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ABSTRACT

This guide is designed to provide summary information about support programs of the National Science Foundation and is intended as a source of general guidance for institutions and individuals interested in participating in these programs. Program listings describe the principal characteristics and basic purpose of each activity, eligibility requirements, closing dates (where applicable), and the address from which more detailed information, brochures, or application forms may be obtained. (Author/CP)

NATIONAL
SCIENCE
FOUNDATION

GUIDE TO PROGRAMS

FISCAL YEAR 1972

NSF 71-22

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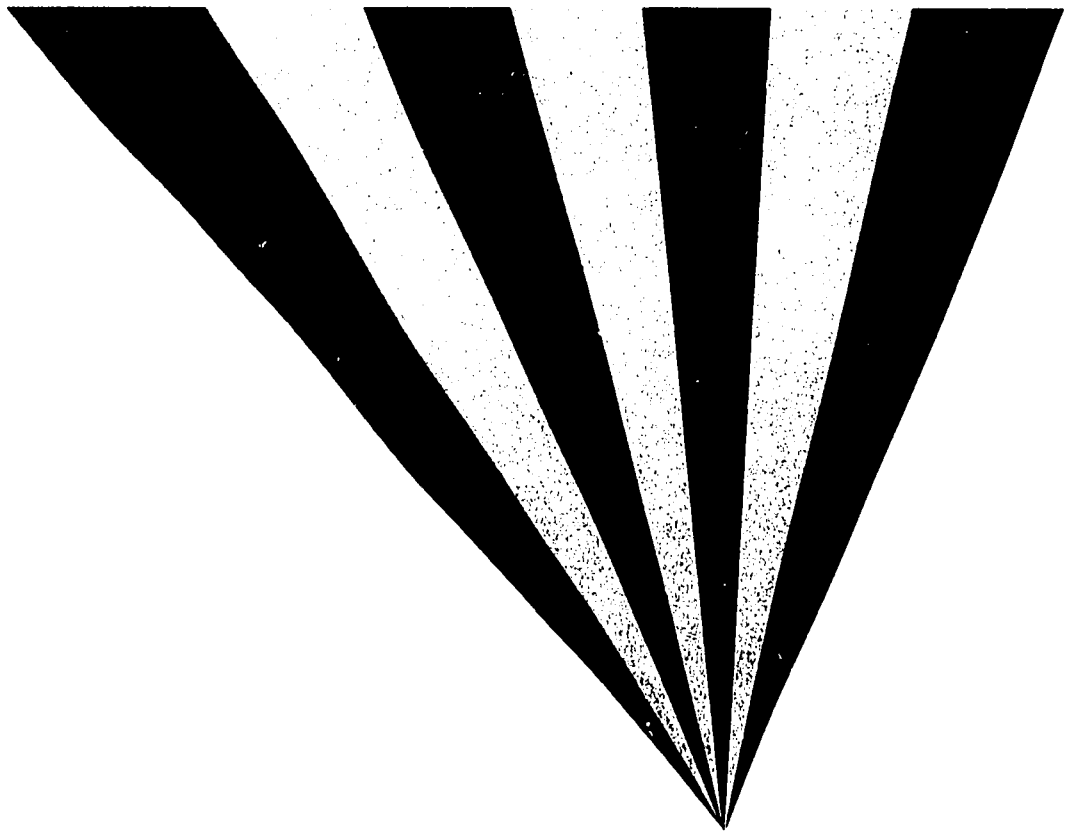

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FISCAL YEAR 1972

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INTRODUCTION

The National Science Foundation is an agency of the Federal Government established in 1950 to advance scientific progress in the United States. The Foundation fulfills this responsibility primarily by sponsoring scientific research, encouraging and supporting improvements in science education, and fostering scientific information exchange. NSF does not itself conduct research or carry out education projects.

The Foundation supports scientific research and education projects in the mathematical, physical, medical, biological, social and engineering sciences—and in interdisciplinary areas comprised of overlapping fields such as oceanography, meteorology, and geochemistry, etc. The Foundation does not support projects in clinical medicine, the arts and humanities, business areas, social work, or education methodology.

The National Science Board is the policymaking body of the National Science Foundation. It consists of 25 members appointed by the President, by and with the consent of the Senate, and includes the Director of the Foundation who serves on a full-time basis. The Board passes on new Foundation programs and on grants or contracts requiring a total commitment of more than $2 million or an annual expenditure of more than $500,000.

Proposals for support are ordinarily assigned to the appropriate division or office for review and evaluation. An organization chart depicting the major areas of program activity is provided on page 80.

In making its decisions on proposals, the Foundation relies heavily on the advice and assistance of advisory panels, outside reviewers, and other experts to ensure that NSF is able to reach fair and knowledgeable judgments. These scientists and educators come from colleges and universities, from nonprofit research and educational organizations, from industry, and from other Government agencies. Their counsel has proven invaluable to the Foundation.

Contents

I. SCIENTIFIC RESEARCH PROJECT SUPPORT

The National Science Foundation provides comprehensive support to research in all the sciences. Major mechanisms through which research is supported include project grants to scientists, primarily at universities and colleges and cooperative national research programs of a specialized nature. In addition, the Foundation assists in the procurement of specialized research facilities and equipment.

The Foundation considers all proposals for the support of research projects, regardless of source. The majority of such requests are submitted by U.S. universities and colleges on behalf of individual scientists or groups of scientists on their faculties. Foundation policy is to emphasize research that contributes to graduate and postdoctoral education in the sciences. Support of research at foreign institutions is provided only when it is clearly in the interest of science in the United States.

Research project proposals are considered primarily on the basis of scientific merit. Scientific merit is assessed according to the promise of significant scientific results, the possible scientific impact, the probable opening of a new field, the educational by-products, and potential applications.

Programs described in chapter I are administered by the Office of the Assistant Director for Research. Other programs administered by this Directorate will be found in chapter II, National and Special Research Programs.

Scientific Research Projects

The National Science Foundation awards grants to support research in science, engineering, and mathematics. On rare occasions research support may take the form of a contract rather than a grant; proposals directed at grants or contracts are prepared in an identical manner.

A research project grant may support either a specific research project or general research in a coherent area of science.

Research support is given to the full spectrum of sciences, including:

Biological & Medical Sciences
(excludes clinical aspects)
cellular biology; ecology; evolutionary and systematic biology; molecular biology; physiological processes; psychobiology and neurobiology.

Engineering
engineering chemistry; engineering energetics; engineering mechanics; electrical science and analysis; and biomedical engineering.

Mathematical & Physical Sciences
astronomy; chemistry; mathematics; physics.

Materials Research
physics and chemistry of solids and liquids; polymer science; materials engineering.

Social Sciences
anthropology; economic and social geography; economics; history and philosophy of science; law and social science; linguistics; political science; science policy; social psychology; sociology and social indicators.

Enviromental Sciences
atmospheric sciences; earth sciences; physical and biological oceanography.

Institutions are required to share in the cost of each research project supported by an NSF grant. Before submitting a proposal for research support the pamphlet **Grants for Scientific Research** (NSF 69-23) should be consulted. The Foundation does not require standard application forms for research proposals.

Grants normally provide support for periods up to 24 months. Projects of high scientific merit may be approved scientifically for periods up to 60 months and will be funded on an annual basis for the term of the approval, contingent upon the availability of funds and the scientific progress of the research.

Eligibility

Proposals may be submitted by colleges and universities and by academically related nonprofit research organizations. The conditions under which support is occasionally provided to other types of organizations and to individuals is described in the NSF pamphlet **Grants for Scientific Research,** available from the address below. Inquiry may also be made directly to the Assistant Director for Research.

Deadlines

Proposals may be submitted at any time. Approximately six months should be allowed for the consideration of a proposal.

Additional Information

Communications may be addressed to the appropriate division: Division of Biological and Medical Sciences, Division of Engineering, Division of Environmental Sciences, Division of Mathematical and Physical Sciences, Division of Materials Research, or Division of Social Sciences; National Science Foundation, Washington, D. C. 20550.

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Engineering Research Initiation Grants

The National Science Foundation awards grants to encourage the development of meritorious graduate research programs by engineering faculty members.

The usual duration of a grant will include the first summer, and the following academic year and summer. The grant amount will not normally exceed $20,000.

Eligibility

Proposals may be submitted by institutions of higher education that award graduate degrees in engineering on behalf of faculty members who:

(1) Are members of the teaching faculty;

(2) Have received the Ph.D. degree within the past three years (excluding active-duty time in the U.S. Armed Forces), or have completed all requirements for the Ph.D. degree;

(3) Have had no substantial research support.

Deadlines

Instructions for preparing engineering research initiation proposals are available in early October from the office listed below. Application deadline is early December. Awards are made in mid-March.

Additional Information

Pamphlet **Engineering Research Initiation Grants.** Communications may be addressed to: Division of Engineering, National Science Foundation, Washington, D. C. 20550.

Doctoral Dissertation Research

The National Science Foundation awards grants to improve the scientific quality of dissertations in the social sciences and certain sciences involving extensive field work and to make possible the use of larger quantities of better quality data. Grants are awarded for periods up to 24 months. Grant funds may not be used as a stipend for the doctoral candidate, although he may receive support from other sources.

In collaboration with the Office of Economic Opportunity, special grants are also awarded by the Foundation in support of doctoral thesis research centrally related to problems of poverty.

Eligibility

Proposals for the support of dissertation research in the social sciences (including science policy research), systematic biology, ecology, oceanography, earth sciences and atmospheric sciences and dissertation research on poverty may be submitted by universities on behalf of doctoral candidates. The proposal should be submitted by the dissertation advisor, department chairman, or chairman of the departmental committee on doctoral degrees.

Deadlines

Proposals may be submitted at any time; one or more grant requests may be made in a single proposal if the budget for each request is set forth separately. Four months should be allowed for processing the grant application.

Additional Information

A leaflet that sets forth application procedures is available from the Foundation. Communications may be addressed to: Division of Biological and Medical Sciences, Division of Environmental Sciences, or Division of Social Sciences, National Science Foundation, Washington, D. C. 20550.

Specialized Research Facilities and Equipment Program

The National Science Foundation awards grants for specialized research facilities and major items of research equipment.

Facilities supported under this program are those required for highly specialized scientific purposes, as distinct from laboratory buildings used in normal academic research programs. Examples are: nuclear reactors, controlled-environment biological laboratories, some marine research equipment and support facilities, mobile laboratories, off-campus research facilities, and unique one-of-a-kind research facilities. Grants may provide for construction or modernization of facilities.

Equipment support may be provided where a research tool is needed by several investigators in a department. Examples are: electron microscopes, mass spectrometers, cryogenic equipment, and special-purpose computers.

The National Science Foundation encourages local contributions from non-Federal funds whenever possible; however, there is no fixed requirement as to the amount of funds that institutions must contribute.

Before submitting a proposal for specialized research facilities and equipment the NSF pamphlet **Grants for Scientific Research** should be consulted. The Foundation does not provide standard application forms for research facilities and equipment proposals.

Eligibility

Institutions eligible to submit proposals are colleges and universities offering graduate studies (though in exceptional circumstances colleges and universities without graduate programs may be eligible), associations of colleges and universities, and nonprofit research institutions such as research museums.

Deadlines

Proposals may be submitted at any time. Approximately four to six months are required for consideration of a proposal.

Additional Information

See also page 14, Oceanographic Facilities and Support.

The NSF pamphlet **Grants for Scientific Research** is available from the Foundation. Communications may be addressed to the appropriate division: Division of Biological and Medical Sciences, Division of Engineering, Division of Environmental Sciences, Division of Mathematical and Physical Sciences, or Division of Social Sciences; National Science Foundation, Washington, D. C. 20550.

Science Policy Studies and Development

The National Science Foundation awards grants:

1. to develop the Nation's capabilities for research and training in the area of science planning and policy; and
2. to support research on national science policy issues.

Examples of problems and subjects for science policy research include:

- The relation of current and future national problems and goals to science, technology, and the universities;
- Alternate national goals and strategies for science and technology;
- Resources for and uses of science and technology;
- The policy process and institutions to perform, support and use science and technology;
- Improved criteria and methods to allocate resources for science and technology.

Activities eligible for support include:

Research projects concerning problems of science planning and policy and the methods and techniques appropriate thereto. This research, which often is interdisciplinary in character, may be conducted by faculty members and graduate students working either individually or in groups.

University Science Planning and Policy Development Grants to conduct coherent efforts involving a variety of research projects, research seminars and possibly the development of related curricula. Typically, junior and senior faculty members and graduate students would be involved together in these activities.

Grants to improve doctoral dissertation research on science policy problems. (See page 5.)

Eligibility

Proposals for Science Policy Grants may be submitted by responsible individuals at educational and nonprofit research institutions.

Proposals for University Science Planning and Policy grants may be submitted by colleges and universities that grant at least a baccalaureate-level degree in science.

Proposals for Grants to Improve Doctoral Dissertation Research on Science Policy Problems may be submitted by universities on behalf of doctoral candidates. (See page 5.)

Deadlines

A proposal may be submitted at any time; approximately four months are required to consider and process a dissertation grant proposal; other proposals require approximately six months. Informal inquiry to the Foundation may be made to determine whether or not a potential project would qualify for support under NSF Science Policy Programs.

Additional Information

Communications may be addressed to Science Policy Research Section, Division of Social Sciences, National Science Foundation, Washington, D. C. 20550.

II. NATIONAL AND SPECIAL RESEARCH PROGRAMS

National and Special Research Programs of the Foundation are major efforts of research or research support of such broad scope that extensive coordination of planning, management. funding, and logistics is essential to effective program performance. These programs may be characterized by inclusion of one or more of the following elements: international cooperation, coordination with other agencies of government, a relationship to a specific geographic region, or interdisciplinary scientific investigations.

Except where otherwise noted, programs described in this chapter are administered by the Assistant Director for National and International Programs.

Arctic Research Program

The National Science Foundation has been assigned responsibility as lead agency for the extension of Arctic environmental research, with the advice of the Interagency Arctic Research Coordinating Committee (IARCC). The Foundation has accordingly established the Arctic Research Program to provide support for academic research and to coordinate the Foundation program with those of other Federal agencies through IARCC. This program was initiated in fiscal year 1971.

The Foundation has in the past supported activities in the Arctic region through grants and contracts awarded by existing program elements of various offices and divisions. These programs will continue to support such activities. Proposals for research projects in a specific scientific discipline should be addressed to the appropriate division of the Assistant Director for Research. (See page 3.) The Arctic Research Program will support projects of an interdisciplinary nature, including field investigations that require logistic arrangements and/or interagency or international cooperation, as well as the subsequent analysis of data.

The program of academic research will react to problems of the Arctic seas and pack ice, tundra ecosystems, geomagnetic phenomena, snow, ice and permafrost phenomena, and other scientific problems related to the physical and biological aspects of a cold-dominated environment, and man's impact upon them. Support is also given for Arctic science information activities.

Eligibility

Proposals for grants or contracts for research project support may be submitted by colleges and universities and by academically related nonprofit research organizations. Grants are normally made for a period of 12 months, but under certain circumstances can be made for periods up to a maximum of 60 months. Institutions are required to share in the cost of research projects supported by an NSF grant.

Additional Information

Communications may be addressed to: Office of Polar Programs, National Science Foundation, Washington, D. C. 20550.

U.S. Antarctic Research Program

The National Science Foundation awards grants to support research projects in all fields of science pertinent to the Antarctic, including both field work in Antarctica and study in the United States of specimens or data already gathered. On occasion research support may take the form of a contract rather than a grant.

The U.S. Antarctic Research Program supports research projects in the fields of behavioral sciences, biology, cartography, geology, glaciology, meteorology, oceanography, solid-earth geophysics, and upper atmosphere physics. Support is also given as required for Antarctic science information activities. Logistic support operations for scientific and other programs in Antarctica are carried out by the U.S. Navy, the U.S. Coast Guard, and commercial contractors.

Institutions are required to share in the cost of research projects supported by an NSF grant.

Grants are normally made for a period of 12 months, but under certain circumstances can be made for periods up to a maximum of 60 months. For projects of high scientific merit initial funding may be for two years with assurance of support for the full term of the project, contingent upon the availability of funds and the scientific progress of the research.

Eligibility

Proposals for grants or contracts for research project support may be submitted by colleges and universities and by academically related nonprofit research organizations. The conditions under which support is occasionally provided to other types of organizations are described in the NSF pamphlet **Grants for Scientific Research,** available from the Foundation.

Before submitting a proposal for research support, scientists should consult the pamphlet **Grants for Scientific Research.** They are encouraged to discuss their plans by letter or in person before submitting formal proposals. The Foundation does not provide standard application forms for proposals.

Deadlines

Proposals should be submitted by February 1 for work in Antarctica during the following austral summer (October to February).

Additional Information

Communications may be addressed to: Office of Polar Programs, National Science Foundation, Washington, D. C. 20550.

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International Decade of Ocean Exploration

In support of the International Decade of Ocean Exploration, the National Science Foundation awards grants and contracts for cooperative programs of ocean research and exploration with emphasis on environmental quality, environmental prediction, and seabed assessment. The program sponsors a small number of relatively large scientific problems especially susceptible to concerted effort by the research community. Emphasis is placed upon scientific excellence, development and testing of numerical models, state-of-the-art technology, including automatic data processing, program management, and applicability of results. The Decade is unique in that it recognizes that a major share of world oceanographic effort must be devoted to globally planned and coordinated study of the ocean as a system, for the benefit of mankind.

The long-range goals of the Decade are:

(1) to preserve the ocean environment by accelerating scientific observation of the natural state of the ocean and its interactions with the continental margins;

(2) to develop and improve an ocean forecasting and monitoring system, to facilitate prediction of oceanographic and atmospheric conditions, and to reduce hazards to life and property and permit more effective use of marine resources;

(3) to expand seabed assessment activities, to permit better management of ocean mineral exploration and exploitation;

(4) to improve worldwide oceanographic data exchange;

(5) to increase opportunities for international sharing of responsibilities and costs for ocean exploration and assure better use of limited exploration resources.

The United States national program is coordinated closely with the Long-term and Expanded Program of Oceanic Exploration and Research of the International Oceanographic Commission of UNESCO. The Comprehensive Outline of the Scope of this program was endorsed by the General Assembly of the United Nations in December 1969. The International Decade of Ocean Exploration has been identified as an important element of this program. The criteria of the Expanded Program which could be applied as appropriate in selecting cooperative projects, and which could also serve as criteria for the Decade, are:

"(1) Member States are willing to participate actively in the project;

(2) The project can be carried out most effectively through international cooperative action;

(3) The project has a sound scientific basis and is well designed to yield significant new information;

(4) The project will provide information and understanding that will contribute to the goal of enhanced utilization of the ocean and its resources;

(5) The project will help meet the needs of developing countries."

"A project that satisfied all those criteria would be an extremely strong candidate for inclusion in the Expanded Program. It will not be necessary in each case that all criteria be met, but the willingness of Member States to participate is clearly essential."

The Decade was funded for the first time in the fiscal year beginning July 1, 1970.

Deadlines

Proposals may be submitted at any time.

Additional Information

Communications may be addressed to: Office for the International Decade of Ocean Exploration, National Science Foundation, Washington, D. C. 20550.

Ocean Sediment Coring Program

The National Science Foundation sponsors the acquisition of cores taken from below the floors of the deep ocean basins by means of rotary drilling through the sedimentary layer, with short penetrations into the crystalline basement at selected sites. Samples of the core material are made available to qualified scientists for individual research projects.

Under the program, a single operational deep sea drilling project is performed by the Scripps Institution of Oceanography of the University of California, San Diego. Since August 1968, extensive amounts of core material have been recovered from drill sites located across the Atlantic and Pacific Oceans and in many of the adjacent seas, including the Gulf of Mexico, the Caribbean Sea, and the Mediterranean Sea. Operations are continuing, with plans for drilling across the Indian Ocean.

One or more boreholes are drilled at each site, and at each hole cores are taken continuously or intermittently through the depth of the hole, as the scientific party aboard chooses with reference to prior plans and to immediately apparent results. About 65 deep ocean drill sites are occupied per year, yielding about 16,000 linear feet of 2½-inch-diameter cores. Drill sites have been located in water depths exceeding 20,000 feet, and sub-bottom penetrations of more than 3,500 feet have been achieved.

An initial description of the core samples is started on shipboard and completed at shore-based laboratories by teams of participating scientists of about 10 individuals for each two-month drilling cruise. The comprehensive results of that initial description are published in a series of volumes, **Initial Reports of the Deep Sea Drilling Project,** one volume for each two-month operational period. The volumes are placed with all major libraries, and are available for purchase by individuals from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402. Samples of the material may be requested, prepared with reference to the published descriptions, one month after the publication of each volume.

Eligibility

Proposals for grants for studies of the core material may be submitted by academic institutions, nonprofit organizations, and individual scientists.

Deadlines

Proposals may be submitted at any time. Approximately six months are required to consider a proposal.

Additional Information

Suggestions for scientific planning, including sites to be included on the drilling intinerary, may be addressed to: Manager, Deep Sea Drilling Project, Scripps Institution of Oceanography, University of California, San Diego, Calif. 92037.

Requests for samples of the core material, to be made with reference to the published **Initial Reports of the Deep Sea Drilling Project,** may be directed to: Curator, Deep Sea Drilling Project, address as above.

Proposals for funding support of research on the core material may be submitted to: Division of Environmental Sciences, National Science Foundation, Washington, D. C. 20550.

Additional information about the Ocean Sediment Coring Program may be requested from: Office of National Centers and Facilities Operations, National Science Foundation, Washington, D. C. 20550.

Global Atmospheric Research Program (GARP)

The National Science Foundation awards grants to support research projects which involve the general circulation of the atmosphere and the physical basis of climate. Such research may improve the capacity of long-range weather prediction, and explore the feasibility of large-scale weather and climate modification.

The Global Atmospheric Research Program (GARP) is a long-term commitment by many nations. Within the United States, by formal agreement among Federal agencies, the Foundation is the primary agency for the support of non-Federal research in the program, particularly at universities. The Department of Commerce is the primary agency for Federal activities.

Grants are normally made for periods up to 24 months. Projects of high scientific merit may be approved scientifically for periods up to 60 months, and will be funded on an annual basis for the term of the approval, contingent upon the availability of funds and the scientific progress of the research.

Eligibility

Institutions eligible to submit proposals under GARP are colleges and universities; nonacademic, nonprofit organizations; and individual scientists. Occasionally NSF sponsors supporting efforts by other Government agencies, particularly for field programs. Institutions are required to share in the cost of their research projects supported by an NSF research grant; this may be accomplished by a contribution to any cost element in the project, direct or indirect.

Before submitting a research proposal, the NSF pamphlet **Grants for Scientific Research,** available from the Foundation, should be consulted. The Foundation does not provide standard application forms for research proposals

Deadlines

Proposals may be submitted at any time; approximately three months are required for consideration of a proposal.

Additional Information

Communications may be addressed to: Division of Environmental Sciences, National Science Foundation, Washington, D. C. 20550.

This program is administered by the office of the Assistant Director for Research.

International Biological Program

The National Science Foundation awards grants to support research projects that are part of the U.S. participation in the International Biological Program (IBP). The theme of IBP is the study of "the biological basis of productivity and human welfare," and the major portion of the program is in the area of ecosystem analysis.

The International Biological Program was proposed by the International Council of Scientific Unions in 1964; there are 55 nations now participating in the program. The U.S. National Committee for the International Biological Program, established by the National Academy of Sciences-National Research Council, assists in planning U.S. participation in IBP.

Eligibility

Appropriateness of projects for consideration by the Foundation under the U.S. IBP research program is determined by the U.S. National Committee for IBP, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D. C. 20418. Scientists who wish to become affiliated with an IBP research program should address an inquiry to the Academy prior to the preparation of a formal proposal.

Before submitting a research proposal the pamphlet **Grants for Scientific Research** should be consulted. The Foundation does not provide standard application forms for research proposals.

Institutions are required to share in the cost of each research project supported by an NSF research grant; this may be accomplished by a contribution to any cost element in the project, direct or indirect.

Deadlines

Proposals may be submitted at any time; approximately six months are required for consideration of a proposal. Grants are normally made for periods up to 24 months.

Additional Information

Communications may be addressed to: Division of Biological and Medical Sciences, National Science Foundation, Washington, D. C. 20550.

This program is administered by the office of the Assistant Director for Research.

Oceanographic Facilities and Support

The National Science Foundation awards grants or contracts for support of construction, modification, conversion, purchase, and operation of oceanographic facilities which lend themselves to shared usage. Community arrangements for shared use of these facilities are being developed under the University National Oceanographic Laboratory System (UNOLS).

Facilities supported under this program are those required for research both in the open oceans and in the near-shore areas, in estuaries and on the Great Lakes. Examples of such facilities are ships, boats, submersibles, buoys, piers, shipboard and shore-related computing capability, environmental simulation units, equipment development capabilities, and new developments for marine environment studies.

The Foundation encourages local contributions from non-Federal funds whenever possible; however, there is no fixed requirement as to the amount of funds that institutions must contribute.

Before submitting a proposal for support under this program, institutions should seek advice from the Office for Oceanographic Facilities and Support (OFS). Specific instructions may be obtained for certain portions of the program, such as ship operations support.

Eligibility

The general objective of OFS is to provide support for large and expensive oceanographic facilities in accordance with the demonstrated needs of the total academic oceanographic community. Access to NSF-funded facilities will be assured to qualified users through UNOLS.

Institutions qualifying to operate shared facilities will need to demonstrate the logistic capability to carry out all related tasks. Operator institutions may include colleges and universities, nonprofit research institutions, and associations of colleges and universities.

Deadlines

Ship operations proposals are due July 1 each year. Other types of proposals may be submitted at any time during the year.

Additional Information

Communications may be addressed to: Office for Oceanographic Facilities and Support, National Science Foundation, Washington, D. C. 20550.

III. RESEARCH APPLICATIONS

Research Applications

During recent years, the National Science Foundation has developed improved capabilities to stimulate research efforts more immediately and directly related to problems of society and the environment.

The problems, challenges, and opportunities to which the scientific community must respond require careful and objective analysis, expansion of the pool of directly relevant knowledge, and considered efforts to make this knowledge available to interested users. Specific needs of the nation provide the basis for program objectives and organization and management of the research supported under these programs. The principal program efforts included under Research Applications are presented under the collective heading Research Applied to National Needs (RANN). The major coordinated research programs administered under RANN are Environmental Systems and Resources, Social Systems and Human Resources, Advanced Technology Applications, and Exploratory Research and Problem Assessment. An additional element is comprised of the Intergovernmental Science Programs, which is also included in the program descriptions on the following pages.

Institutions are required to share in the cost of each research project supported by an NSF grant; this may be accomplished in accordance with the institution's cost-sharing policies. Before submitting a proposal for research support, descriptive brochures on the RANN program and the Intergovernmental Science Programs should be consulted.

Eligibility

Proposals may be submitted by colleges and universities and nonprofit organizations, including State and local governments. These proposals may provide for collaborative arrangements with other universities, nonprofit and/or profit-making organizations.

Deadlines

Proposals may be submitted at any time, and should first be submitted in preliminary form for negotiation and discussion. Approximately three to six months are required for consideration of proposals. Proposals requesting renewal support should be submitted at least six months in advance of the anticipated termination date of the existing grant in order to assure uninterrupted support.

Additional Information

The publication NSF 71-21 describes guidelines for proposal preparation to the RANN program. Communications may be addressed to the appropriate division or office: Division of Environmental Systems and Resources, Division of Social Systems and Human Resources, Division of Advanced Technology Applications, Office of Exploratory Research and Problem Assessment, or Office of Intergovernmental Science Programs, National Science Foundation, Washington, D. C. 20550.

Environmental Systems and Resources

The programs of this division develop scientific data and strategic frameworks to deal with environmental problems, including the complex tradeoffs between economic and social development and environmental quality.

Research supported under these programs deals specifically with establishing baselines of environmental quality, long-range environmental management strategies, the environmental consequences of modern technology, resource exploitation, and procedures for resource recycling.

Weather Modification

The overall purpose of the Weather Modification Program is to study those atmospheric mechanisms which can be or are being influenced by man to modify natural weather patterns and evaluate the impact of their modification upon society.

The specific objectives may be defined as follows:

- Develop a level of understanding of the mechanisms of hail formation in severe convective storms which will lead to a more reliable method of hail suppression.
- Develop a more adequate knowledge of the ice nucleation mechanism in the atmosphere which will result in a capability to measure and predict the consequences of a seeding operation.
- Develop a more adequate knowledge of how atmospheric pollutants may influence weather patterns through the modification of natural meteorological processes.
- Develop new concepts and models of the atmosphere which will result in greater operational capabilities or increased efficiency in weather modification techniques.
- Increase our understanding of the social, economic, legal, and ecological impact of operational weather modification practices upon society.

Environmental Aspects of Trace Contaminants

This program is designed to develop an understanding of the impact on man and the environment of many known and potential environmental trace contaminants, such as manufacturing by-products, agricultural and household wastes, oil and hazardous materials spillage and dissipation, and elements of the bio-geochemical environment. The purpose of the Trace Contaminants Program is to study trace substances in the environment for the purpose of understanding and control. Specific objectives are:

- Identify the trace contaminants (and magnitude of their release into the environment) resulting from natural processes, agricultural and mining practices, and the manufacture, use, and disposal of products and by-products.
- Develop techniques in analytical chemistry, data on biota highly sensitive to pollutants, and knowledge of pollutant-concentrating mechanisms in food chains.
- Identify the environmental sources and sinks, routes, and rates of flow of trace contaminants.
- Identify the targets, including man, in the routes of flow, and assess the degree of damage to these targets.
- Synthesize models of environmental systems which define trace contaminant transport (mass flux), predict causes and effects, and alternative actions for contaminant control.
- Identify the changes in molecular species which trace contaminants undergo in their movement through environmental media.
- Identify the legal and economic factors which impede or assist environmental pollution by trace contaminants, and assess their impact.
- Identify public attitudes on "willingness to pay" for environmental quality.

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- Provide data that assist Federal and other governmental regulatory agencies in setting realistic and fair environmental standards.
- Provide information useful to local and regional decision-makers in planning further use of land, water, and air resources for habitation, recreation, and commerce, including information on environmental decontamination.

Regional Environmental Systems Program

The purpose of this program is to study regional environments and resources in order to establish the scientific basis for their management and use. A major aim of the Regional Environmental Systems Program is the enhancement of man's capacity to select from the universe of development and management strategies those which most effectively achieve environmental quality objectives within the context of other societal goals.

Objectives of the program are:

- Define environmental problems, including those unique to a particular region and those common to many regions.
- Identify resources impacted and ecosystem relations to predict consequences of alternative schemes to correct environmental problems.
- Assess environmental preferences and determine those factors which influence perceptions and attitudes toward—and willingness to pay for—various resource mixes and levels of environmental quality.
- Evaluate economic and legal mechanisms as management options available to decision-makers, the specific environmental effects of these options, and the potentially detrimental effects of other forms of public policy.
- Synthesize management schemes utilizing the necessary environmental, economic, and social information.
- Evaluate management schemes in relation to other policies designed to meet other societal objectives.

Significant environmental problems may be viewed as either issue-centered or region-centered. In either case, the current state of understanding of environmental systems is rudimentary, yet the problems may be quite pressing. Efficient and effective realization of coordinated interdisciplinary research which contributes to management strategies is essential.

Social Systems and Human Resources

The Division of Social Systems and Human Resources has two major purposes. The first is to fill needs for policy-relevant research on major social problems. Policy-relevant is defined as research that could make a direct and significant difference in the choices made by national, State, or local decision-makers or that helps clarify and resolve debate on social policy. The second objective is to advance the state-of-the-art in social policy analysis. Quite frequently, well-intentioned social policies fail or even have adverse consequences because the analytic methods used were not powerful enough to generate the information or predictions required for sensible decision-making.

Programs of the division are:

Municipal Systems, Operations, and Services

The purpose of this program is twofold—to provide systematic analysis of urban problems as they affect particular cities, and by careful choice of cities and problems, to achieve generalizations about perceived national problems. The emphasis on specific examples of general problems must be clearly understood. For example, finding policy instruments that can control and channel urban growth is a problem of national concern. But decisions on this problem require sorting out and ordering policies that are applied at different levels and ensuring that policy actions at one level do not defeat actions at another level. This requirement implies that we examine and understand within-city behavior as well as the national actions and trends that affect all cities. Specific objectives are to:

- Identify and evaluate what is now known about municipal systems.
- Perform comparisons and analyses of urban structure to highlight the variety of urban problems and the variety of applicable instruments.

There are many functional problem areas which link closely with the work on urban structure. The following have been selected for special emphasis:

- Identify the benefit-costs of alternative forms for the delivery of municipal goods and services.
- Identify cost-effective changes in criminal justice systems.
- Conduct socioeconomic evaluations of new communications technology.
- Identify and analyze impact of innovations in urban transportation.
- Identify the socioeconomic consequences of innovations in urban school systems.
- Identify alternative Federal, State, and local relationships.

Social Data and Community Structure

- Identify valid social indicators.
- Community and population structure work, focused on creating baseline descriptions of the socioeconomic structure of American communities and of the American population. Baselines are necessary to provide a standard for comparing the effects of alternative policies. Creating baselines in the detail now required for policy requires some methodological work on handling, combining, and analyzing large data files, particularly Census files.
- Research on minority and ethnic problems, focused on establishing socioeconomic baselines for the minority populations. One area selected for very intensive investigation is the intra-urban mobility of minority populations.

Evaluation Methodologies for Social Programs

This program addresses the theoretical and practical issues that contribute to the inadequacy of currently available methodologies for the evaluation of major social programs. Work will continue on the improvement of the

statistical techniques and experimental designs appropriate to social evaluation. The program has a particular focus on the development and application of methods that are useful under the constraints imposed by the policy process.

Program work will emphasize improving evaluations of techniques in the context of ongoing social innovation and experiments. In particular, the program emphasizes work on improved measurement of "output" from innovations and experiments and work on the generalizability of innovation and experiments.

Research on a quick reaction capability in assessing social problems will be initiated. Methods will be sought for developing rapid social information, particularly survey information, that will provide guidance for short-term policy issues, or for identifying new policy issues.

Advanced Technology Applications

The principal goals of the Division of Advanced Technology Applications are to support technological research that contributes to the national economy and productivity, reduces the adverse economic and societal costs of destructive natural phenomena, reduces the adverse impacts of technology on society and the environment, and improves the quality of community life.

Disaster and Natural Hazard Research

The subprograms are Earthquake Engineering and Fire Research. The natural hazards to be considered are primarily dynamic in nature and include: earthquake, wind (tornadoes, hurricanes), tsunami and wind-induced waves landslide, flood, drought, and unwanted fire.

Earthquake Engineering. There are eight basic task areas for earthquake engineering research activity: (1) socioeconomic effects and costs; (2) ground motion instrumentation and measurements; (3) effects on soils and foundations; (4) dynamic analysis of structures; (5) detailed fabrication of structures; (6) tsunami (earthquake-caused tidal waves)—observation and protection; (7) design and distributional aspects of public services and utilities; and (8) post-earthquake inspection and engineering evaluation. These areas, while not separable in any sense, represent areas of concentration with high potential benefits relative to expenditure.

Fire Research. The following objectives indicate the scope of the research:

- Increase the basic knowledge on the mechanisms of ignition and flame spread.
- Study specific classes of materials, particularly new materials, for burning and the products of combustion.
- Obtain basic information on fabric flammability and associated hazards, leading toward the setting of standards.
- Study flame spread mechanisms in structures.
- Develop models of flame spread.
- Develop knowledge of the mechanisms of flame suppressants.
- Seek improved means for fire detection, alarm, and control.

Technological Needs and Opportunities

Support may be provided for research activities that represent technological opportunities, such as enzyme technology, instrumentation technology, and advanced industrial processing.

Enzyme Technology. The purpose of the Enzyme Technology Program is to stimulate the development of the engineering and technology required to facilitate increased industrial uses of enzymes. The program will support the development of uses of enzymes. The research involved will relate as closely as possible to those enzymes which have the potential for industrial importance. The objectives of this program include:

- Advancement of fermentation and cell culture technology for the production of enzymes.
- Advancement of technology for the isolation and purification of dissolved enzymes and of particle-bound enzymes.
- Advancement of technology of enzyme reaction systems using free and/or immobilized enzymes.
- Development and/or preliminary economic evaluation of new applications of enzymes.

Instrumentation Technology. The purpose of this program is to support research projects leading to new uses and improvements of instrumentation for environmental, social, and technological systems.

The objectives of this program are to:

- Adapt and expand the uses of existing instrumentation and methodologies for new applications, e.g., particle accelerators for detection of trace elements for use in environmental monitoring.

- Develop new research instrumentation that can extend the range or accuracy of measurement of control for existing applications, e.g., mono-energetic X-ray radiography for improved services to society.
- Utilize scientific or engineering principles to develop new instrumentation capabilities and improved methods of measurement and control, e.g., infrared laser radiation for gas analysis for use in environmental monitoring.
- Seek understandings of new scientific and engineering principles that can lead to new substantial additional capabilities in instrumentation applications, e.g., negative pion therapy for improved services to society.

Advanced Industrial Processing. This program focuses upon those technologies expected to have an immediate benefit in the areas of materials processing and extractive metallurgy.

Urban Technology

The technological problems of the urban area cross many boundaries of traditional research and innovation. The Urban Technology activity brings together two programs: Urban Engineering and Excavation Technology. These represent the beginning of a technological assault on improving the physical attributes of the city.

Urban Engineering. This program has four major components: (1) design studies of technological concepts; case studies of existing facilities—their strengths and weaknesses; (2) research studies of innovative technological advances for urban application and renewal; (3) systems engineering and operations research for improvement of metropolitan services employing technology; and (4) modeling of micro and mega urban systems: transportation, water and sewage, air, solid waste, housing, land use and drainage.

Excavation Technology. The following areas are appropriate for research: (1) site investigation; (2) excavation material investigation; (3) ground support and tunnel lining technology; (4) systems technology and testing; (5) systems analysis and investigation; (6) excavation technology; (7) education and information dissemination; (8) testing and evaluation of cavity stability; (9) economic factors; (10) legal and institutional factors; and (11) material handling technology.

Energy Resources Research and Analysis

The three general objectives in energy resources research and analysis are to sponsor research on:

- Analysis of future, intermediate, and long-range needs and various strategies for meeting these needs.
- Environmental, economic, and social impacts of energy production and use and means for assessing and ameliorating detrimental impacts.
- Neglected or otherwise underexploited technologies which have possible major impact on the energy problem but no present appropriate sponsor.

Specific areas of emphasis include:

- Conversion Technology
- Energy Systems—Analysis and Synthesis
- Energy Resources, Management and Use
- Transmission Systems and Networks

Exploratory Research and Problem Assessment

This program supports exploratory research and assessment projects to determine which national problems may be amenable to amelioration through the application of science and engineering capabilities. Assessments will help to define the role of science in dealing with societal problems, and will also examine the impact of science and technology on society. Principal goals are: to define adequately the broad context of particular societal problems; and to identify those research opportunities and strategies which are critical to dealing with the problems. Major components of the program are:

Problem Definition and Assessment

Problem Definition. Defining and analyzing national issues in a broad context to synthesize existing knowledge and identify specific opportunities for research to assist decision-makers.

Technology Assessment. Exploring the impacts of present or proposed applications of science and technology in order to illuminate public policy alternatives.

Exploratory Research

Supporting early stages of research in areas not yet well enough defined or understood to merit full programmatic support; this includes research into the impact of science and technology on public policy issues, and consideration of the utility of further research and the merits of a concerted programmatic effort.

The range and type of problem areas planned for this research program include:

Technology and the Economy:
Exploring the interfaces of technology and the economy where the Government has a unique role or opportunity to stimulate and influence qualitative and quantitative socio-economic change.

Individual Well-Being and Human Development:
Exploring opportunities and problems engendered by life in our highly technological society, through examination of such areas as alternative population patterns, rehabilitation potentials, the roles of different societal groups, and modified social services.

Alternative Futures and Institutional Innovation:
Exploring the societal system improvements that might stem from wide application in both public and private sectors of the best technique of forecasting, of long-range planning, and of institutional innovation.

Intergovernmental Science Programs

The National Science Foundation awards grants to enable State and local levels of government to develop improved programs and institutions for applying science and technology to governmental problems, and for implementing recommendations or utilizing information resulting from NSF problem-oriented and applied research programs.

Objectives of Intergovernmental Science Programs are:

(1) To advance the understanding of public issues and problems having scientific and technological content at the State and local levels of government, and to assess needs and opportunities for more effective application of science and technology;

(2) To demonstrate innovative science and technology planning and decisionmaking processes related to State, local, and regional problems;

(3) To stimulate selected State and local governments' experimentation, on a pilot basis, with science and technology systems in the context of their own needs and resources;

(4) To encourage adoption of new systems which show promise for enhancing State and local ability to incorporate science and technology into public programs;

(5) To improve communication between persons and groups concerned with science and technology at the Federal, State, and local levels of government.

The proposal activity must involve a problem of general interest to State and local governments. Preference will be given to innovative approaches looking toward the development of models for governmental use of science and technology. Activities supported may include research projects, manpower and education programs (involving State and local government officials), technology assessment and forecasting studies, and planning studies to help develop innovative policies and programs for State and local governments. Institutional support will be provided to assist in establishment of centers for governmental science policy planning. Conferences and seminar projects will also be supported.

Pilot experiments will be supported (a) to enable State and local governments to install systems for using science and technology in public decisionmaking processes, or (b) to improve mechanisms for R&D transfer between units of government, colleges and universities, and the private sector.

Eligibility

Proposals may be submitted by units of State and local governments and their regional organizations, special purpose districts, legislative bodies, professional schools, State academies of science, colleges and universities (including community colleges), and nonprofit institutions. Proposals combining academic institutions and units of government will be of particular interest. There is no requirement for matching funds, but normally applicants are required to share in the cost of any proposal activity. Contractual arrangements are arranged on occasion with profit-making organizations for the performance of work in which they are particularly qualified.

Proposals may be submitted to other Federal agencies for partial support and to NSF for those activities that fall outside the program scope of other Federal agencies.

Deadlines

Proposals may be submitted at any time; processing of a proposal requires approximately six months. Informal inquiry to the Foundation may be made to determine whether or not a potential project would qualify for support under NSF Intergovernmental Science Programs.

IV. NATIONAL RESEARCH CENTERS

The National Science Foundation provides support for the development and operation of National Research Centers established to meet national needs for research in specific areas of science requiring facilities, equipment, staffing, and operational support which are beyond the capabilities of private or State institutions and which would not appropriately be provided to a single institution to the exclusion of others. Unlike many federally sponsored research laboratories, the NSF-supported National Research Centers do not perform specific research tasks assigned by or for the direct benefit of the Government. They are established and supported for the purpose of making available, to all qualified scientists, the facilities, equipment, skilled personnel support, and other resources required for the performance of independent research of the scientists' own choosing, in the applicable areas of science.

The Foundation supports four astronomy centers (National Astronomy and Ionosphere Center at Arecibo, Puerto Rico; Cerro Tololo Inter-American Observatory, located near Santiago, Chile; Kitt Peak National Observatory, located at Tucson, Ariz.; and National Radio Astronomy Observatory, located at Green Bank, W. Va.) and one atmospheric research center (National Center for Atmospheric Research, Boulder, Colo.).

The centers are managed by the Office of National Centers and Facilities Operations in the Directorate of National and International Programs. More detailed information on each of these National Research Centers is given on the following pages.

449-897 O - 71 - 5

Cerro Tololo Inter-American Observatory

The National Science Foundation supports the Cerro Tololo Inter-American Observatory (CTIO), an independent research center whose optical telescopes and related facilities are available to all qualified scientists from the United States, Chile, and elsewhere in Latin America. CTIO provides astronomers with the opportunity to observe those parts of the Southern Hemisphere skies which are not visible or not adequately observable from the United States, using telescopes made available by the Federal Government and other organizat ons.

The Cerro Tololo Observatory is located on a 7,200-foot mountain in the foothills of the Andes Mountains about 300 miles north of Santiago, Chile. The administrative headquarters is in the coastal city of La Serena, about 60 miles away. CTIO is supported under the terms of a contract between the Foundation and the Association of Universities for Research in Astronomy, Inc., which also operates the Kitt Peak National Observatory. Close ties are maintained with the University of Chile.

Major astronomical instruments at Cerro Tololo include 60-inch, 24-inch, 36-inch, and two 16-inch telescopes, and a 24-inch Schmidt camera on long-term loan from the University of Michigan. A 150-inch reflecting telescope is scheduled to be completed in 1973. Cerro Tololo has a small permanent staff of U.S. scientists.

Eligibility

Most of the observing time at Cerro Tololo is used by visiting astronomers. Qualified scientists may use the instruments subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the available time.

Additional Information

Communications may be addressed to: Office of National Centers and Facilities Operations, National Science Foundation, Washington, D. C. 20550; or Director, Kitt Peak National Observatory, 950 North Cherry Avenue, Tucson, Ariz. 85717.

Kitt Peak National Observatory

The National Science Foundation supports the Kitt Peak National Observatory (KPNO), an independent National Research Center that makes available optical telescopes and associated equipment to qualified scientists.

Headquarters of KPNO is in Tucson, Ariz.; observing facilities are located atop Kitt Peak, about 45 miles southwest of Tucson. KPNO is supported under the terms of a contract between the Foundation and the Association of Universities for Research in Astronomy, Inc.

Major astronomical instruments at Kitt Peak include the world's largest solar telescope of 60-inch aperture; a 50-inch automated reflecting telescope; an 84-inch, two 36-inch, and two 16-inch reflecting telescopes; and a 12-inch, f/2 Schmidt telescope. A 150-inch telescope is scheduled to be completed in 1972. The observatory also maintains a program of rocket-borne experiments for research primarily on the atmospheres of the planets Jupiter, Mars, Venus, and Earth. KPNO has a staff of resident scientists, engineers, and technicians.

Eligibility

KPNO makes up to 60 percent of the observing time on each instrument available for the use of visiting scientists. All qualified U.S. scientists and on occasion foreign visitors may use the instruments, subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work, and the available time.

Additional Information

Communications may be addressed to: Office of National Centers and Facilities Operations, National Science Foundation, Washington, D. C. 20550; or Director, Kitt Peak National Observatory, 950 Cherry Avenue, Tucson, Ariz. 85717.

National Astronomy and Ionosphere Center

The National Science Foundation supports the National Astronomy and Ionosphere Center at Arecibo (Puerto Rico), an independent National Research Center for the conduct of radio astronomy, radar astronomy, and ionospheric research. The observatory is managed and operated by Cornell University under contract with the Foundation.

The world's largest reflector, a 1,000-foot diameter spherical fixed telescope, is located at the Arecibo observatory. The immense size of this research instrument has enabled it to make unique and significant contributions to understanding of the earth's atmosphere, the solar system, and radio sources outside of the solar system.

The major objective of the observatory is to make available on a national basis radio and radar facilities that will enable it to contribute significantly to new discoveries in the fields of ionospheric studies, lunar and planetary radar, and radio astronomy.

Future planning for the observatory includes new and important installations. The most important is the upgrading of the present reflector. A new surface will enable the telescope to be operated at 10-cm. wavelength in lieu of the present 70-cm. wavelength.

Eligibility

All qualified U.S. scientists and on occasion foreign visitors may use the instruments, subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the time available.

Additional Information

Communications may be addressed to: Office of National Centers and Facilities Operations, National Science Foundation, Washington, D. C. 20550; or Director, National Astronomy and Ionosphere Center at Arecibo, Box 995, Arecibo, Puerto Rico 00612.

National Center for Atmospheric Research

The National Science Foundation supports the National Center for Atmospheric Research (NCAR) as an independent research center that serves as a focal point for an expanding national research effort in the atmospheric sciences. NCAR offers support services, fellowships, and research facilities to qualified scientists working in the field of atmospheric research.

Headquarters and major laboratories of NCAR are located in Boulder, Colo. Research activities and operations are worldwide. Support of NCAR is provided under the terms of a contract between the Foundation and the University Corporation for Atmospheric Research, a nonprofit corporation.

Research and facilities programs of NCAR are carried out by four groups: the Laboratory of Atmospheric Sciences (LAS), the High Altitude Observatory (HAO), the Facilities Laboratory, and the Advanced Study Program. LAS is concerned primarily with the earth's atmosphere up to an altitude of about 60 miles. HAO is interested in the sun and the regions between the sun and the earth and operates a permanent observing station at Climax, Colo., equipped with a 16-inch coronascope. Other NCAR facilities available to assist visiting scientists include a National Scientific Balloon Facility at Palestine, Tex., a Computing Facility at Boulder, and an Aviation Facility at Broomfield, Colo.

In addition to conducting its own research programs, NCAR participates in a number of atmospheric research efforts conducted by Government agencies, university scientists, and research groups on a national or international scale. Major efforts include development of computer simulation of atmospheric global circulation patterns and convective cloud processes, measurement of chemical constituents of the atmosphere, theoretical studies and observations of solar-terrestrial phenomena, investigation of the atmospheric conditions responsible for the formation of hailstorms, and development of techniques to abate hail formation. More than 550 scientists, engineers, technicians, and support personnel comprise the NCAR staff.

Eligibility

Visiting scientists study and conduct research at NCAR under fellowships and research programs. NCAR facilities are available to qualified scientists, subject to scheduling feasibility.

Additional Information

Communications may be addressed to: Office of National Centers and Facilities Operations, National Science Foundation, Washington, D. C. 20550; or Director, National Center for Atmospheric Research, P.O. Box 1470, Boulder, Colo. 80302.

National Radio Astronomy Observatory

The National Science Foundation supports the National Radio Astronomy Observatory (NRAO), an independent National Research Center through which Government-owned radio astronomy facilities are made available to qualified scientists. The NRAO staff assists visiting scientists with the large radio antennas, receivers, and other equipment needed to detect, measure, and identify radio waves from outer space.

Headquarters for NRAO is in Charlottesville, Va.; observing facilities are located primarily in Green Bank, W. Va. NRAO is supported under the terms of a contract between the Foundation and Associated Universities, Inc., a nonprofit corporation.

Major research facilities at NRAO include a 140-foot highly precise, fully steerable radio telescope; an interferometer consisting of three fully steerable 85-foot telescopes with a portable 42-foot telescope for remote operation; and a 300-foot radio telescope steerable in declination (latitude) only. A 36-foot radio telescope operating at millimeter wavelengths is located at the Kitt Peak National Observatory near Tucson, Ariz. NRAO has a small staff of resident scientists, engineers, and technicians.

Eligibility

NRAO makes up to 60 percent of the observing time on each instrument available for the use of visiting scientists. All qualified U.S. scientists and on occasion foreign visitors may use the instruments, subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the time available.

Additional Information

Communications may be addressed to: Office of National Centers and Facilities Operations, National Science Foundation, Washington, D. C. 20550; or Director, National Radio Astronomy Observatory, Charlottesville, Va. 22901.

V. INTERNATIONAL COOPERATIVE SCIENTIFIC ACTIVITIES

International Cooperative Scientific Activities supported by the Foundation are designed to ensure adequate U.S. participation in international scientific events to help maintain the overall strength of U.S. science. Programs in the international scientific area are intended to produce new scientific knowledge; foster the exchange of information between U.S. and foreign scientists; strengthen U.S. science through the introduction of foreign talent and procedures; and contribute to the achievement of U.S. foreign policy objectives.

Programs described in this chapter are administered by the Office of International Programs (OIP) and complement the international aspects of other Foundation activities in support of science and science education. OIP is a component of the Directorate of National and International Programs.

United States-Republic of China Cooperative Science Program

The National Science Foundation awards grants to support the participation of U.S. scientists in the United States-Republic of China Cooperative Science Program. Chinese funds support Chinese scientists participating in the program.

Three types of projects are supported in the program:

(1) Cooperative research in all areas of the natural sciences.

(2) Visiting scientists:

(a) short-term visitors to serve as consultants, to lecture, to participate in symposia or special workshops, and similar activities in all fields; but limited to U.S. scientists already in East Asia for other purposes;

(b) long-term visitors from six months to one year to instruct at the graduate level and to conduct collaborative research in all areas of the natural sciences.

(3) Scientific seminars on any appropriate scientific subject including science education.

A brochure describing the United States-Republic of China Cooperative Science Program is available from the Foundation, together with instructions and guidelines for submitting proposals.

Eligibility

Those eligible to submit proposals are colleges and universities, individual scientists, or groups of scientists. The program is aimed primarily at the academic scientist; however, others may be considered. An informal inquiry to the Foundation should be made before a formal proposal is submitted. All projects involving both United States and Chinese scientists are jointly funded and must be approved by the Foundation and the National Science Council in Taipei.

Deadlines

Proposals may be submitted at any time, but with the exception of (2) (a) above; approximately six months are needed for consideration.

Additional Information

Communications may be addressed to: United States-Republic of China Cooperative Science Program, Office of International Programs, National Science Foundation, Washington, D. C. 20550.

440-807 O - 71 - 6

United States-France Exchange of Scientists Program

The National Science Foundation and the Centre National de la Recherche Scientifique jointly sponsor an exchange of scientists for study or research in the mathematical, physical, chemical, and engineering sciences and in the biological sciences exclusive of the medical sciences. Awards are not made in the social or medical sciences or in education or business fields.

Eligibility

Eligible individuals are citizens or nationals of the United States and France who will have earned a doctoral degree or its equivalent normally not more than five years prior to the commencement of the exchange visit. Eligible institutions are, for American candidates, any appropriate nonprofit French institution. Appropriate nonprofit institutions are institutions of higher education; government research institutes, laboratories, or centers; and privately sponsored nonprofit institutes. The period of the exchange visit is normally between 5 and 15 months. French candidates may obtain information and application materials from the Centre National de la Recherche Scientifique. American candidates may obtain information and application materials from the address below.

Additional Information

Communications may be addressed to: United States-France Exchange of Scientists Program, Office of International Programs, National Science Foundation, Washington, D. C. 20550.

United States-India Exchange of Scientists and Engineers

The National Science Foundation administers the participation of U.S. scientists and engineers in a program of short-term exchanges for the purposes of exchanging scientific information and planning future scientific cooperation. In India the program is administered by the Council of Scientific and Industrial Research. These organizations are jointly responsible for approving each exchange visit. The National Science Foundation pays only travel costs of U.S. scientists to and from India. Within India, expenses are covered by the local hosts. A brochure describing this program is available from the Foundation.

Eligibility

Individual senior scientists and engineers are eligible to submit proposals. The evaluation of requests is based on the applicant's professional qualifications and the merit of the proposed activity in India.

Deadlines

Proposals may be submitted at any time.

Additional Information

Communications may be addressed to: United States-India Exchange of Scientists and Engineers, Office of International Programs, National Science Foundation, Washington, D. C. 20550.

United States-Italy Cooperative Science Program

The National Science Foundation coordinates the participation of U.S. scientists and institutions in the United States-Italy Cooperative Science Program.

The objectives of the program are to promote cooperation between scientists of the two countries for peaceful purposes and to provide additional opportunities for them to exchange ideas, skills and techniques; to attack problems of particular mutual interest; to work together in unique environments; and to utilize special facilities.

Types of projects included in this program are:

(1) Joint research projects.

(2) Exchange of scientists, in connection with approved projects.

(3) Seminars to exchange information and plan cooperative research.

Each activity in the program involves participation by scientists of both countries and requires approval by the Foundation and by the Consiglio Nazionale delle Ricerche, the executive agencies responsible for carrying out the terms of the agreement in the United States and Italy. Nothing in the agreement is intended to prejudice other arrangements for scientific cooperation between the two countries.

Funds for the support of the activities of American scientists may come from any U.S. source, which includes but is not confined to the regular research support programs of the Foundation. Proposals are submitted to the appropriate funding agency or institution in accordance with its normal procedures. At the same time, the U.S. investigator sends a copy of his proposal to the address below, together with a copy of the joint Application Form, signed by him and the Italian principal investigator.

Additional Information

Communications may be addressed to: United States-Italy Cooperative Science Program, Office of International Programs, National Science Foundation, Washington, D. C. 20550.

United States-Japan Cooperative Science Program

The National Science Foundation awards grants to support the participation of U.S. scientists in the United States-Japan Cooperative Science Program. Japanese funds support Japanese scientists participating in the program.

Three types of projects are included in the program:

(1) Cooperative research in all areas of the natural sciences.

(2) Scientific seminars.

(3) Visiting scientists.

The joint United States-Japan Committee stresses the need for more American scientists working for extended periods in Japanese laboratories.

A brochure describing the United States-Japan Cooperative Science Program is available from the Foundation, together with instructions and guidelines for submitting proposals.

Eligibility

American scientists in any fundamental scientific discipline may apply to the Foundation for support of a research or training project to be carried out in a Japanese institution. Assurance must be given that the Japanese institution can accommodate the American participant.

Organizations eligible to submit proposals are colleges and universities, nonprofit research institutions, individual scientists, or groups of scientists. This program is aimed primarily at the academic scientist; however, others may be considered. All projects involving both United States and Japanese scientists are jointly funded and must be approved both by the Foundation and the Japan Society for the Promotion of Science.

Deadlines

Proposals may be submitted at any time; approximately six months are needed to consider a proposal.

Additional Information

Communications may be addressed to: United States-Japan Cooperative Science Program, Office of International Programs, National Science Foundation, Washington, D. C. 20550.

United States-Romania Science and Technology Exchange and Cooperation

Jointly with the National Council for Science and Technology of Romania, the National Science Foundation supports exchanges of scientists and cooperative scientific activities between scientists and institutions of the United States and Romania. Exchange and cooperation may be in those fields of science in which the Foundation supports scientific research projects. (See page 3.)

Eligibility

Proposals for grants for cooperative scientific activities may be submitted by colleges and universities and by academically related nonprofit research organizations. Individual scientists employed by such institutions and organizations may apply for support of exchange visits to Romania.

Additional Information

Communications may be addressed to: United States-Romania Science and Technology Exchange and Cooperation Program, Office of International Programs, National Science Foundation, Washington, D. C. 20550.

International Science Education Assistance Programs

At the request of the Agency for International Development (AID), the National Science Foundation provides advice and administrative services in support of assistance projects concerned with science education improvement. Such projects may be addressed to regional or national development goals. The costs of the U.S. contribution to these projects are paid for by AID.

These activities take place under the terms of an agreement concluded in 1965 between NSF and AID, which has the purpose of permitting AID to draw on the experience of NSF in devising methods of improving science education through teacher-training programs and the development of new and improved science curricular materials.

Present activities under the agreement are:

Cooperative Program for the Improvement of Science Education in India—Under an agreement between NSF, AID, and the Government of India, the Foundation recruits and assigns technical and administrative personnel for long-term positions with the Science Liaison Staff in New Delhi and for short-term consultant assignments with specific projects in India. Some short-term consultants are employed to assist with projects in curriculum design, the production of texts and teaching aids, the design of teacher-training programs, and college and university development. They serve at various places in India, at different times of the year, and usually for periods of less than three months.

Eligibility

U.S. scientists and science teachers with extensive experience in educational projects in the United States or abroad are eligible and encouraged to express their interest. If selected, they are appointed as consultants to the National Science Foundation and assigned to specific projects in India. Consultants receive travel and living expenses and a consulting fee for their service in India.

Science Education Support—Worldwide—Under an agreement with the Office of Education and Human Resources of AID's Technical Assistance Bureau, the Foundation administers a small program that provides services or special studies performed by selected institutional grantees or consultants to help AID fulfill its responsibilities for assisting the developing countries in which it works to improve the quality of their scientific and technical education.

The limited funds available are already fully committed, but the Foundation will accept informal proposals which will be reviewed for possible inclusion in the future. These informal proposals should be limited to projects in science education improvement which provide for studies or services of general applicability in countries receiving assistance from AID.

Additional Information

Communications may be addressed to: International Science Education Assistance Programs, Office of International Programs, National Science Foundation, Washington, D. C. 20550.

VI. SCIENCE EDUCATION

A major task of the National Science Foundation is to assist in fostering beneficial changes in education in the sciences at all academic levels. Convinced of the importance of science in molding a better future for all people, the Foundation supports projects designed to find ways in which science education can better serve a broad segment of society, make science education relevant to society's needs as well as students' needs and interests, and provide the scientific background necessary to assist people in dealing with problems besetting society.

The Foundation's education program stresses the development of new and more effective ways, in terms of both techniques and costs, of educating people, of developing new approaches to the initial preparation of teachers, technicians and research scientists, and of improving the in-service training of science manpower in such a way as to bring about sound educational reform at all levels of education.

In addition to supporting specific types of activities designed to promote the general objectives mentioned above, the Foundation encourages experimentation with other new and innovative ways of improving education in the sciences. Many of the new directions in educational reform today are the outgrowth of experiments in science education supported by the Foundation as special projects.

Project proposals which may significantly improve science education are encouraged and accepted; awards are made on the basis of merit. Two factors are of primary importance in assessing the merit of a proposed project: (1) does the proposal demonstrate that the activity will be of high scientific and educational quality and give promise of bringing about substantial and lasting improvement in instructional programs in science? (2) does the proposed project merit the respect and confidence of the academic community, and involve the time, effort and leadership of scientists distinguished as investigators and/or teachers in their respective fields?

The majority of proposals for projects to improve education in the sciences are submitted by colleges and universities. Proposals may also be submitted by nonprofit organizations such as professional, scientific, and educational associations or societies, and research institutes and laboratories. Commercial organizations, State and local school systems, and individuals acting independently of institutional sponsorship, while not normally grantees for the support of education in science projects, may under certain circumstances submit proposals and receive support from the Foundation. Such organizations and individuals should consult with the Foundation prior to formal submission of a proposal.

Support of activities benefiting science education is not limited to programs administered by the Office of the Assistant Director for Education toward which this chapter is oriented. In particular, the reader should note those activities supported by the Office of Computing Activities and the Office of International Programs.

Graduate Fellowships

The National Science Foundation awards Graduate Fellowships for study or work leading to a master's or doctoral degree in the mathematical, physical, medical, biological, engineering, and social sciences and in the history and philosophy of science. Awards will not be made in clinical, education, or business fields, nor in history or social work, nor for work toward medical or law degrees.

Graduate Fellowships are awarded on the basis of the applicant's ability as evidenced by academic records, letters of recommendation, and scores obtained in examinations designed to measure scientific aptitude and achievement.

Fellowships are awarded for full-time study or research at appropriate nonprofit U.S. or foreign institutions of higher education.

In previous years, Graduate Fellowships have been awarded for one or two years, with a 9 or 12 months' tenure in the fellowship year. The basic 12-month stipend for graduate fellows was set at $2,400 for the first year level, $2,600 for the intermediate level, and $2,800 for the terminal level graduate student. A travel and dependency allowance was also provided. Beginning with the awards to be announced in March 1972, Graduate Fellowships are to be offered for a period of three years, the second and third years to be approved by the Foundation on certification by the fellowship institution of the fellow's satisfactory progress toward an advanced degree in the sciences. The basic stipend is to be $300 per month of tenure. No dependency allowances will be provided. A fellow may receive concurrently additional educational training remuneration from the Veterans Administration and may receive supplementation of his stipend from institutional funds according to his year of residence at the institution.

Eligibility

Beginning with the awards to be announced in March 1972, Graduate Fellowships are to be offered only to individuals who: (1) are citizens or nationals of the United States; (2) have not completed more than one year of graduate study by the fall of the first year of fellowship; (3) have demonstrated ability and special aptitude for advanced training in the sciences; and (4) have been or will be admitted to graduate status by the institution selected.

Deadlines

A brochure on the Graduate Fellowship Program is available each year in October from the Foundation. Applications must be submitted to the Fellowship Office, National Research Council, 2101 Constitution Ave., N.W., Washington, D. C. 20418, by late November. NSF announces the awards in March. Each application must include a complete transcript of college and university records, and a proposed plan for graduate study or research.

Additional Information

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Graduate Traineeships

The National Science Foundation awards grants that enable universities to provide Graduate Traineeships in the mathematical, physical, medical, biological, engineering, and social sciences, and in the history and philosophy of science. Awards will not be made in clinical, education, or business fields, nor in history or social work, nor for work toward medical or law degrees.

Traineeships are awarded to individuals by the institution, not by the National Science Foundation. Trainees may be appointed for part-time or full-time 9- or 12-month tenure periods only. The basic 12-month stipends presently paid from NSF funds to trainees are: first year level, $2,400; intermediate level, $2,600; and terminal year level, $2,800. A dependency allowance may also be provided. Beginning with the 1972-1973 academic year the basic stipend is to be $250 per month of tenure. No dependency allowance will be provided. An institution may supplement a trainee's stipend from institutional funds according to his year of residence at the traineeship institution.

No funds are available for new starts in fiscal year 1972; however, NSF expects to provide an estimated 1,808 continuing Graduate Traineeships in 1972-73 to institutions receiving prior year traineeship grants.

Eligibility

Institutions Institutions eligible to submit proposals for Graduate Traineeships are universities that confer doctoral degrees in science. Proposals are submitted on behalf of departments of science or engineering, and a separate proposal is required for each department or comparable unit.

Individuals To be eligible for tenure under a Graduate Traineeship an individual: (1) must be a citizen or national of the United States; (2) must be enrolled in a program leading to an advanced degree in science; and (3) must be affiliated with the institution at which he receives his appointment.

Deadlines

Institutions The proposal closing date is in October; grants are made in February for the following academic year.

Individuals A list of institutions in which Graduate Traineeships are available may be obtained in February from the Foundation. Individuals wishing to apply for a Graduate Traineeship should request application forms, brochures, or other information from the institution in which he is, or intends to be, enrolled. The deadline for receipt of applications is established by the institution. Traineeship appointments normally must be made before the opening of the fall term.

Additional information

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D. C. 20550.

North Atlantic Treaty Organization (NATO) Postdoctoral Fellowships in Science

In cooperation with the Department of State, the National Science Foundation awards NATO Postdoctoral Fellowships in Science for scientific study or work in mathematics, the sciences (physical, biological, medical, and social), engineering, or interdisciplinary areas. Fellowships are not awarded for support of work toward the M.D., D.V.M., or D.D.S. degrees, nor for support of residency training or similar work leading to qualification in a clinical field.

The NATO fellowship program is designed to assist in obtaining a closer collaboration among the scientists of the NATO nations. Fellowships are awarded for full-time scientific study or work at nonprofit scientific institutions located in foreign countries that are members of or are cooperating with NATO.

Evaluation of applicants will be based on their academic records, letters of recommendation, and ability to carry out the activities program. Consideration is also given to proposed fellowship activities that promote international science cooperation.

The tenure of a NATO Postdoctoral Fellowship in Science is normally 9 or 12 months; in no case may it be less than 6 or more than 12 months. Fellows may begin fellowship activities at any time within one year following announcement of the award. The stipend is $6,500 for a full year. A limited travel and dependency allowance may also be provided. During their tenures NATO fellows may not receive remuneration from another fellowship, scholarship, or similar award, or a Federal grant.

Eligibility

NATO Postdoctoral Fellowships in Science, awarded by the National Science Foundation, are offered only to individuals who: (1) are citizens or nationals of the United States; (2) have demonstrated ability and special aptitude for advanced training in the sciences; (3) have a doctoral degree in one of the qualifying fields of science; or have had scientific training and research experience equivalent to that represented by the science doctorate; or have a degree such as M.D., D.D.S., or D.V.M. and desire to obtain further training for a career in research.

This program is designed primarily for applicants who have received their doctorates within the past five years. Each applicant must submit an outline of his proposed study under the fellowship and complete transcripts of his college and university records.

Deadlines

A brochure is available each year in July from the Foundation. Applications must be submitted to the Division of Graduate Education in Science, National Science Foundation, Washington, D. C. 20550, by late September of each year. Awards are announced by the National Science Foundation in January.

Additional Information

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D. C. 20550.

North Atlantic Treaty Organization (NATO) Advanced Study Institute Participant Grants

The National Science Foundation awards grants to enable U.S. scientists to attend certain NATO Advanced Study Institutes. These meetings, held usually during the summer and varying in length from one to eight weeks, permit exhaustive treatment of a given scientific topic by individuals whose reputations are worldwide.

An international travel grant normally covers the cost of round-trip air fare between the point of origin in the United States and the institute, based on jet-economy, if applicable, or excursion rates. U.S. flag carriers must be used for overseas travel. Per diem is not paid by the Foundation, but in some cases may be available from the NATO institute.

Eligibility

Institutes Each year the National Science Foundation selects certain institutes to receive support for participant-travel and invites the institute director to recommend U.S. participants for such awards. The Foundation then invites the recommended participants to apply for international travel grants.

Individuals To be eligible to receive an NSF international travel grant to attend a NATO Advanced Study Institute, an individual must be: (1) a citizen or national of the United States, and (2) an outstanding young scientist (graduate or recent postdoctoral student).

In addition, individual institutes have specific academic prerequisites for admission. Their announcements should be consulted for details.

Deadlines

Announcements of NATO Advanced Study Institutes are frequently posted by the departments of colleges and universities and also are printed in professional and academic journals. The Foundation makes available a list of these institutes annually around March. Individuals wishing to attend a NATO Advanced Study Institute should request information from the institute director. The deadline for receipt of applications for admission is established by the institute.

Additional Information

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Advanced Science Education Program

The National Science Foundation awards grants to upgrade the quality of science instructional programs at the graduate level and to identify and support new approaches for improving graduate science education. No specific criteria are established; creative and novel approaches are encouraged.

Examples of appropriate projects are: strengthening a graduate degree program by the development of new or special course offerings, including the design and preparation of films and other educational aids; improvement of graduate-level training programs for prospective junior college and college science teachers; developing model courses for incorporation into graduate programs in other institutions; initiating or strengthening interinstitutional programs; the development of courses on the relationship between science and society; and supporting special conferences or studies on national problems in graduate education.

Eligibility

Institutions eligible to submit proposals for Advanced Science Education are universities and colleges, and other appropriate nonprofit organizations or professional scientific societies. Before preparing a formal proposal the project should be discussed informally with NSF project staff, and/or a preliminary proposal should be submitted. An announcement containing application materials is available from the Foundation.

Deadlines

Proposals may be submitted at any time. The period of time required for processing a proposal varies greatly; some proposals require six months or more before a decision can be reached.

Additional Information

Communications should be addressed to Division of Graduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Summer Institutes for College Teachers

The National Science Foundation awards grants to support summer institutes in advanced-level science, mathematics, and engineering courses for college teachers. Such courses permit exploration in depth of those areas that may have become particularly significant for the reorganization and strengthening of the college curriculum. The duration of the summer institute varies considerably, but the average is between six and seven weeks.

Within the range $100-$250, each participant may be provided with a weekly stipend equal to one-fortieth of the participant's academic year salary for the year preceding the summer the project will be in operation. Travel allowances are also provided.

Eligibility

Institutions Institutions eligible to apply for grants to support summer institutes are normally colleges and universities with graduate programs where staffing, laboratories, and libraries are adequate for the advanced nature of the work.

Individuals To be eligible to participate in Summer Institutes for College Teachers an individual must be a U.S. college teacher of one of the sciences (biological, medical, physical, or social), mathematics, or engineering. Teachers at junior or community colleges or technical schools are eligible. A limited number of college teachers who are foreign nationals may be accepted as participants in these institutes.

In addition, individual summer institutes have established specific academic prerequisites for admission; their brochures should be consulted for details.

Deadlines

Institutions An announcement containing application materials is available in March from the Foundation. The application deadline is June 1. Grants for Summer Institutes for College Teachers are made in October for the following summer.

Individuals A list of institutions offering Summer Institutes for College Teachers is given in the Directory of College Teacher Programs published annually in late November; the directory is available from the Foundation.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the project director in charge of the institute. The deadline for receipt of applications is established by each local project director.

Participants are selected by the institutions involved, not by the Foundation.

Additional Information

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Short Courses for College Teachers

The National Science Foundation awards grants for short courses in science, mathematics, and engineering for college teachers. The courses are under the direction of highly competent research scientists who provide specialized short-term instructional programs (less than four weeks' duration) covering recent advances in selected areas of their scientific fields.

Scheduling of courses is arranged for time periods that are convenient for college teachers, such as early or late summer, or during the academic year.

Within the range $100-$250, each participant may be provided with a weekly stipend equal to one-fortieth of the participant's academic year salary for the year preceding the summer the project will be in operation. Travel allowances are also provided.

Eligibility

Institutions Institutions eligible to apply for grants to support short courses are normally colleges and universities with graduate programs where staffing, laboratories, and libraries are adequate for the advanced nature of the work.

Individuals To be eligible to participate in Short Courses for College Teachers an individual must be a U.S. college teacher of one of the sciences (biological, medical, physical, or social), mathematics, or engineering. Teachers at junior or community colleges or technical schools are eligible.

In addition, individual short courses have established specific academic prerequisites for admission; their brochures should be consulted for details.

Deadlines

Institutions An announcement containing application materials is available in March from the Foundation. The application deadline is June 1. Grants for Short Courses for College Teachers are made in October for the following summer and academic year.

Individuals A list of institutions offering Short Courses for College Teachers is given in the Directory of College Teacher Programs published annually in late November; the directory is available from the Foundation.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the project director in charge of the project. The deadline for receipt of applications is set by the project director. Participants are selected by the institutions involved, not the Foundation.

Additional Information

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Student-Originated Studies

The National Science Foundation awards grants in a competitive program for the support of student-originated studies of environmental problems. The program seeks to advance two basic objectives: (1) to encourage serious students of science to express in productive ways their growing concern for the environmental well-being of the Nation; and (2) to provide support for groups of college and university students who can demonstrate their readiness to assume increasing responsibility for their own educational development.

Projects must: (a) meet standards of intellectual rigor, replicability, and—to a reasonable degree—originality; (b) be organized around a single problem or group of logically related problems concerned with the quality of the environment (natural or social); (c) be interdisciplinary in nature; and (d) be student-originated and student-directed.

Eligibility

Institutions Groups of science students in four-year colleges and universities are eligible to apply for Student-Originated Studies (SOS) grants. Guidelines are being kept as brief and straightforward as possible to permit maximum diversity and flexibility in the projects proposed. A group of students wishing to ally themselves for a summer's work of 10 to 12 weeks must submit a proposal describing the project they envision.

Each project must name a Student Project Director and a (faculty) Project Advisor. Physical facilities and fiscal services must be provided by a college or university that agrees to accept the grant on behalf of the student group and to serve as its host. Both undergraduate and graduate students may participate in SOS projects. Participants may be drawn exclusively from the student body of the host institution, but inclusion of students from other institutions is strongly encouraged.

Individuals Students not affiliated with a group applying for SOS support may be accepted for one of the projects supported by the Foundation. A list of the projects that will operate each summer will be mailed to individual inquirers in March. Such individuals must then apply to the Student Project Director of the activity in which they are interested to ascertain what vacancies are available; learn what talents, qualities, or prerequisites are required by the project; secure application materials, and the like. Individual participants will be selected by local project officials—not by the National Science Foundation.

Deadlines

The date for receipt of applications is in late October; the grant award date is in late February.

Additional Information

A Student-Originated Studies announcement containing application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Undergraduate Research Participation

The National Science Foundation awards grants that provide undergraduate students with research or independent study opportunities under the guidance of competent research directors.

Undergraduate Research Participation grants are awarded for full-time projects of at least ten weeks' duration. Part-time academic year projects are no longer supported.

Full-time undergraduate research participants may receive stipends at a rate not to exceed $80 per week, up to a maximum of 12 weeks.

Eligibility

Institutions Organizations eligible to apply for an Undergraduate Research Participation grant are four-year colleges, universities, and nonprofit research institutions.

Individuals To be eligible to participate in an Undergraduate Research Participation project an individual must be a full-time undergraduate student and be well-grounded in science. A student may apply for full-time projects at institutions other than the one he attends, and for projects in disciplines other than his major field.

Since each research participation project establishes specific academic prerequisites for student admission, the appropriate project director should be consulted for details.

Deadlines

Institutions An Undergraduate Research Participation announcement containing application materials is available in late May from the Foundation. The date for receipt of applications is in early September; the grant award date is in late December.

Individuals A list of institutions conducting undergraduate research participation projects is available from the Foundation in February for the following summer.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the project director. Application deadlines are set by the project director. Participants are selected by the institutions involved, not the Foundation.

Additional Information

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Technical Education Development Program

The National Science Foundation awards grants to assist in expansion and improvement of post-secondary technician education programs in the United States. Grants are made in two major categories of activity:

(1) Support to technical and professional organizations, institutions, or ad hoc groups of competent technicians and scientists, to assist in the development and testing of new instructional patterns and curricula that will enable technical education programs to keep pace with the changing needs of the industrial-scientific complex.

(2) A pilot program of institutional support for coherent technician education program development and implementation, via a limited number of grants to institutions offering formal curriculums for technician training, which will serve to establish criteria and guidelines and provide models for broader development in technician-training institutions throughout the Nation.

Eligibility

The institutional support program is open to all nonprofit (2-year or 4-year) institutions offering programs for the training of individuals who will become a part of the corps of backup personnel directly supporting the work of scientists and engineers.

Support of such programs in proprietary schools or other for-profit institutions will be considered, where such organizations have special capabilities.

Individual institution support for technician education program development and implementation is restricted, until further notice, to those programs providing technical backup for physical scientists and engineers. Support to technical or professional organizations, etc., for curriculum materials development is not restricted to physical science and engineering.

Deadlines

Proposals may be submitted at any time; processing requires approximately six months.

Additional Information

An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Pre-Service Teacher Education Program

The National Science Foundation awards grants to improve programs for the preparation of prospective pre-college science teachers, by emphasizing both increased knowledge of the subject matter and greater skill in organizing and presenting course materials. The objectives of the program are to develop the type of curricular change at colleges which will increase the scientific competence of graduates and at the same time provide the pedagogical preparation essential to their performance as teachers of science.

Projects under the Pre-Service Teacher Education Program (PSTEP) may include any activity or combination of activities calculated to improve the preparation of undergraduate students for careers as elementary or secondary school science teachers. A proposal should show that both education and science departments will be jointly involved in producing graduates who are thoroughly prepared both substantively and pedagogically to become science teachers.

Experience has shown that the problems of science teacher education are multifaceted, and that all the facets are more likely to be considered if the design and execution of improvement projects includes representatives of all the groups that will be affected. Projects already underway include many of the following activities: recruitment that informs students and strengthens communication with their teachers; teaching science and education courses through the use of instructional methods that derive from the subject being taught; providing a diversity of teaching and other classroom experience before the required student teaching; developing strong collaboration of college faculty and supervising teachers; including in the undergraduate preparation a thorough grounding in the more modern elementary and secondary courses and curricula; maintaining close liaison with new graduates and their administrative superiors; supporting pre-service and in-service teachers by assembling materials and advisors for continuing self-renewal and professional growth.

Eligibility

Institutions eligible to submit proposals under PSTEP are four-year colleges and universities that have, or are actively planning, elementary or secondary school teacher education programs in the sciences. Proposals may also be submitted by existing or ad hoc consortia of institutions. A brochure containing suggestions for submission of proposals is available from the Foundation. It is suggested that the proposed project first be described in a preliminary proposal with sufficient detail to permit the Foundation to determine whether a formal proposal should be submitted.

Deadlines

Proposals may be submitted at any time; processing requires six to nine months. For projects with a June or September starting date, three copies of the preliminary proposal should be received in the Foundation the preceding November.

Additional Information

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

College Science Improvement Program A: Individual Institutional Projects in 4-Year Colleges

The primary purposes of Program A (COSIP) are to accelerate development of the science capabilities of predominantly undergraduate institutions and to enhance their capacity for continuing self-renewal. In order to improve the full range of undergraduate education in the sciences and to expand opportunities for undergraduates to become interested in scientific careers as scientists or as science teachers at the elementary, secondary or college level, or to develop the kind of understanding of science and its interactions with society that must be characteristic of educated nonscientists, COSIP aims to have beneficial effects on professors and students, subject matter and methods of instruction, curricula and individual courses, facilities, equipment, and teaching materials. A proposal will be expected to present a coherent and realistic plan for improving science activities at the undergraduate level.

No specific prescription for an improvement plan will be formulated by the National Science Foundation. The individual means adopted by institutions should vary. Each institution will be expected to develop plans that are built upon its present strengths and oriented toward eliminating its present weaknesses. Creative and original approaches holding greater promise than the following of standard practice will be looked upon with favor. Such creative approaches may certainly include those which promise to effect improvement in the economy of instruction.

The maximum duration of a grant is three years; grants will generally not exceed an average of $100,000 per year. Only one proposal from an institution will be considered at any one time.

Eligibility

Both new and established institutions are eligible for support.

1. **New institutions.** Eligibility begins one calendar year prior to the institution's formal initiation of classes for its first group of matriculated students.

2. **Established institutions.** Colleges and universities that have strong baccalaureate programs in the sciences, and that did not grant more than 10 Ph.D. degrees in the sciences during the academic years 1961-62 to 1963-64 inclusive, are eligible for grants. Preference is given to institutions awarding 100 or more science baccalaureates in the most recent three-year period for which data are available.

Deadlines

Proposals may be submitted at any time; processing requires approximately six to nine months.

Additional Information

An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Those institutions (or consortia of institutions) which find that their long-range planning logically involves coordinated implementation of improvements in the humanities as well as the sciences should consider the possibility of simultaneous or joint proposals to the Foundation and the National Endowment for the Humanities. For further information on the Endowment's activities in this regard, contact: Division of Education Programs, National Endowment for the Humanities, 806 15th Street, N.W., Washington, D. C. 20506. Institutions contemplating joint or simultaneous proposals to these two agencies should discuss their plans with the appropriate program staffs before developing a proposal.

College Science Improvement Program B: Interinstitutional Projects in 4-Year Colleges

The primary purposes of Program B, as in Program A, are to accelerate development of the science capabilities of predominantly undergraduate institutions and to enhance their capacity for continuing self-renewal. In order to improve the full range of undergraduate education in the sciences and to expand opportunities for undergraduates to become interested in scientific careers as scientists or as science teachers at the elementary, secondary or college level, or to develop the kind of understanding of science and its interactions with society that must be characteristic of educated nonscientists, this program aims to have beneficial effects on professors and students, subject matter and methods of instruction, curricula and individual courses, facilities, equipment, and teaching materials. A proposal will be expected to present a coherent and realistic plan for improving science activities at the undergraduate level.

This program is intended for projects that are, for academic and/or economic reasons, clearly more appropriately carried out by a group of institutions acting together than by an individual institution acting alone.

The maximum duration of a grant is three years; grants will generally not exceed an average of $100,000 per year.

Eligibility

Formal and ad hoc associations or consortia of four-year colleges and universities are eligible to submit proposals for interinstitutional projects.

Institutions eligible to participate as a member of a group are four-year colleges and universities with baccalaureate programs in the sciences that have not granted more than 10 Ph.D. degrees in the sciences during academic years 1961-62 to 1963-64 inclusive. However, a university that has exceeded that number may serve as advisor to a group of eligible institutions.

Deadlines

Proposals may be submitted at any time; processing requires approximately six to nine months.

Additional Information

An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Those institutions (or consortia of institutions) which find that their long-range planning logically involves coordinated implementation of improvements in the humanities as well as the sciences should consider the possibility of simultaneous or joint proposals to the Foundation and the National Endowment for the Humanities. For further information on the Endowment's activities in this regard, contact: Division of Education Programs, National Endowment for the Humanities, 806 15th Street, N.W., Washington, D. C. 20506. Institutions contemplating joint or simultaneous proposals to these two agencies should discuss their plans with the appropriate program staffs before developing a proposal.

College Science Improvement Program C: Cooperative Projects for 2-Year Colleges

The National Science Foundation awards grants to accelerate development of the science, mathematics, and engineering capabilities in regional groupings of two-year colleges. Proposals should contain a coherent and realistic plan for improving the preparation of college students for careers in science or science teaching. A consortium of two-year institutions is to participate with a nearby college or university to accelerate faculty development and related course content improvement. Ordinarily each proposal is to deal with a single science discipline, and any one department in a given two-year college may not be involved concurrently with the Foundation's support in more than one cooperative project. Grants are limited to a duration of three years, and ordinarily are made in support of a plan whereby one or two teachers from each two-year college meet with colleagues to improve the subject-matter coverage and currency of their courses.

Eligibility

The cooperative four-year institution preferably is one that grants the master's degree or Ph.D. in the appropriate science field. It serves as the grantee institution and contributes leadership to the project. Two-year colleges eligible to participate are those that offer college-parallel courses in science for transfer credit.

Deadlines

Deadline for submission of proposals under the Cooperative Projects for Two-Year Colleges is mid-October; awards are announced in mid-January.

Additional Information

An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

College Science Improvement Program D: Projects for Historically Black Colleges

The primary purposes of the program are to accelerate development of the undergraduate science capabilities of historically or traditionally Negro institutions and to enhance their capacity for continuing self-renewal. In order to improve the full range of undergraduate education in the sciences and to expand opportunities for undergraduates to become interested in scientific careers as scientists, or as science teachers at the elementary, secondary or college level, or to develop the kind of understanding of science and its interactions with society that must be characteristic of educated nonscientists, COSIP aims to have beneficial effects on professors and students, subject matter and methods of instruction, curricula and individual courses, facilities, equipment, and teaching materials. A proposal will be expected to present a coherent and realistic plan for improving science activities at the undergraduate level. Two types of projects, one for individual institutions and one for groups of institutions are supported.

Individual Institutional Projects. No specific prescription for an improvement plan will be formulated by the National Science Foundation. The individual means adopted by institutions should vary. Each institution will be expected to develop plans that are built upon its present strengths and oriented toward eliminating its present weaknesses. Creative and original approaches holding greater promise than the following of standard practice will be looked upon with favor.

The maximum duration of a grant is three years; only in exceptional circumstances will requests for over $300,000 be considered. For a project of shorter duration the limit will be proportionately reduced. Not more than two separate proposals for an individual institutional project will be considered at any one time.

Eligibility

This program is open to all science baccalaureate-granting historically or traditionally Black Colleges and Universities in the United States.

Deadlines

Proposals may be submitted at any time; processing requires approximately six to nine months.

Interinstitutional projects. In cases where two or more institutions consider it advantageous to launch a cooperative attack upon common problems, COSIP will entertain proposals prepared jointly by members of ad hoc or formal consortia of baccalaureate-granting institutions. Support may be requested for a period of up to three years. Interinstitutional projects must clearly be more advantageously carried out by a group of institutions than by each institution acting alone.

Eligibility

An institution is eligible to participate in an Interinstitutional Project even though it is active in other consortia supported by this program (within the limits given below) and/or has an Individual Institutional Project proposal pending or grant in force. A single department may not, however, participate in more than one interinstitutional project, and a single institution may not participate in more than three such projects.

Deadlines

Proposals may be submitted at any time; processing requires approximately six to nine months.

Additional Information

An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Visiting Scientists (Colleges)

The National Science Foundation awards grants to provide for visits of productive and creative scientists to colleges and small universities for two to three days to give lectures; hold seminars; confer with students, administrators, and instructors; and to aid in other ways in motivating students toward the pursuit of careers in science and teaching science. The program is directed primarily to those colleges and universities in which educational opportunities are more limited than in larger or more amply equipped institutions.

Eligibility

Organizations Organizations eligible to submit proposals for the Visiting Scientists (Colleges) program are national scientific and professional societies in the sciences (biological, physical, and social), engineering, and mathematics.

Institutions Institutions eligible to obtain visits by visiting scientists are junior colleges, technical schools, four-year colleges, and universities.

A list of organizations that have received grants under the Visiting Scientists (Colleges) program is available from the Foundation. Institutions wishing to apply for visits by scientists should make their requests through the project director of the appropriate organization holding a Foundation grant under this program. Visits are arranged by the organization, not by the Foundation.

Deadlines

The deadline for submission of proposals by organizations is early October; grants are awarded in March for the following academic year.

Grants are **not** made to colleges and universities to establish Visiting Scientist programs.

Additional Information

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Undergraduate Science Course Improvement

The National Science Foundation awards grants for projects to improve science education, course content and curricula in the biological, engineering, mathematical, physical, and social sciences, in the history and philosophy of science, and in interdisciplinary approaches to the above areas.

Only projects which promise significant improvement in undergraduate science education on a national level will be supported. Local projects cannot be supported unless their novelty and implications as a model are exceptional.

Projects which have received support have generally fallen into one of the following categories: (1) development of course segments dealing with new approaches to subject matter that may involve written materials, film, television, laboratory experiments and equipment, or programmed materials; (2) development of complete model courses or course sequences, using many types of learning and teaching aids; (3) small-scale experimental projects, typically limited in subject matter, scope and academic level, whose primary purpose is to investigate and develop innovative approaches to science teaching; (4) committee and conference studies designed to identify problems in a given field and to formulate guidelines for the evaluation of modern instructional programs; and (5) planning and coordination projects designed to develop basic guidelines for course improvement, to stimulate the initiation of appropriate projects, to correlate independent developmental projects, and to facilitate wide dissemination of the results of such efforts.

Prospective proposers are encouraged to describe their projects in a preliminary document in sufficient detail so that the Foundation can determine whether a formal proposal can be considered. This document should discuss the rationale, the personnel, the amount and nature of support requested, the expected outcome, as well as plans for the evaluation and for the dissemination of the ideas and materials produced.

Eligibility

Institutions eligible to submit proposals for Undergraduate Science Course Improvement are colleges, universities, and other nonprofit institutions and organizations.

Deadlines

Proposals may be submitted at any time. Processing of formal proposals requires approximately six months.

Additional Information

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Undergraduate Instructional Scientific Equipment

The National Science Foundation awards grants to assist institutions of higher education to significantly improve science curricula at the undergraduate level by providing funds to purchase instructional equipment needed to implement the improvement. Not more than 50 percent of the cost of the equipment will be funded by the Foundation, and the institution's matching funds must be derived from non-Federal sources.

Eligibility

Institutions eligible to submit proposals for Undergraduate Instructional Scientific Equipment are junior colleges, colleges, and universities.

Deadlines

An announcement containing application materials is available in October from the Foundation. The closing date for receipt of applications is in late January; the award date is mid-May.

Additional Information

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D. C. 20550.

Academic Year Institutes for Secondary School Teachers

The National Science Foundation awards grants for institutes conducted full time during the school year to provide specially designed science or mathematics programs for secondary school teachers or supervisors for the purpose of improving the science and mathematics programs of their schools. Some institutes include an additional related summer program to enable selected participants to complete the requirements for an advanced degree.

Academic year institutes are available for teachers or supervisors interested in concentrating on a single discipline or studying several related disciplines, and teachers seeking specific educational objectives, such as science supervision.

For experienced teachers a maximum stipend of $4,000 is paid for the period September 1 to June 30. Dependency and travel allowances are also provided.

Eligibility

Institutions Institutions eligible to apply for grants to conduct Academic Year Institutes for Secondary School Teachers are colleges and universities which offer appropriate graduate-level work.

Individuals To be eligible for stipend support in an Academic Year Institute for Secondary School Teachers an individual: (1) must be presently employed as a teacher or supervisor of science or mathematics in grades 7-12 with at least five years of teaching experience; (2) must ordinarily have received a bachelor's degree; and (3) must not, except in a few specified cases, have attended a previous NSF-supported academic year institute, two or more summers of a sequential program in summer institutes leading to an advanced degree, or any three summer institutes during the five years preceding the academic year in question. Teachers not meeting all of the above requirements may participate in some of the projects on a tuition-and-fees only basis.

In addition, individual institutes establish specific academic prerequisites for admission; their brochures should be consulted for details.

Deadlines

Institutions An academic year institute announcement containing grant application materials is available in mid-March from the Foundation. The deadline for receipt of proposals is June 1. Grants are made in mid-September for the following academic year.

Individuals A directory of institutions offering academic year institutes is available in October for the following academic year from the Foundation.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the appropriate institute director. Completed application forms must be mailed no later than January 20; successful applicants will be notified of awards by February 15. Participants are selected by the institutions involved, not the Foundation.

Additional Information

Communications should be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D. C. 20550.

Summer Institutes and Short Courses for Secondary School Teachers

The National Science Foundation awards grants in support of institutes and short courses which during the summer months provide opportunities for the supplementary training of secondary school science and mathematics teachers, for the purpose of improving the science and mathematics programs in their schools.

Toward this purpose, a typical summer institute offers one or more of the following: subject-matter study aimed at specific needs of teachers and schools, knowledge of new curriculum materials and teaching methods, assistance to teachers in developing materials adapted to their own locales, development of leadership and supervisory capability. Most of these institutes offer a single summer of study. About one-third are sequential institutes involving a planned program of study for the same participants for several summers.

Short courses are specialized in nature, and of short duration, usually one to four weeks.

Summer institute participants may receive a maximum stipend of $100 per week, plus dependency and travel allowances. Short-course participants receive an allowance toward the costs of room, board, and travel. Participants in institutes or short courses are exempt from the payment of tuition or academic fees.

Eligibility

Institutions Institutions eligible to apply for summer institute or short-course grants are colleges and universities which grant at least a baccalaureate-level degree, and appropriate nonprofit organizations.

Individuals To be eligible to attend a Summer Institute or Short Course for Secondary School Teachers, an individual must be currently employed as a teacher or a science or mathematics supervisor at the secondary school level, grades 7-12. A teacher must be employed at least half-time and must teach at least one full course in natural science or mathematics, or must teach substantial amounts of social science in at least one secondary school course.

Priority among applicants to a summer institute—except for qualified returnees in a sequential institute—is given to individuals who have not previously received stipends in summer or academic year institutes and who provide evidence that their participation will assist their schools in improving the schools' science and mathematics programs. Preference is given to individuals who have taught for at least three years.

In addition, individual institutes establish specific academic prerequisites for admission; their brochures should be consulted for details.

Deadlines

Institutions A summer institute announcement containing grant application materials is available in mid-March from the Foundation. The deadline for receipt of proposals is July 1. Grants for summer institutes are awarded in November for the following summer. Proposals for short courses should be submitted by October 1, except in unusual circumstances.

Individuals A directory of institutions offering summer institutes and short courses for the following summer is available in January from the Foundation. Individuals wishing to apply for admission should request brochures, application forms, and other information from the appropriate institute director. Completed application forms must be mailed no later than March 1. Participants are selected by the institutions involved, not the Foundation.

Additional Information

Communications should be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D. C. 20550.

In-Service Institutes for Secondary School Teachers

The National Science Foundation awards grants that provide supplemental science or mathematics instruction for secondary school teachers or supervisors for the purpose of improving the science and mathematics programs of their schools. The times during which instruction is offered in these projects is so chosen that teachers may participate in a program of study without interference with their classroom duties.

Although many in-service institutes meet once a week for periods of two to four hours for a full academic year, others are held in vacation periods or irregularly, as they are not restricted to a particular schedule format. These institutes enable teachers to obtain additional knowledge of subject matter and/or to become acquainted with important new textual and laboratory materials developed by a number of course content study groups.

There are no tuition and fees charged for participating teachers. A book purchase allowance and a travel allowance for commuting expenses are provided.

Eligibility

Institutions Organizations eligible to apply for grants to support In-Service Institutes for Secondary School Teachers are universities and colleges that grant at least a baccalaureate-level degree and other appropriate nonprofit organizations.

Individuals To be eligible to attend an In-Service Institute for Secondary School Teachers an individual must be a supervisor or teacher of science or mathematics in grades 7-12. In addition, individual institutes establish specific academic prerequisites for admission; their brochures should be consulted for details.

Deadlines

Institutions An in-service institute announcement containing grant application materials is available in early September from the Foundation. The deadline for receipt of proposals is in early November; grants are awarded in March for the following academic year.

Individuals A directory of institutions offering in-service institutes is available in April for the following academic year from the Foundation. Individuals wishing to apply for admission should request brochures, application forms, and other information from the appropriate institute director. The deadline for receipt of applications is established by each institute director and is given in the specific institute brochure. Participants are selected by the institutions involved, not the Foundation.

Additional Information

Communications should be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D. C. 20550.

Cooperative College-School Science Program

The National Science Foundation awards grants that enable school systems and nearby colleges or universities to work cooperatively to bring about significant improvements in science (includes social science) or mathematics programs of school systems. Projects may focus on elementary or secondary school programs.

Projects are expected to reflect the needs and plans of the cooperating school systems. They may be designed to strengthen current courses of study, to adapt new materials to local use, to prepare teachers in subject matter relevant to the school system's instructional needs, or to accomplish a combination of activities.

Projects may provide for the training of key staff members of the school systems in the summer and follow-up activities during the school year when the strengthened or new programs are implemented. Orientation activities may take place in the spring preceding the summer phase.

Eligibility

Institutions Institutions eligible to submit proposals to the Cooperative College-School Science Program are universities, colleges and other appropriate nonprofit organizations. Grants are not made directly to elementary or secondary school systems, but close collaboration between school systems and the grantee institution in designing the proposal and carrying out the project is essential.

Individuals To be eligible for participation in a project, a teacher must be employed by the collaborating school system. Selection of participants is made jointly by the cooperating institution and the local school system.

Deadlines

Institutions An announcement containing grant application materials is available in April from the Foundation. The deadline for receipt of proposals is in mid-August; grants are awarded in December for the following spring, summer, or academic year.

Individuals Announcements of grants and qualifications for participants are made locally and disseminated to eligible teachers.

Additional Information

Communications should be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D. C. 20550.

Pre-College Curriculum and Instruction Development Program

The National Science Foundation awards grants that assist scientists and engineers working with educators to carry out projects for the improvement of education in the sciences (including social science), mathematics and engineering for the educational levels from kindergarten through the twelfth grade. High priority will be given to projects designed for a broad ability range of students in the elementary and secondary schools, and to the development of courses and units which relate science and technology to environmental and societal problems. Examples of projects that have received support are: (1) committee and conference studies designed to identify problems in a given field and to formulate guidelines for the evolution of modern instructional programs; (2) planning and coordination projects designed to develop basic guidelines for course improvement, to stimulate the initiation of appropriate projects, to correlate independent developmental projects, and to facilitate wide dissemination of the results of such efforts; (3) projects whose studies of the learning process can be expected to be useful to other study groups in developing improved curriculum materials; (4) small-scale experimental projects, typically limited in subject-matter scope and academic level, whose primary purpose is the investigation of innovative approaches to science teaching; (5) projects for the development of course segments dealing with new approaches to subject-matter presentations through written materials, film, television, laboratory experiments and equipment, or programmed approaches; (6) projects to develop complete model courses or course sequences, using many types of learning and teaching aids; (7) projects to develop models of outside-the-classroom instruction or other modes of instruction which approach in a realistic way the needs of nonacademically oriented students; (8) projects designed to study the educational system with particular reference of the application of scientific principles to educational processes; (9) evaluation projects designed to provide a record of the diffusion and implementation process for new course materials and to indicate more effective means for diffusion and implementation of the new course materials; and (10) projects to develop leadership qualities and strengthen the backgrounds in science curricula of resource people who are then able to assist local school systems which choose to implement these new courses.

Eligibility

Institutions eligible to submit proposals for Pre-College Course Content Improvement projects are colleges and universities and other appropriate nonprofit organizations. Elementary and secondary schools, school systems, and State departments of education are normally excluded as grantees, although the involvement of schools and teachers in all phases of the development of materials is essential.

Deadlines

Proposals for projects falling under category (10) have an early fall deadline. Proposals for projects under other categories may be submitted at any time. Prospective proposers are encouraged to describe their projects in a preliminary document so that the Foundation can determine whether a formal proposal can be considered.

Additional Information

Communications may be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D.C. 20550.

Student Science Training Program (Pre-College)

The National Science Foundation awards grants that provide advanced educational opportunities for superior secondary school students. These activities, usually conducted at the grantee institution, encourage student participation in either scientific research or special course work.

Training is usually offered during the summer in sessions of at least five weeks' duration, although academic year projects may also be supported. Research participation projects afford the student the opportunity to work with experienced scientific investigators and to obtain firsthand knowledge of research methods and techniques. Course-oriented projects present subject matter at a level more advanced than can be expected in high school.

Costs of instruction are paid by the Foundation; the student is expected to pay his own expenses for room, board, and travel. Financial assistance is available for students who otherwise would be unable to attend.

Eligibility

Institutions Institutions eligible to apply for grants under the Student Science Training Program (Pre-College) are universities and colleges which grant at least a baccalaureate-level degree, and other appropriate nonprofit organizations.

Individuals To be eligible to participate in a student science training project an individual must be a high-ability secondary school student, as evidenced by school records. Summer projects are open only to students who will be completing their junior year (11th grade) at the time of application. Academic year projects are open to students from the 10th, 11th, and 12th grades.

In addition, individual projects establish specific academic and other prerequisites for admission; their brochures should be consulted for details.

Deadlines

Institutions An announcement containing grant application materials is available in April from the Foundation. The deadline for receipt of proposals is late August. Grants are awarded in December for the following summer and academic year.

Individuals A directory of institutions offering science training programs for high-ability secondary school students is available in January for the following summer from the Foundation.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the appropriate project director. The deadline for receipt of application forms is established by the project director and usually falls between March 1 and April 1 for summer projects. Participants are selected by the institutions involved, not the Foundation.

Additional Information

Communications may be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D. C. 20550.

VII. COMPUTING ACTIVITIES IN EDUCATION AND RESEARCH

The Office of Computing Activities (OCA) was established in the Foundation in July 1967, to provide Federal leadership in exploring and developing the uses of the computer in education and research. OCA administers programs directed at supporting basic research in computer science and engineering; the development of advanced computer-based research techniques, systems and resources; and the exploration and development of innovative uses of the computer in the educational process.

OCA is a component of the Directorate of National and International Programs.

Computer Science and Engineering Programs

The National Science Foundation awards grants to support research in the computer science and engineering areas. The primary objective is to stimulate the creation of the scientific base of computer development.

The areas of research supported through the three programs within Computer Science and Engineering are indicated below. Projects may contain elements considered within several programs or deal with topics not explicitly mentioned here. The primary focus of the research will determine which program will consider the proposal.

Theoretical Computer Science Program—This program supports basic research in the theory of computation, numerical analysis and computational mathematics, theory of formal languages, intelligent systems, and other topics concerned with the theoretical foundations of computer science.

Software and Programming Systems Program—Awards in this program support basic and applied research on software and systems of programs including operating systems, computer languages and their processors, information structures and file management, man-machine interaction, graphics, and the study of algorithms.

Computer Systems Design Program—Grants for basic and applied research focusing on the development of principles of computer systems design include computer system architecture, computer system performance, major subsystems, and logic design.

Eligibility

Guidelines on eligibility and proposal preparation and other helpful suggestions are contained in the NSF pamphlets, **Grants for Computing Activities** (NSF 71-4), and **Grants for Scientific Research** (NSF 69-23), which may be obtained from the Foundation.

Deadlines

Proposals may be submitted at any time.

Additional Information

Communications may be addressed to: Office of Computing Activities, National Science Foundation, Washington, D. C. 20550.

Computer Innovation in Education Programs

The National Science Foundation awards grants to support the exploration and development of innovative uses of the computer in education. The objectives of support through these programs include (1) the exploration and development of computer technology and techniques of potential application to education; (2) the exploration, development, and evaluation of computer-oriented instructional concepts and curricular materials; and (3) the exploration and development of various models for the dissemination of computer-based concepts, curricular materials, programs, and techniques.

Computer Technology and Systems Program—Awards in this program support research in computer technology and techniques applicable to education, and projects focused on the testing and evaluation of special systems.

Computer-Oriented Curricular Activities Program—This program supports projects aimed at (1) the development, test, and evaluation of curricular materials in selected disciplines to support new, innovative uses of computing in instruction; (2) the development, test, and evaluation of new instructional concepts related to computer-based education; and (3) the development of mechanisms to disseminate and facilitate the widespread use of such materials and concepts.

Regional Cooperative Computing Activities Program—Grants awarded under this program support projects which will assist institutions of higher education in the establishment of cooperative arrangements directed at exploring the application of computer techniques and networks in the education process.

Grants are awarded on a competitive basis to consortia of institutions which typically include a major university, or equivalent, and a number of participating institutions in proximity to each other. Other designs, including State-wide educational computing networks, are acceptable. Institutional support at a level adequate to be self-sustaining following an award is a criterion in the consideration of proposals.

The program provides support for cooperative teacher-training programs designed to introduce and raise the level of sophistication in computer-use technology and provide training in the development of discipline-oriented instructional computer applications. In support of the training activities, the program includes partial support for remote computer service supplied to each participating institution. A provision to facilitate the transfer and dissemination of information and materials developed should be part of the cooperative plan.

Eligibility

Guidelines on eligibility and proposal preparation and other helpful suggestions are contained in the NSF pamphlets, **Grants for Computing Activities** (NSF 71-4), **Grants for Scientific Research** (NSF 69-23), **Grants for Education in Science** (NSF 69-19), and **Regional Cooperative Computing Activities Program** (NSF 70-36), which may be obtained from the Foundation.

Deadlines

Proposals may be submitted at any time during the year.

Additional Information

Communications may be addressed to: Office of Computing Activities, National Science Foundation, Washington, D. C. 20550.

Computer Applications in Research Programs

The National Science Foundation awards grants to support research in advanced computational technology. The potential usefulness of computers in research has increased markedly with advances in technology which (1) make possible a high degree of interaction between the researcher and the computer; (2) enable computers to be accessed by a variety of remotely located terminals; and (3) permit computers to be used on-line in complex experimental research activities. Projects in Computer Applications in Research focus on the exploitation of these and other advances in computer technology in the development of new applications of computers in research.

Special Research Resources Program—NSF awards in this program include support of the development of major research centers and resources in computational technology in disciplinary, interdisciplinary, and functionally oriented research areas. While projects will be considered that involve cooperative efforts of scientists at a single institution, projects for exploring, planning, and implementing activities which will have a strong national impact are encouraged.

Techniques and Systems Program—Proposals which seek to apply advanced computational techniques and systems to specific research projects and activities are examined critically in this program to assess the contribution of the proposed work to the specific discipline and to the existing body of computer-based techniques and systems.

Eligibility

Guidelines on eligibility and proposal preparation and other helpful suggestions are contained in the NSF pamphlets, **Grants for Computing Activities** (NSF 71-4), and **Grants for Scientific Research** (NSF 69-23), which may be obtained from the Foundation.

Deadlines

There are no deadlines for proposals submitted to these programs.

Additional Information

Communications may be addressed to: Office of Computing Activities, National Science Foundation, Washington, D. C. 20550.

VIII. SPECIAL PROGRAMS

Institutional Grants for Science Program

The National Science Foundation awards grants for broad institutional use to colleges and universities, based on Federal research awards from any one of the Federal departments or agencies reporting obligations to the Committee on Academic Science and Engineering. These are flexible funds for use at the discretion of the institution to strengthen and balance science programs of research and education. The funds may not be used for indirect costs.

The grants are computed by a graduated formula based on Federal Research Awards received by the institution during the previous fiscal year. More than 600 institutions participate annually in the Institutional Grants for Science Program.

Eligibility

Institutions eligible to apply for grants under the Institutional Grants for Science Program are colleges and universities receiving research awards, excluding those of the Public Health Service, during the previous year (July 1-June 30). Grants made by the Foundation through its programs of Undergraduate Research Participation and Research Participation for College Teachers also establish eligibility for Institutional Grants and are included in the base for their computation.

Deadlines

Announcements are available in May of each year from the address listed below. The application deadline is July 31. Grants are announced in November.

Additional Information

Communications may be addressed to: Institutional Grants for Science Program, National Science Foundation, Washington, D. C. 20550.

This program is administered by the office of the Assistant Director for Institutional Programs.

International Travel Grants

The National Science Foundation awards international travel grants to assist scientists to go abroad for one of the following purposes:

(1) Attending international scientific congresses and meetings;

(2) Obtaining or exchanging information in the areas of basic research, science education, science information or information relating to international scientific programs and associated activities;

(3) Cooperating in international scientific activities.

International travel is defined as all travel outside the United States and its possessions, except Canada and Puerto Rico.

NSF each year selects certain meetings, in areas of particular interest to the Foundation, for which participant support may be granted.

International travel grants made to individuals are based on, and normally limited to, the equivalent cost of jet-economy air transportation from the city where the traveler resides, or is employed, to his destination abroad and return. A per diem may be paid when an individual is traveling as a representative of the U.S. Government. Travel must be by U.S. flag carriers, except in special circumstances.

Eligibility

Requests for international travel grants may be submitted by individual U.S. scientists or by nonprofit organizations (usually professional societies). When a request is submitted by an individual U.S. scientist, NSF form 9-1, Application for International Travel Grant, available from the Foundation, should be used.

Deadlines

Approximately a month is required to process requests, but those for travel to meetings should be submitted well in advance because evaluation of requests normally occurs several months before the meeting date.

Additional Information

Communications may be addressed to the appropriate division or office: Division of Biological and Medical Sciences; Division of Engineering; Division of Environmental Sciences; Division of Mathematical and Physical Sciences; Division of Social Sciences; Office of Science Information Service; Office of International Programs; Office of Computing Activities; Office for the International Decade of Ocean Exporation; Office of Polar Programs; Advanced Science Education Program, Division of Graduate Education in Science; National Science Foundation, Washington, D. C. 20550.

Scientific Conference Grants

The National Science Foundation awards grants to support conferences and symposia that bring together leading scientists who are pioneering in new or incompletely explored fields of science.

The Foundation does not provide support for regular meetings of scientific societies. Support for special conferences should be requested only if regular meetings of professional societies do not provide the necessary forum.

Eligibility

Proposals for support for scientific conferences may be submitted by colleges and universities, nonprofit research institutions, or scientific or professional societies. Concomitant support by several Federal agencies or private organizations is permissible.

Deadlines

Proposals for Scientific Conference Grants may be submitted at any time.

Additional Information

Communications may be addressed to the following divisions or offices as appropriate: Division of Biological and Medical Sciences; Division of Engineering; Division of Environmental Sciences; Division of Mathematical and Physical Sciences; Division of Social Sciences; Office of Computing Activities; Office of Science Information Service; Office for the International Decade of Ocean Exploration; Office of Polar Programs; Office of International Programs; Office of Exploratory Research and Problem Assessment; or Office of Intergovernmental Science Programs; National Science Foundation, Washington, D. C. 20550.

Science Information Service

The National Science Foundation awards grants and contracts to improve the dissemination of scientific information. Foundation support may be provided for the following activities:

(1) Development and improvement of information systems.

(2) Operational support for information systems and services, and the publication of results of original research, including journals and monographs; production and publication of abstracts, indexes, and other bibliographic aids.

(3) Research in science information, including both theoretical and applied aspects.

The Foundation's pamphlets **Improving the Dissemination of Scientific Information** (NSF 69-25) and **Grants for Scientific Research** (NSF 69-23) should be consulted for additional information on scientific information programs and instructions for submission of proposals.

Eligibility

Institutions eligible to submit proposals are professional scientific and technical societies, universities and colleges, and organizations both for profit and not for profit. Organizations that plan to submit proposals are encouraged to discuss their ideas informally with the appropriate staff members before preparing formal proposals.

Deadlines

Proposals may be submitted at any time; approximately three months are required to consider a proposal.

***PLEASE NOTE** The Office of Science Information Service is not organized for the following services:*

***(1)** Provide bibliographic or reference services or perform literature searches.*

***(2)** Furnish copies of publications resulting from research sponsored by NSF or other organizations.*

***(3)** Hire translators or perform translations of any foreign publications.*

Additional Information

Communications may be addressed to: Office of Science Information Service, National Science Foundation, Washington, D. C. 20550.

This program is administered by the office of the Assistant Director for National and International Programs.

Special Foreign Currency Program

The National Science Foundation awards grants to support scientific activities overseas which will incur costs payable in the currencies of Burma, Guinea, India, Morocco, Pakistan, Poland, Tunisia, the United Arab Republic (Egypt), or Yugoslavia. These activities are comprised of two categories: research, science education, and related activities; and science information activities. They utilize foreign currencies which the Treasury Department has determined to be in excess of the normal requirements of the United States.

Research, Science Education, and Related Activities Six classes of activities are included in the program: cooperative research and study; visiting U.S. scientists; scientific resources and services; U.S. research and training; science advancement (joint conferences, meetings, joint studies); and international travel.

The Foundation brochure, **Special Foreign Currency Awards for Research, Science Education, and Related Activities** (NSF 71-10), describes the classes of activities supported and provides other information. This program offers no dollar support, but may include support of the costs of international travel.

Science Information Activities The Foundation negotiates contracts with organizations in the eligible countries (including Israel) for delivery of scientific and technological information to the United States. Contracts cover translation, abstracting, indexing, reviewing, and publication in English of significant foreign scientific literature. The preparation and publication of surveys, directories, guides, and other reference aids on foreign scientific and technical information resources—literature, institutions, scientists—is also undertaken under contract. U.S. planning, coordination, representation, and participation in international organizations and conferences having significant science information programs is supported by grants to U.S. institutions and individuals.

Eligibility

Organizations eligible to submit proposals are nonprofit higher educational institutions, scientific institutes, scientific and technical societies and associations, and similar organizations, both nonprofit and profit-making, chartered or otherwise authorized to conduct business in the United States or in the cooperating country. Scientists affiliated with any of the above organizations may apply for support.

Agreement on the nature and scope of the cooperative project in Research, Science Education, and Related Activities should be reached by the U.S. and foreign principals before submission of their proposals. Proposals should be prepared in accordance with the requirements outlined in the relevant NSF brochures, **Grants for Scientific Research** (NSF 69-23), **Grants for Education in Science** (NSF 69-19), or **Improving the Dissemination of Scientific Information** (NSF 69-25). Consultation or correspondence with the Office of International Programs by prospective U.S. or foreign proposers prior to submission of a proposal is recommended.

Those considering proposing projects in Science Information Activities are encouraged to discuss their ideas informally with the staff of the Office of Science Information Service. Details for the submission of proposals are contained in the Foundation's brochures, **Improving the Dissemination of Scientific Information** and **Grants for Scientific Research.**

Deadlines

Proposals for any activity funded by foreign currency may be submitted at any time. Approximately three months are required to consider a proposal.

Additional Information

Communications may be addressed to: Special Foreign Currency Program, Office of International Programs or Office of Science Information Service, as appropriate, National Science Foundation, Washington, D. C. 20550.

Public Understanding of Science

The National Science Foundation considers one of its important responsibilities to be the development of a greater public understanding of science. In addition to fostering public understanding of science as part of many grant programs, the Foundation has a special program of Public Understanding of Science seeking to bring direct focus and support to this area. Central to the purpose of this program is the enhancement of citizen knowledge and understanding of both the potentials and limitations in the use of science and technology in meeting current and emerging societal problems.

Proposals are encouraged which relate to one of the following programs, within terms of a single or combined focus.

Information Projects on Science—Proposals to be considered under this general support area should facilitate the dissemination of information on science for the general public. Examples of the types of projects which may be eligible for support are: books on science for laymen, special purpose films, science museum exhibits, science forums for laymen, and comparable activities.

A limited number of projects are funded which focus on either increasing the scientific knowledge of news media personnel or promoting the exchange of ideas through seminars and conferences between scientists and laymen on science policy issues of national and regional import.

Training Programs—In cooperation with the Graduate Science Education Division, proposals will be considered which provide advanced, supplementary capabilities to graduate programs with the aim of preparing "science leadership for tomorrow." The purpose here is to develop, at the graduate level, science-related interdisciplinary programs involving the social sciences on one hand, and administration, communications, etc., on the other; and provide focus on increasing the communications skills of students in science, science writing, and communications.

Research-Development Programs — Support will be provided for innovative and interdisciplinary pilot programs which include the testing and evaluation of new approaches in public understanding of science.

Informal proposals may be submitted in the form of a brief memorandum, including a budget outline, prior to the preparation and submission of a formal proposal.

Eligibility

Institutions eligible to submit proposals are colleges, universities and independent, nonprofit organizations.

Deadlines

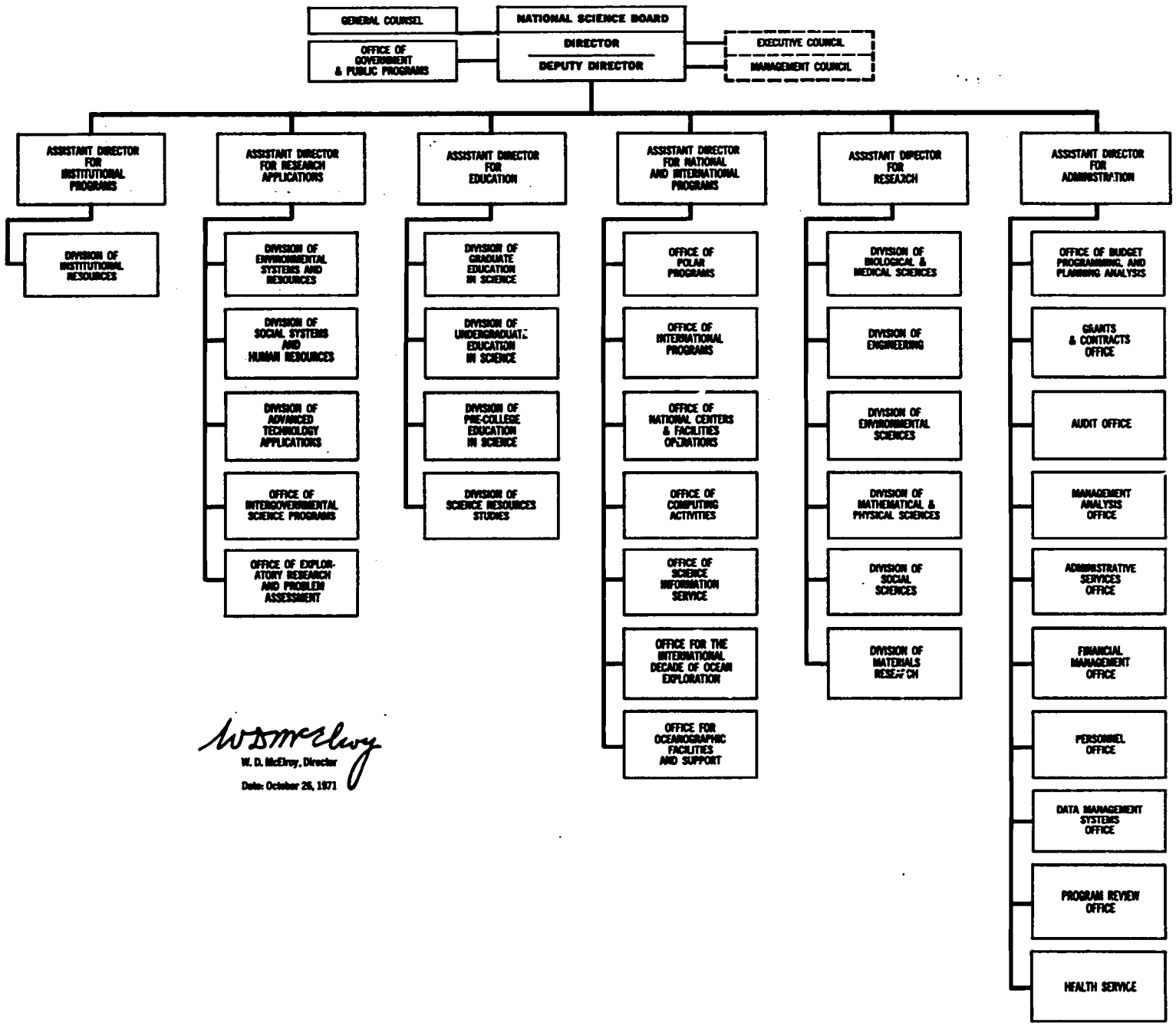
Proposals may be submitted at any time. Processing usually requires at least four months.

Additional Information

The **Public Understanding of Science** brochure (NSF 70-42) describes the process of submitting proposals in more detail. Communications may be addressed to: Office of Public Understanding of Science, National Science Foundation, Washington, D. C. 20550.

This program is administered by the Office of Government and Public Programs.

ORGANIZATION
NATIONAL SCIENCE FOUNDATION



W. D. McElroy, Director

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