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# Mathematics Opportunities

## U.S.-Mexico Collaborative Research Opportunities

The National Science Foundation (NSF) of the U.S. and the Consejo Nacional de Ciencia y Tecnologia (CONACyT) of Mexico announce the continuation of a five-year pilot activity to support new efforts in international collaborative research and research infrastructure in computer science, information systems, and computer engineering.

The areas of interest include high-performance computing and communications, information infrastructure and technology, digital libraries, basic research in computer and information sciences and engineering, and all areas of engineering. Projects supported under this initiative must include researchers and educators in institutions from both countries. Corresponding proposals are expected from each side for binational awards under this initiative. Generally, NSF will administer and cover costs of U.S. investigators only, while CONACyT will administer and cover costs of Mexican researchers. Exceptions to this rule may include per diem for travel within the host country by visitors.

The total amount of support requested from NSF for a project under this initiative should be in the \$5,000 to \$100,000 range, with duration from one to three years, but larger or smaller grants may be awarded if appropriately justified. Activities supported by these grants may include research collaboration by individuals or small research teams in each country, workshops, short- and long-term visits by junior and senior research faculty and teaching faculty, undergraduate and graduate student exchanges,

and short-duration learning experiences and exchange of technical experts.

For further information, consult the program announcement, NSF publication 96-4. A paper copy may be requested by sending e-mail to [pubs@nsf.gov](mailto:pubs@nsf.gov) or by calling the NSF Publications Section at 703-306-1130. The program announcement is also available through the NSF's World Wide Web home page, <http://www.nsf.org/>. There are two deadlines each year in this program, on the second Tuesday in January and the second Tuesday in May. The next deadline is **May 14, 1996**.

—NSF Program Announcement

## Call for Applications to Project NExT

Project NExT (New Experiences in Teaching) is a program for new or recent Ph.D.s in the mathematical sciences who are interested in improving the teaching and learning of undergraduate mathematics. Faculty who are just beginning or just completing their first year of full-time teaching at the college/university level are invited to apply to become Project NExT Fellows. Project NExT is sponsored by the Mathematical Association of America (MAA) with support from the Exxon Education Foundation.

The first event for the 1996–1997 Fellows will be a workshop, August 7–9, 1996, just prior to the Summer Joint Mathematics Meetings (the Mathfest) in Seattle, Washington. At this workshop, Fellows will explore and discuss issues of special relevance to beginning faculty, including:

calculus and pre-calculus reform, alternative methods of teaching and assessment, using technology in the classroom, lessons from pedagogical research, and the faculty member as teacher and scholar. The Fellows will also have an opportunity to meet and interact with the Fellows who began the program in previous years.

Invited speakers include: Gerald Alexanderson, Santa Clara University, MAA president-elect; Joseph Gallian, University of Minnesota-Duluth; Sol Garfunkel, Consortium for Mathematics and its Applications; Pamela Matthews, Mount Hood Community College; and Anita Solow, Grinnell College.

Following the workshop, Project NExT Fellows will attend the Mathfest, August 10–12, 1996, participating in all the opportunities of that meeting and choosing among special short courses on issues in teaching and learning collegiate mathematics, including the pedagogical uses of graphing calculators and computers. During the following year, Project NExT Fellows will participate in: a network that links Project NExT Fellows with one another and with distinguished teachers of mathematics; special events at the Joint Mathematics Meetings in San Diego, California, in January 1997; and a workshop in the summer of 1997.

Approximately sixty Project NExT Fellows will be selected for the 1996–1997 year. Funding for room and board at the workshop in Seattle, Washington, and for the short courses at the 1996 Mathfest will be provided by a grant from the Exxon Education Foundation. Institutions employing the Project NExT Fellows are expected to provide financial assistance. Limited funds are available to assist those institutions that are unable to afford full or partial support.

To apply, send the application form and chair's letter of support by **April 26, 1996**, to the address given below. Applications received after that date will be considered until all spaces are filled. Applicants will be notified by June 1, 1996, whether they have been accepted as Project NExT Fellows.

Applications and other inquiries should be sent to: James R. C. Leitzel, Department of Mathematics and Statistics, University of Nebraska-Lincoln, P.O. Box 880323, Lincoln, NE 68588-0323; telephone 402-472-7232; fax 402-472-8466; e-mail [jimleitz@unlinfo.unl.edu](mailto:jimleitz@unlinfo.unl.edu). Application forms may be obtained by writing to Leitzel; they are also available at the Project NExT World Wide Web site, <http://archives.math.utk.edu/projnext/>.

—Project NExT Announcement

## Interdisciplinary Initiative in Materials Science

The Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) and the Applied and Computational Mathematics Program (ACMP) at the Advanced Research Projects Agency (ARPA) are developing a joint program to bring mathematical tools to bear on problems in materials science. The program will fund multidisciplinary

teams of researchers working on projects having clear connections to industrial needs. Although at the time of this writing final approvals for the program had not been secured, the DMS and ACMP are confident that the program will proceed. The deadline has not been set, but it is anticipated that the time between the call for proposals and the deadline will be fairly short, probably a few months.

“This program is a fantastic opportunity for mathematicians to interact directly with scientific and engineering teams, from experiment to modeling, to theory and to the discovery and invention of new mathematical structures,” says Ronald Coifman of Yale University. “Problems in materials science are extraordinarily varied and difficult, and traditional modeling by partial differential equations often fails to provide adequate macroscopic descriptions. It is quite clear that new mathematical paradigms for modeling need to be invented and integrated with computation and simulation.”

“This is not, for DMS, a departure from individual investigator grants,” explains DMS Director D. J. Lewis. “It is, rather, a new direction that we are exploring and is a broadening of our portfolio of research support mechanisms.” The portion of the program's budget contributed by the NSF came from the new Office of Multidisciplinary Activities; none of the funding came from the core DMS budget. NSF would like to encourage mathematical scientists to collaborate with others on interdisciplinary research. For its part, ARPA recognizes that fundamental and applied research in mathematics has the potential to revolutionize much of the technology it seeks to develop. The two agencies created the program based on the rationale that many applications of deep mathematics are inaccessible to potential users in industry and in other scientific and engineering disciplines.

The new program will support research toward developing a design paradigm for new thin film processes in which computer simulations play a major role. Some computer modeling is currently used in this area, but extensive use of physical prototypes is still needed. ACMP director Anna Tsao says the ultimate goal, still decades away, is to eliminate the use of extensive physical prototypes. “We want to be able to create the perfect material for the user the first time, every time,” she states.

The problems fall in three main areas: understanding basic thin film properties, understanding and controlling fabrication processes, and devising modeling and simulation techniques that lead to advances in the first two areas. Mathematical opportunities include: modeling, from the atomistic to the continuum; designing sensing, control, and optimization strategies from high-fidelity models; developing better numerical simulation techniques for the models; and developing statistical techniques for understanding the data describing materials properties and the sensing data arising in fabrication processes. It is critical that the mathematical models developed be validated against experimental data.

The program will support teams of researchers from the mathematical, physical, and computational sciences. The DMS and ACMP hope to put in place a process whereby interested mathematical scientists and scientists and engi-

neers in other areas can establish contacts with each other, for the purpose of building teams and preparing joint research plans. The projects funded must have demonstrable connections to industry so as to maintain a focus on realistic long-term goals. The research must relate directly to experimental data and validation, but it is expected that the research groups will leverage existing experimental infrastructure and/or industrial connections.

Out of the total program budget of \$4 million, a number of two-year grants will be made. In fact, DMS and ACMP are proceeding on the assumption that they will offer a three-year commitment to grantees, and they anticipate that the program will receive additional funds in fiscal year 1997. The typical grant is anticipated to be at least \$1 million for the initial two years, but the size of the teams to be funded is not specified.

"It is possible that many of the tools needed already exist in some form within mathematics, but it is more likely that they will have to be invented, being inspired by existing techniques from core mathematics," Coifman notes. "It is quite obvious that the better the simulation and understanding of these processes, the easier it will be for industry to integrate them in production. The beauty of this program is that by integrating teams, from manufacturing to theory, we have both a reality check and mutual inspiration."

Because of the short window of opportunity for this program, those interested are urged to begin developing their ideas right away. By the time this issue of the *Notices* reaches its readers, further information about the program should be available on the World Wide Web, on the ARPA home page <http://www.arpa.mil/> and the DMS home page, <http://www.nsf.gov/mps/dms/>. To gather ideas for the program, two workshops were held at the Institute for Mathematics and its Applications in January and February. Reports of the workshops are available from Anna Tsao, [atsao@arpa.mil](mailto:atsao@arpa.mil).

—Allyn Jackson

## News from The Fields Institute

In 1997 The Fields Institute for Research in Mathematical Sciences will be sponsoring a program in Singularity Theory and Geometry. The organizing committee for the program consists of Edward Bierstone, Askold Khovanskii, Pierre Milman, Alex Nabutovsky, and Mark Spivakovsky (University of Toronto). All activities will take place during the period January 1997 to June 1997 at The Fields Institute in Toronto.

The program will concentrate on topics in the following areas: geometric and topological applications of singularity theory, resolution of singularities and subanalytic geometry, fewnomials and subanalytic sets, and geometry and complexity. The program will include three workshops: Real Algebraic Geometry, January 1997, organized by Selman Akbulut, Gregory Mikhalkin, and Oleg Viro; Geometry and Complexity, May 1997, organized by Askold Khovanskii, and Alex Nabutovsky; and Symplectic Geom-

etry, June 23–27, 1997, organized by Yakov Eliashberg and Boris Khesin.

There will be at least three graduate courses during the period January–April 1997: Differential Topology and Geometry from a Recursion-Theoretic Viewpoint, taught by A. Nabutovsky; Fewnomials, taught by A. Khovanskii; and Resolution of Singularities, taught by E. Bierstone or P. Milman.

The Fields Institute is also planning to host several related activities, such as a workshop on The Model Theory of Analytic Functions (March 17–21, 1997, organized by A. Macintyre and D. Marker, related to subanalytic geometry) and a conference in honour of V.I. Arnold, the Arnoldfest (June 15–21, 1997).

The Fields Institute particularly invites applications from graduate students and young researchers who are interested in taking part in the program. Postdoctoral fellowships, graduate student fellowships, and support for short- and long-term visitors is available. The deadline to apply is **June 28, 1996**.

For further information, send a message to [singular@fields.utoronto.ca](mailto:singular@fields.utoronto.ca) or contact: Singularity Theory and Geometry Program, The Fields Institute, 222 College Street, Toronto, Ontario, Canada, M5T 3J1.

—*from Fields Institute Announcement*

## News from the Mathematical Sciences Research Institute

The Mathematical Sciences Research Institute is planning a Mathematics in Finance Workshop for June 26–28, 1996. For information, see MSRI's World Wide Web page (<http://www.msri.org/>) or e-mail [inquiries@msri.org](mailto:inquiries@msri.org).

—MSRI