several years, to gain greater understanding of the origin and nature of human morality, character, and ethics which will be related to the reality of real world contexts—government, business, schools. (Project director: J. Clayburn La Force, Chairman; Grant period: June 1990-June 1993.)

TRUSTEE GRANTS

Polytechnic University **$172,500**
Brooklyn, New York 11201

Polytechnic's new graduate program in manufacturing engineering will provide an educational service to the New York area. The curriculum emphasizes manufacturing methods and concentrates on design, quality engineering and modern production methods (just-in-time, pull systems, cycle time reduction). Special attention is given to productivity and quality improvements that can be obtained in small companies as well as large. Courses in the program are currently offered in Brooklyn and Westchester. Students have come from the City, Long Island, Westchester, New Jersey, and Connecticut. (Project director: Charles W. Hoover, Director, Manufacturing Engineering Program; Grant period: November 1990-February 1994.)

Fund for the City of New York **$250,000**
New York, New York 10013

The Foundation will provide $50,000 per year to finance the Fund for the City of New York Public Service Awards program for the next five years. Each year six awards are made to New York City civil servants at all levels who exemplify the highest standards in city government. Each winner receives $5,000 and is honored in ceremonies at their work places among their co-workers and at a formal reception in the evening with the Mayor and other high city officials attending. Criteria for selection include passion and dedication to their jobs, selflessness, imagination in the tackling of difficult problems and relentless energy. Winners range from departmental commissioners to school custodians. It is abundantly clear that the impact of the program on civil service morale extends well beyond the six annual award winners. For the next five years the program will be called the Alfred P. Sloan Foundation Public Service Awards of the Fund for the City of New York. (Project director: Gregory Farrell, Executive Director; Grant period: September 1990-August 1995.)

Regional Plan Association **$100,000**
New York, New York 10018

The Regional Plan Association is a respected, independent, region-wide organization that was responsible for the development of comprehensive plans for the New York-New Jersey-Connecticut metropolitan region during the 1920's and 1960's. It proposes to develop a third such plan in the 1990's, this time with a heavy emphasis upon the region's relationship to the global economy. The funds requested from the Sloan Foundation will provide early partial support for two components of the plan: a series of region-wide roundtables focussed upon the future regional impacts of developments in two important industries, telecommunications and energy; and an analysis of the potential strengths and weaknesses of the region in the rapidly globalizing areas of financial services, telecommunications, and the developing world markets in advertising, corporate law, management consulting, and public relations, among others. (Project director: Richard T. Anderson, President; Grant period: November 1990-December 1992.)

TRUSTEE GRANT

The Foundation Center **$180,000**
New York, New York 10003

The Foundation Center plays an indispensable role for the foundation community by disseminating information about foundations' programs and priorities to grantseekers and the public. With over 25,000 private foundations in the country, grantseekers must have a map to guide intelligent fund-raising. This is the purpose of the Foundation Center which it implements through libraries in major cities, publications including *The Foundation Directory*, and a computer database on foundation grants. About half of the Center's revenues come from the sale of publications. The balance comes from foundation and corporate grants. The Sloan Foundation has been one of the Center's supporters for over two decades, for the past three years at an annual level of $60,000. (Project director: Thomas R. Buchman, President; Grant period: October 1990-December 1992.)

OFFICER GRANTS

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

A membership contribution. (Project director: James A. Joseph, President.)

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

A membership contribution. (Project director: Jeanne Bohlen, Vice President, Membership and Development.)

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

A membership contribution. (Project director: Barbara Bryan, Executive Director.)

FINANCIAL REVIEW

The financial statements and schedules of the Foundation, which have been audited by Ernst & Young, independent auditors, appear on pages 99 to 106. They include balance sheets, statements of income, expenses and changes in fund balance and of changes in financial position, and schedules of management and investment expenses.

Investment and other income for 1990 was $39,376,085, an increase of $4,999,685 from $34,376,400 in 1989. After the deduction of investment expenses and provision for Federal excise tax from investment and other income, net investment income was $36,251,064 in 1990 as compared with $31,608,253 for the prior year. Investment expenses during 1990 totaled $1,734,621 of which $1,239,724 represented investment counsel fees. Provision for Federal excise tax amounted to $1,390,400. The total of these deductions from income in 1990 was $3,125,021 versus $2,768,147 in 1989.

The total of grants and appropriations authorized, net of grant refunds, and management expenses during 1990 was $30,664,095. This sum was $5,586,969 less than 1990 net investment income. Of this total, grants and appropriations authorized amounted to $28,099,153 while management expenses were $2,702,241. Since the Foundation's inception in 1934, the cumulative excess of grants and expenses over the Foundation's income has amounted to $12,621,507.

Grant and appropriation payments in 1990 were $21,190,975 compared with $17,227,445 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 1990 was $26,903,566 while in 1989 the amount was $22,573,678.

The market value of the Foundation's total assets was $612,221,359 at December 31, 1990 including investments valued at $610,815,353 as compared with total assets of $622,070,457 at December 31, 1989.

AUDITOR'S 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, 1990 and 1989, 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 disclosure 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, 1990 and 1989, 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 audit has been made primarily for the purpose of expressing an opinion on the basic financial statements taken as a whole. The accompanying supplementary

AUDITOR'S REPORT

schedules of management and investment expenses for the years ended December 31, 1990 and 1989 are presented for purposes of additional analysis and are not a required part of the basic financial statements. Such additional information has been subjected to the procedures applied in the audit 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 28, 1991

BALANCE SHEETS
DECEMBER 31, 1990 AND 1989

Assets	1990	1989
INVESTMENTS:		
Fixed income:		
Government and agency	$113,700,974	$142,221,543
Corporate and other	150,053,581	117,579,735
	263,754,555	259,801,278
Equity:		
General Motors Corporation	32,447,710	32,741,408
Other	248,647,457	213,989,828
	281,095,167	246,731,236
Other:	21,072,147	16,438,947
Total investments (market value: $610,815,353 in 1990 and $621,582,329 in 1989)	565,921,869	522,971,461
INTEREST PURCHASED	1,354,350	397,106
OTHER		16,409
CASH	51,656	85,641
Total	$567,327,875	$523,470,617

Liabilities and Fund Balance

GRANTS AND APPROPRIATIONS UNPAID	$ 27,557,602	$ 20,649,424
OTHER	133,032	105,774
FUND BALANCE	539,637,241	502,715,419
Total	$567,327,875	$523,470,617

See accompanying notes to financial statements.

STATEMENTS OF INCOME, EXPENSES AND CHANGES IN FUND BALANCE

For the years ended December 31, 1990 and 1989	1990	1989
INVESTMENT INCOME:		
Dividends	$ 12,877,000	$ 13,351,226
Interest	26,496,268	20,972,043
Other	2,817	53,131
	39,376,085	34,376,400
LESS:		
Investment expenses	1,734,621	1,643,847
Provision for Federal excise tax	1,390,400	1,124,300
	3,125,021	2,768,147
Net investment income	36,251,064	31,608,253
Grants and management expenses:		
Grants and appropriations authorized (net of grants refunds of $137,299 in 1990 and $127,617 in 1989)	27,961,854	21,076,486
Management expenses	2,702,241	2,346,673
Total	30,664,095	23,423,159
GRANTS AND EXPENSES LESS THAN INCOME FOR THE YEAR	5,586,969	8,185,094
NET GAIN ON DISPOSALS OF SECURITIES	31,334,853	35,923,193
ASSETS RECEIVED AS REMAINDERMAN OF TRUST		3,167,206
NET CHANGE IN FUND BALANCE FOR YEAR	36,921,822	47,275,493
FUND BALANCE JANUARY 1	502,715,419	455,439,926
FUND BALANCE AT END OF YEAR	$539,637,241	$502,715,419

See accompanying notes to financial statements.

STATEMENTS OF CHANGES IN FINANCIAL POSITION

For the years ended December 31, 1990 and 1989	1990	1989
SOURCE OF FUNDS		
Investment income	$39,376,085	$34,376,400
Net gain on disposals of securities	31,334,853	35,923,193
Trust distribution and other	49,886	3,537,798
	70,760,824	73,837,391
APPLICATION OF FUNDS		
Grant and appropriation payments (net of grant refunds of $137,299 in 1990 and $127,617 in 1989)	21,053,676	17,099,831
Management expenses	2,702,241	2,346,673
Investment expenses	1,734,621	1,643,847
Federal excise taxes	1,413,028	1,483,327
	26,903,566	22,573,678
INCREASE (DECREASE) IN FUNDS CONSISTING OF:		
Cost of investments	42,950,408	51,922,017
Interest purchased	957,244	397,106
Cash balances	(33,985)	(714,464)
Other	(16,409)	(340,946)
NET INCREASE	$43,857,258	$51,263,713

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

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.

Investments purchased are carried at cost; for those received by gift or bequest, cost is market value at date of gift or bequest. Gain or loss in disposal of investments is determined generally on the basis of first-in, first-out cost, but in certain instances the identified lot basis is used. Net gain or loss on disposals is applied to the principal section of the fund balance. Grant 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 provides for the purchase of annuities for employees. Retirement plan expense was $187,841 and $173,652 for 1990 and 1989, respectively.

4. LEASE

The Foundation's lease for its office space expires April 30, 1993. 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 was $584,291 in 1990 and $564,309 in 1989.

5. FUND BALANCE

Fund balance, at year end, is comprised of the following:	**1990**	**1989**
Principal	$552,258,748	$520,923,895
Income—cumulative excess of grants and expenses over income from inception of the Foundation	(12,621,507)	(18,208,476)
Fund balance	$539,637,241	$502,715,419

SCHEDULES OF MANAGEMENT AND INVESTMENT EXPENSES

For the years ended December 31, 1990 and 1989	1990	1989
MANAGEMENT EXPENSES		
Salaries and employee benefits:		
Salaries	$1,382,811	$1,154,091
Employees' retirement plan and other benefits	414,660	379,518
Total	1,797,471	1,533,609
Rent	584,291	564,309
Program expenses	335,272	272,886
Office expenses and service	391,465	394,596
Reports and publications	23,671	13,077
Professional fees	64,968	54,438
Total management expenses	3,197,138	2,832,915
Less management expenses applicable to investments	494,897	486,242
Management expenses applicable to grant making	$2,702,241	$2,346,673
Investment Expenses		
Investment counsel fees	$1,239,724	$1,157,605
Management expenses applicable to investments	494,897	486,242
Total investment expenses	$1,734,621	$1,643,847

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