

# **ENVIRONMENTAL GEOCHEMISTRY AND BIOGEOCHEMISTRY**

**Research at the Interfaces of  
Geochemistry, Hydrology, Coastal  
Sciences, Atmospheric Sciences,  
Chemistry, Microbial and Molecular  
Biology, Colloid and Transport  
Engineering, and Mathematical Sciences**

---

*Solicitation*

**DIVISION OF EARTH SCIENCES  
DIVISION OF OCEAN SCIENCES  
DIVISION OF ATMOSPHERIC SCIENCES  
DIVISION OF CHEMISTRY  
DIVISION OF CHEMICAL & TRANSPORT SYSTEMS  
DIVISION OF MOLECULAR & CELLULAR  
BIOSCIENCES  
DIVISION OF MATHEMATICAL SCIENCES**

**DEADLINE DATE:** *January 20, 1999*



**NATIONAL SCIENCE FOUNDATION**

## ***Description***

The goal of the Environmental Geochemistry and Biogeochemistry (EGB) activity is to enhance fundamental, interdisciplinary research on chemical processes that determine the behavior and distribution of inorganic and organic materials in environments near the Earth's surface. Of particular importance are projects that characterize chemical parameters in both perturbed and unperturbed natural systems, clarify the chemical and biological processes or behavior observed, or combine observations and interpretations into predictive models.

A central challenge of environmental research is understanding how the physical, chemical, geological, and biological processes that comprise the Earth's natural systems are functionally interrelated. EGB addresses this challenge by supporting studies on the physical-chemical-biological behavior of chemical substances within one environment or by emphasizing research that focuses on a common chemical theme throughout a variety of environments. Environments of interest are soils, ground waters, surface waters, coastal marine and estuarine areas, and portions of the troposphere in contact with these environments.

This research activity encourages integration of critical inquiry from the disciplines of inorganic, organic, bioinorganic, and bioorganic chemistry (reactions in complex environments), geochemistry (characterization and distribution of chemical compounds in natural systems), hydrology (flow and transport), biology (dynamic influences of microbes and other communities), colloid, interfacial, and transport engineering (including generic mechanisms in porous media), and mathematics (analytical, statistical, and computational modeling of complex systems) to address environmental problems. Research projects combining approaches from other chemically-based science or engineering fields of study with these disciplines are also appropriate. This NSF activity ***is not an appropriate venue for research suitable for support in existing NSF disciplinary programs, for research having impact on a single discipline, or for research with epidemiological or toxicological objectives.*** Such proposals should be submitted to existing disciplinary programs in the various divisions. PIs who have questions about the suitability of their proposed research for EGB should contact the appropriate Program Director listed on page 4 of this announcement.

Research supported through this activity will facilitate development of a multi-faceted perspective and predictive understanding of the complex interactions of the geosphere, hydrosphere, biosphere, and atmosphere as they relate to chemical transport.

The results will contribute to the knowledge base used by management and policy decision-makers in planning, development, pollution avoidance, remediation, and restoration activities.

Selected examples of research areas suitable for study under the EGB activity follow:

- interactions of inorganic and organic compounds, colloids, and microbes in natural waters, soils, and sediments, and impacts on processes such as speciation and transport behavior of contaminants and nutrients at the molecular level;
- the integrated effects of physical, chemical, biological, geological, and anthropogenic factors on chemical sorption, transport, and bioavailability in natural waters, soils and sediments;
- trace and major tropospheric gases: role of soils, biota, and coastal waters as receptors and emitters; reservoir size and flux;
- modeling, including mathematical and numerical simulation, that integrates solute/suspension transport and geochemical reactions involving inorganic and organic substances and microorganisms; developing the means for extrapolating chemical observations among different space and time scales (*e.g.*, molecular and laboratory level to field and watershed level);
- interdisciplinary studies of interactions among the geosphere, hydrosphere, biosphere, and atmosphere that elucidate a natural system's response to, and recovery from, chemical perturbations caused by natural phenomena or human activities;
- national or international workshops or conferences on appropriate topics that emphasize interdisciplinary research or future directions for environmental geochemistry and biogeochemistry.

Award lists and abstracts for the FY95, FY96 FY97, and FY98 competitions are available on-line at <http://www.nsf.gov/geo/egch>.

## ***Preparation and Submission of Proposals***

Proposals submitted in response to this solicitation will be accepted from colleges, universities, and other not-for-profit institutions in the U.S. Organizations affiliated with local, state, or federal government units (including FFRDCs) are not considered eligible to submit proposals. Such organizations may, however, request support to participate in research conducted by eligible organizations by means of subcontracts. These subcontracts are intended to cover lab, field and travel expenses, but not salary expenses, and must constitute less than 20% of total requested funding.

Award durations of two to three years will be considered. The total funding requested for each project, for all investigators at all institutions, must not exceed \$550,000. **Proposals for projects that exceed this amount cumulatively will be returned without review.** The number of awards will depend on a variety of factors, including quality of proposals submitted and linkages with other NSF activities and programs. In FY 1999, NSF expects to make awards totaling approximately \$ 4.8 million for this activity, depending on availability of funds.

Proposals must meet all guidelines (except for the length and deadline noted herein) specified in the NSF *Grant Proposal Guide* (GPG), NSF 99-2 and must be prepared in accordance with the *Proposal Forms Kit* NSF 99-3. These guides are available in most university offices of sponsored research. They can also be accessed through the NSF Home Page (<http://www.nsf.gov/>) Single copies are available at no cost from:

NSF Clearinghouse  
P.O. Box 218  
Jessup, MD 20794-018  
TEL: (301) 947-2722, or  
e-mail: [pubs@nsf.gov](mailto:pubs@nsf.gov)

The normal 15-page limit for the project description (including results of prior research) specified in the GPG will be strictly enforced. For group proposals involving three or more PIs/co-PIs the page limitations described in GPG, section II.D.12.b, are superseded by the following: up to 10 pages may be used for the project description plus up to 2 pages per senior investigator for description of progress under prior NSF awards.

Group and collaborative proposals involving more than one institution **MUST** be submitted as a single administrative package from one of the institutions involved. Multiple submissions will not be accepted (these single packages may be split into separate proposals for each institution if the project is

recommended for support). The package should include one project summary, one table of contents, one project description, one section for references, and one copy of special information and appendices as specified in GPG section II.D.10-11. Additionally, the package should include, for each university and its PIs/co-PIs, a signed cover sheet, budget pages and explanation, results from prior NSF support (up to 2 pages per person), biographic sketches (up to 2 pages per person), current and pending support for each PI/co-PI, and facilities and other resources unique to each institution.

All proposals submitted to the Environmental Geochemistry and Biogeochemistry competition must reference this program solicitation (NSF 99-9) on the cover page. Proposals prepared for this solicitation may be submitted as paper copies or by electronic submission. NSF encourages the use of electronic submissions through the FastLane system.

The FastLane system is available through the World Wide Web at the FastLane homepage (<http://www.fastlane.nsf.gov>). To access this system, your institution must be a registered FastLane institution. A list of registered institutions and the registration form are located on the homepage. For questions concerning FastLane, please send an e-mail message to [fastlane@nsf.gov](mailto:fastlane@nsf.gov), or call support services at (703) 306-1142.

For paper submission, twenty stapled copies of each proposal/proposal package, including one copy bearing original signatures from all institutions should be mailed to:

Solicitation No. 99-9  
National Science Foundation  
Room P60 - PPU  
4201 Wilson Boulevard  
Arlington, VA 22230

**All proposals (both paper and electronic) submitted in response to this solicitation MUST be received no later than 5:00 pm EST on January 20, 1999.**

***Submission of Signed Cover Sheets.* For proposals submitted electronically via the NSF FastLane Project, the signed proposal Cover Sheet (NSF Form 1207) should be forwarded to the following address and received by NSF by January 26, 1999:**

National Science Foundation  
DIS-FastLane Cover Sheet  
4201 Wilson Blvd.  
Arlington, VA 22230

A proposal may not be processed until the complete proposal (including signed Cover Sheet) has been received by NSF.

### ***Inquiries:***

For further information about the Environmental Geochemistry and Biogeochemistry research activity, contact Donald Rice (EGB Coordinator), Division of Ocean Sciences, (703) 306-1589, [drice@nsf.gov](mailto:drice@nsf.gov); or Margaret Cavanaugh, Division of Chemistry, (703)306-1842, [mcavanau@nsf.gov](mailto:mcavanau@nsf.gov); L. Douglas James, Division of Earth Sciences, (703) 306-1549, [ldjames@nsf.gov](mailto:ldjames@nsf.gov); Maryellen Cameron, Office of Polar Programs, (703) 306-1030, [mcameron@nsf.gov](mailto:mcameron@nsf.gov); John Foss, Division of Chemical and Transport Systems, (703) 306-1365, [jfoss@nsf.gov](mailto:jfoss@nsf.gov); Anne-Marie Schmoltner, Division of Atmospheric Sciences, (703) 306-1522, [aschmolt@nsf.gov](mailto:aschmolt@nsf.gov); Maggie Werner-Washburne, Division of Molecular and Cellular Biosciences, (703) 306-1440, [mwernerw@nsf.gov](mailto:mwernerw@nsf.gov); or Michael Steuerwalt, Division of Mathematical Sciences, (703) 306-1878, [msteuerw@nsf.gov](mailto:msteuerw@nsf.gov); Thomas Frost, Division of Environmental Biology, (703) 306-1479, [tfrost@nsf.gov](mailto:tfrost@nsf.gov).

### ***Proposal Review:***

#### Merit Review Criteria

Review of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program officers charged with the oversight of the review process. NSF invites the proposer to suggest at the time of submission, the names of appropriate or inappropriate reviewers. Special care is taken to ensure that reviewers have no immediate and obvious conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority serving institutions, adjacent disciplines to that principally addressed in the proposal, etc.

Proposals will be reviewed against the following general merit review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Each reviewer will be asked to address only those that are relevant to the proposal and for which he/she is qualified to make judgments.

#### **What is the intellectual merit of the proposed activity?**

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

#### **What are the broader impacts of the proposed activity?**

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

#### **Integration of Research and Education**

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learner perspectives. PIs should address this issue in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review criteria. NSF staff will give it careful consideration in making funding decisions.

#### **Integrating Diversity into NSF Program, Projects, and Activities**

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports. PIs should address this issue in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review

criteria. NSF staff will give it careful consideration in making funding decisions.

In addition to these criteria, proposals will be evaluated for the potential interdisciplinary synergism among the various research components. It is anticipated that each review panel will have expertise in the fields of chemistry, geochemistry, atmospheric chemistry, hydrology, oceanography, microbiology, engineering and mathematics.

### ***Grant Administration:***

Grants awarded as a result of this solicitation will be administered in accordance with the terms and conditions of NSF GC-1 or FDP, Grant General Conditions. Copies of these documents are available at no cost from the NSF Clearinghouse, phone (301) 947-2722, or via e-mail pubs@nsf.gov (Internet). More comprehensive information is contained in the NSF Grant Policy Manual (NSF 95-26, July 1995), for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, D.C. 20402. The telephone number at GPO is (202) 783-3238 for subscription information. If the submitting institution has never received an NSF award, it is recommended that appropriate administrative officials become familiar with the policies and procedures in the NSF Grant Policy Manual which are applicable to most NSF awards. If a proposal is recommended for an award, the NSF Division of Grants and Agreements will request certain organizational, management, and financial information, including a certification of civil rights compliance. These requirements are described in Chapter V of the NSF Grant Policy Manual. One copy of the Grant Policy Manual will be provided free of charge to any new grantee.

### ***FY 1999 and Beyond***

When it was initiated in FY95, the EGB activity was planned for a five-year duration, after which it would be re-evaluated. NSF plans to re-examine the future of the EGB program and its goals and plans during FY99. Input from the community regarding the program is welcomed. As a result of this review, future EGB special competitions may change somewhat in their nature and emphasis.

### ***Related disciplinary programs:***

NSF disciplinary programs supporting research related to Environmental Geochemistry and Biogeochemistry include:

#### Division of Earth Sciences (703-306-1550)

Geology and Paleontology  
Hydrologic Sciences  
Petrology and Geochemistry

#### Division of Chemistry (703-306-1840)

Analytical and Surface Chemistry  
Environmentally Benign Chemical Synthesis and Processing  
Experimental Physical Chemistry  
Inorganic, Bioinorganic, or Organometallic Chemistry  
Organic Synthesis and Dynamics

#### Division of Molecular and Cellular Biosciences (703-306-1440)

Biomolecular Processes  
Genetics  
Cell Biology  
Biomolecular Structure and Function

#### Division of Environmental Biology (703-306-1480)

Ecological Studies  
Systematic and Population Biology

#### Division of Bioengineering and Environmental Systems (703-306-1320)

Bioengineering  
Environmental and Ocean Systems

#### Division of Chemical and Transport Systems (703-306-1371)

Chemical Reaction Processes  
Fluid, Particulate and Hydraulic Systems  
Interfacial, Transport and Separation Processes

#### Division of Civil and Mechanical Structures (703-306-1360)

Geomechanical, Geotechnical and Geo-Environmental Systems

#### Division of Atmospheric Sciences (703-306-1522)

Atmospheric Chemistry

#### Division of Ocean Sciences (703-306-1580)

Biological Oceanography  
Chemical Oceanography  
Coastal Ocean Processes  
Marine Aspects of Earth System History  
Marine Geology and Geophysics

Division of Mathematical Sciences (703-306-1870)

Applied Mathematics

Computational Mathematics

Statistics and Probability

***Other related programs & activities:***

Arctic Systems Science - Office of Polar Programs (703-306-1045)

Earth System History (703-306-1527)

Long-Term Ecological Research (703-306-1480)

Life in Extreme Environments (703- 306-1551)

NSF/EPA Partnership for Environmental Research (703-306-1365)

Water and Energy: Atmospheric, Vegetative, and Earth Interactions (703-306-1549)

Urban Research Initiative (703-306-1761)

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Grantees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities, and persons with disabilities to compete fully in its programs. In accordance with federal statutes, regulations, and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF (unless otherwise specified in the eligibility requirements for a particular program).

*Facilitation Awards for Scientists and Engineers with Disabilities (FASSED)* provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement or contact the program coordinator at (703) 306-1636.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation regarding NSF programs, employment, or general information. TDD may be accessed at (703) 306-0090 or through FIRS on 1-800-877-8339.

**PRIVACY ACT AND PUBLIC BURDEN STATEMENTS.** The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Reports Clearance Officer; Information Dissemination Branch, DAS; National Science Foundation; Arlington, VA 22230.

Activities described in this publication are in categories 47.076, Education and Human Resources; 47.050, Geosciences; 47.041, Engineering; 47.049, Mathematical and Physical Sciences; 47.074, Biological Sciences in the Catalogue of Federal Domestic Assistance (CFDA).

#### **YEAR 2000 REMINDER**

In accordance with Important Notice No. 120 dated June 27, 1997, Subject: Year 2000 Computer Problem, NSF awardees are reminded of their responsibility to take appropriate actions to ensure that the NSF activity being supported is not adversely affected by the Year 2000 problem. Potentially affected items include: computer systems, databases, and equipment. The National Science Foundation should be notified if an awardee concludes that the Year 2000 will have a significant impact on its ability to carry out an NSF funded activity. Information concerning Year 2000 activities can be found on the NSF web site at <http://www.nsf.gov/oirm/y2k/start.htm>.

OMB 3145-0058  
PT 18 34 40 42  
KW 0605000 0606010 1002003 1002016 1002027 1005002 1005013 1005016  
1005019 1005051 1007000 1007001 1007002 1007003 007010 1007012  
1007040 1008001 1008002 1010000 1002016 1003000 1013036 1230010

**NSF 99-9**  
(replaces 97-172)