



**Supporting International Collaborations  
for U.S. Researchers at the  
National Science Foundation**

**San José State University  
San José, CA  
March 13, 2008**

Wayne Patterson  
Program Manager for Developing Countries  
Office of International Science and Engineering  
National Science Foundation

# Outline

- International Collaboration at NSF
- Support for Faculty
- Programs for Postdoctoral researchers
- Programs for students

# Outline

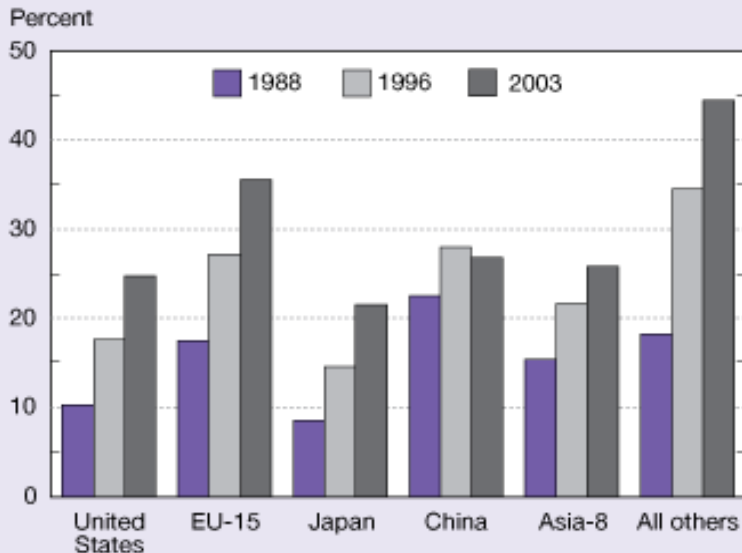
- International Collaboration at NSF
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# Description of Awards, Selected Northern California Universities

- For ten selected Northern California Universities
  - California State University East Bay, California State University Monterey Bay, Fresno State University, San Francisco State University, San Jose State University, Santa Clara University, Stanford University, University of California – Berkeley, University of California – Merced, University of California – Santa Cruz
- Total Number of Current Awards: 1289
- Total Value of Current Awards: \$741,632,745
- Total Number with International Research: 173 or 13.4%
- Total Number with OISE Support: 11 or 0.9%
- Total Number of Countries: 75
- Most Frequent: Antarctica 21, China 20, Japan 16, Australia 13, Germany 13, Canada 12

# International Collaboration

Figure O-19  
Share of scientific and technical articles with international coauthorship, by country/region: 1988, 1996, and 2003



EU = European Union

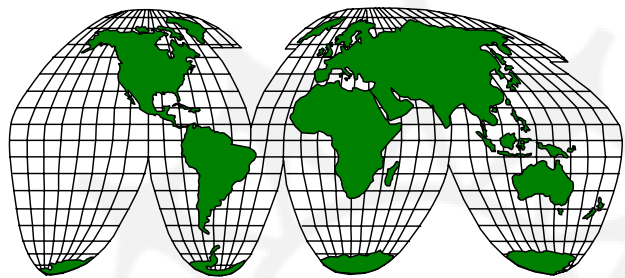
NOTE: Asia-8 includes South Korea, India, Indonesia, Malaysia, Philippines, Singapore, Taiwan, and Thailand.

SOURCES: Thomson ISI, *Science Citation Index and Social Sciences Citation Index*, <http://www.isinet.com/products/citation/>; iPLQ, Inc.; and National Science Foundation, Division of Science Resources Statistics, special tabulations. See appendix tables 5-47, 5-48, and 5-49.

Science and Engineering Indicators 2006

- International collaboration is commonplace
- About 20% of the world's scientific and technical articles in 2003 had authors from two or more countries, compared with 8% in 1988
- One-quarter of articles with U.S. authors have one or more international coauthors, which is similar to the percentages for Japan, China, and the Asia-8.

Discovery is a global enterprise. For the U.S. to remain in the forefront of world science and technology, it needs scientists and engineers from all disciplines who can operate and lead international teams and track international discoveries in some of the most challenging research areas.



Arden L. Bement, Jr.  
NSF Director  
2004

“Domestic and international collaborations are expanding in response to the complexities of new scientific fields, the growing scale and scope of scientific initiatives, new capabilities provided by advances in information and communications technologies, professional ties established during study or work abroad, and explicit government policies and incentives.”

Source: National Science Board, *Science and Engineering Indicators-2004*

# NSF International Objectives...

- A MEANS for advancing FRONTIER RESEARCH
- Provide ACCESS to sites, facilities, people, ideas
- Prepare a GLOBALLY ENGAGED U.S. S&E workforce
- Build and strengthen effective collaborations and institutional partnerships to address problems of a global/regional scale
- [NSF does NOT have a foreign affairs or foreign assistance mission]

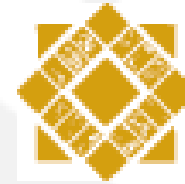
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# Support for International Activities

- Supplements to existing NSF grants
- Part of new proposals to NSF disciplinary programs
- New proposals to Office of International Science and Engineering

# International activities embedded in disciplinary grants – Germany



**San José State**  
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- **Joseph Pesek, San José State University**
- **Improving the Understanding of the Properties and Retention Behavior of Chemically Bonded Stationary Phases**
- The Division of Chemistry supports the collaborative research program of Prof. Joseph Pesek at San Jose State University and Prof. Klaus Albert at the University of Tuebingen. This award coordinates with a collaborative award funded by the Deutsche Forschungsgemeinschaft (DFG) through a joint program between the NSF and DFG that funds collaborative projects between US and German investigators.
- The focus of the collaboration is to better understand how molecules are separated based on their chemical and physical properties using materials based on silica. The separation media will be studied mainly by nuclear magnetic resonance spectroscopy, a technique that can measure how various types of compounds interact with the silica surface. Varying degrees of interaction between the surface of silica particles and the molecules present in a mixture result in separation of these compounds and provide a means of analysis. Understanding these processes will lead to the development of better separation materials to be used in the analysis of complex mixtures encountered in pharmaceutical, clinical, environmental and biological samples.
- Exchanges of students between the two laboratories will enhance the collaborative research experiences of the participants.

# International activities embedded in disciplinary grants – Burkina Faso



- **Leslie Gray, Santa Clara University**
- **RUI: Cotton, Poverty, and the Environment in Africa**
- Cotton production is at the heart of debates about environmental degradation and about unequal globalization, particularly regarding first-world agricultural subsidies and international trade policy. In Africa, cotton has two very different reputations in the international arena.
  - World Bank depicts cotton as an engine of development and a thirty-year success story.
  - skeptics like Oxfam portray West African cotton as a story of increasing poverty and environmental degradation.
- This research project will use a political ecology approach to investigate the intersection of cotton, poverty, and the environment in southwestern Burkina Faso, considering issues of success and failure at multiple scales.
  - (1) how international subsidies are affecting government policy and local communities in Burkina Faso;
  - (2) whether cotton production has increased or decreased household wealth, both by examining the effects of world prices and household resource availability;
  - (3) the interaction between cotton and institutions that provide access to land, labor, inputs, knowledge and networks;
  - (4) whether cotton and associated technological changes have led to landscape and soil changes, examining the differences between resource rich and resource poor households.

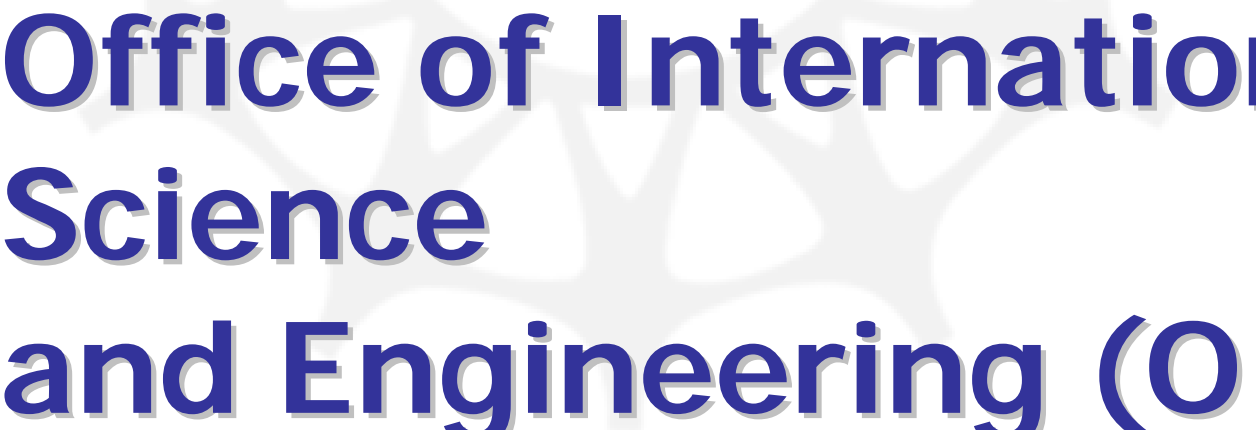
# International activities embedded in disciplinary grants – Papua New Guinea





- Collaborative Research: Stratovolcano lateral collapses and collapse-generated tsunamis in island arc settings: the example of the North New Guinea Arc
- Eli Silver and Steven Ward, University of California, Santa Cruz
- The PIs will investigate submarine edifice-collapse deposits off the coast of New Britain and related tsunami deposits. The PIs propose to map, date and characterize offshore debris deposits and coastal tsunami deposits in the volcanic arc and to use these data to model collapse-generated tsunamis. Edifice collapse has been shown to have been a frequent occurrence in Papua New Guinea, including the well-documented 1888 event at Ritter Island. Knowledge gained could ultimately lead to prediction of coastal impacts from future events in similar tectonic areas.

# Discovery Corps Fellowship (Chemistry Division)

- Joanna Skluzacek, Pennsylvania State University (PSU), is a Discovery Corps Postdoctoral Fellow for the 2007-2008 and 2008-2009 academic years. Skluzacek will build on existing relationships between PSU and the University of Mines and Technology (UMaT) in Tarkwa, Ghana to establish monitoring stations and to develop methods for evaluating water quality in areas of Ghana where development and gold mining have put substantial stress on the environment.
- Skluzacek also will work with the Penn State Materials Research Science and Engineering Center (MRSEC) and the Alliance for Earth Sciences, Engineering and Development in Africa (AESEDA).
- Integrating this work into summer science workshops and undergraduate and graduate courses at PSU will help students recognize the personal and global benefits of international environmental research.



**Office of International  
Science  
and Engineering (OISE)**



# Proposals to OISE

- ✦ Planning Visits (\$20,000 max)
- ✦ Workshops (\$25-60,000)
- ✦ PASI (\$65-100,000)
- ✦ Partnerships for International Research and Education (\$2.5 million)

<http://www.nsf.gov/oise/>

# Planning Visits

- Short trips by US researchers in promising new areas
- Fully assess foreign expertise, facilities, equipment, data, experimental protocols, etc.
- Detailed preparation for collaborative research
- Used more often for countries where access is harder

# Example of Planning Visit – Auburn U to Indonesia Inst of Sci and U of Indonesia

- This award supports a planning visit to enable Professor Jeffrey Fergus at Auburn University in Alabama to meet with Dr. Leonardus Kardono at the Indonesian Institute of Sciences (LIPI), Dr. Ridwan at the Indonesia National Nuclear Energy Agency and Dr. Bambang Soegijono at the University of Indonesia.
- Their goal is to establish a collaborative project to investigate the effect of hydrogen and water vapor on the oxidation of chromia-forming alloys for use as interconnect materials in solid oxide fuel cells (SOFCs). This is an important scientific and practical issue, which is not completely understood.
- In SOFC interconnects, the issue is particularly complicated as the alloys are simultaneously exposed to different atmospheres with different oxygen and hydrogen partial pressures. The careful and systematic control and measurement of hydrogen during oxidation in the proposed work will improve understanding of this complicated phenomenon.

# Workshops

- Co-organized by U.S. & foreign investigator
- NSF supports U.S. participants
- Identify areas of joint research; purpose is to develop new, targeted collaborations
- Outcome should be a proposal to one of the disciplinary offices within NSF
- Priorities vary by region

# Pan American Sensors for Environmental Observatories (PASEO) Workshop

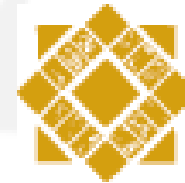


UCMERCED

- Thomas Harmon, University of California - Merced
- Bahia Blanca Argentina, June 2007
- On the subjects of sensors and sensor networking in environmental observatories, and local applications of network systems. Organized by Dr. Thomas Harmon and Dr. Daniel Lupi of the Argentine Instituto Nacional de Tecnologia Industrial (INTI) for the Argentinean side, PASEO will be held at the Instituto Argentino de Oceanografia (IADO) in Bahia Blanca, Argentina, and will bring together researchers and agency officials from Latin America and the United States to exchange research questions and discuss how best to build collaborative research efforts in this area.
- The overall objective of the PASEO Workshop is to create a pathway for international collaborative research on the topic of environmental sensor networks. Engineers and scientists will gather to discuss common ground and identify critical needs surrounding networked sensing in terrestrial and aquatic systems, and at the interfaces between them.

# Vulnerability of Rhodolith Beds to Global Climate Change Workshop

- **Diana Steller, San José State University**
- **La Paz, Baja California, Mexico**



**San José State**  
UNIVERSITY

- The workshop, organized by Dr. Diana L. Steller and Dr. Michael S. Foster of the San Jose State University together with Rafael Riosmena-Rodriguez of the Universidad de Baja California Sur in La Paz, Mexico, aims to bring together researchers from Europe, Australia, Brazil, and Mexico to assess recent research and reformulate critical research objectives directed at developing a coordinated global effort to identify threats to rhodolith beds (including ecological, physiological, paleontological, and ecosystem services) as well as strategies to ameliorate these impacts.
- Similar to coral reefs and kelp forests, rhodoliths create a biogenic habitat that supports a diverse assemblage of species. In addition, due to their calcium carbonate infrastructure, rhodolith beds may serve as an important global carbon sink. However, rhodolith taxonomy, distribution and basic ecology are poorly understood.

# Other Examples

- ✦ Patterson and Jan Persens, University of the Western Cape, South Africa
  - “The Mathematics of Computer Security”, Tunis, Tunisia, August 2004
- ✦ Patterson and Ricardo Baeza-Yates, University of Chile
  - “Computational Methods for Security in a Web Environment”, Arica, Chile, July 2006

# Pan-American Advanced Studies Institutes (PASI)

- Short courses of two to four weeks duration, at the advanced graduate and post-doctoral level.
- Courses should involve distinguished lecturers and active researchers in the field, preferably from the Americas.
- PASIs aim to disseminate advanced scientific knowledge and stimulate training and cooperation among researchers of the Americas in the mathematical, physical, and biological sciences, and in engineering fields

# Recently Funded PASI's

- Modern challenges in statistical mechanics - Argentina
- Study of surfaces, interfaces and catalysis - Venezuela
- Physics at the nanometer scale - Argentina
- Green chemistry - Uruguay
- Quantum information - Brazil
- Materials for energy conversion and environmental protection – Brazil
- Process Systems Engineering – Argentina

# PASI with a California Flavor

- Climate Change in the Americas; La Paz, Baja California Sur, Mexico
  - Organized by ***Dr. Walter C. Oechel, of San Diego State University***, the Institute will provide an opportunity for emerging scientists to participate in lectures and activities related to current global/climate change research, while developing international and interdisciplinary relationships that will help foster future collaborative projects. The focus of this Institute will be on the impacts of climate change on natural and managed ecosystems, and the associated feedbacks of changes in ecosystem structure and function based on environmental change and management strategies.
- Computational Science and Engineering; Oaxaca, Mexico
  - This Institute will take place at the Universidad Autonoma "Benito Juarez" de Oaxaca, Mexico, on the topic of computational science and engineering. Organized by ***Dr. Jose E. Castillo, San Diego State University***, it will consist of a combination of lectures, short courses, discussions and hands-on computer labs. The content of the courses will include research in areas of computational fluid dynamics, numerical optimization, parallel computing, grid generation, scientific visualization and numerical linear algebra.

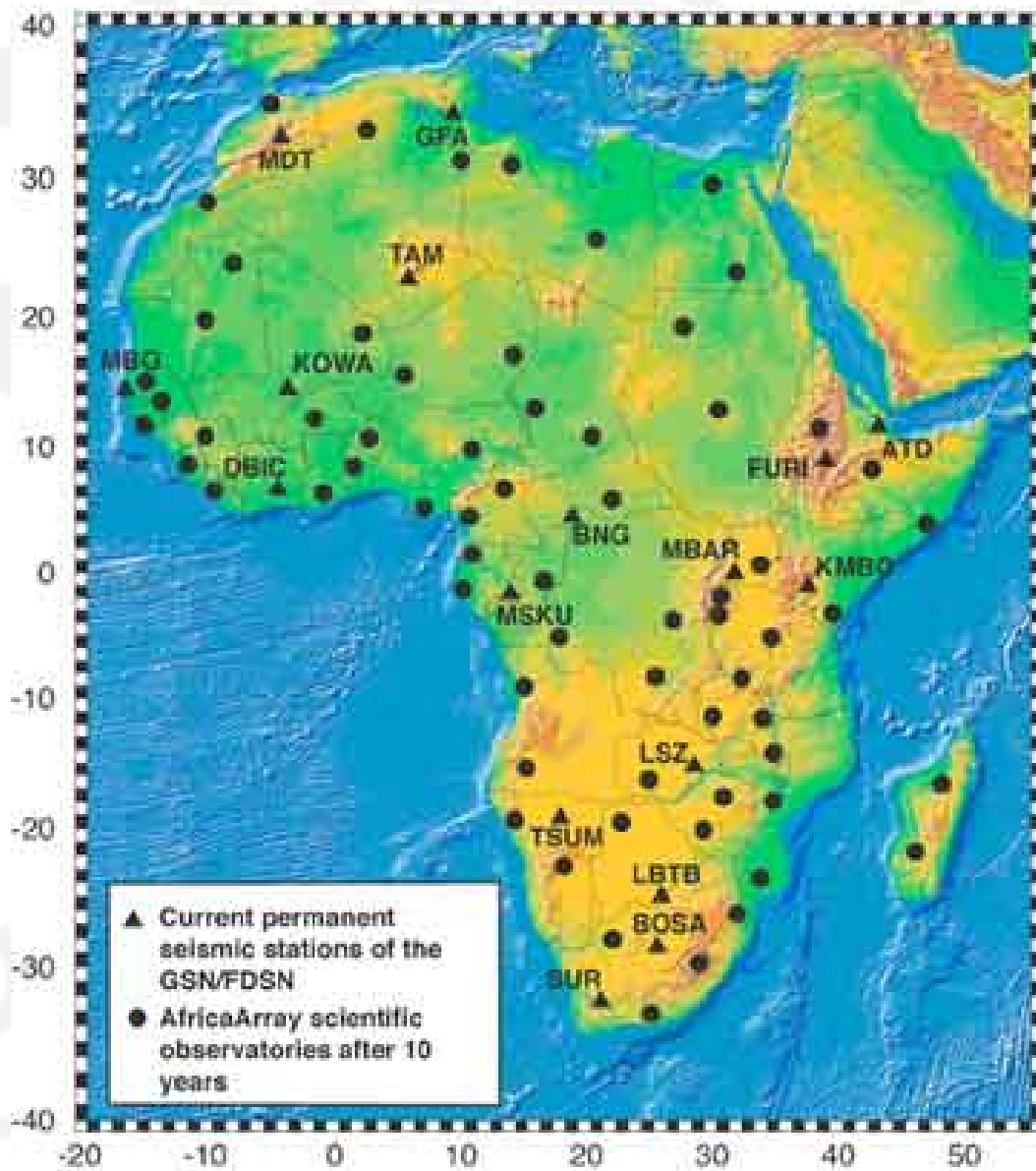
# Partnerships for International Research and Education (PIRE)

- Cutting Edge scientific research
- Strong international partners
- Innovative models
- Involvement of students & junior researchers
- Institutional resources (IT, language/culture, curriculum, study abroad, other)
- 14-17, 5-year awards of up to \$2.5M each
- Eligibility: Ph.D. granting in U.S. (20 in 2 years)
- Prelim proposal deadline: October 30, 2008 (limit 3 per institution)

# PIRE



- *AfricaArray* is a long-term initiative to promote coupled training and research programs for building and maintaining a scientific workforce for Africa's natural resource sector. Africa's natural resource sector (petroleum, minerals, and water, in particular) is a major driving force for economic development. Africa is a primary source of strategic and base metals for the world market. Petroleum production from sub-Saharan African countries alone may provide 25% of U.S. oil imports by 2015. Water resources are needed for supporting sustainable livelihoods throughout the continent, and in some countries geothermal reservoirs provide an important energy source.
- The name "*AfricaArray*" refers to an *array* of shared training programs, an *array* of shared scientific observatories, scientists across the continent working on an *array* of shared projects, and above all, a shared vision that Africa will retain capacity in an *array* of scientific fields vital to the development of its natural resource sector.
- Initially, *AfricaArray* is focusing on geophysics to:
  - Maintain and develop further geophysical training programs in Africa, in response to industry, government and university needs.
  - Promote geophysical research in Africa, and establish an Africa-to-Africa research support system.
  - Obtain geophysical data, through a network of shared observatories, for studying scientific targets of economic and societal importance.



# PIRE: Electron Chemistry and Catalysis at Interfaces

- This award establishes a long-term Partnership for International Research and Education for Electron Chemistry and Catalysis at Interfaces (PIRE-ECCI) between the ***University of California Santa Barbara (UCSB)*** and the Dalian Institute for Chemical Physics (DICP) in Dalian, China. The focus area for research is modern heterogeneous catalysis with a multidisciplinary approach that seeks to increase contacts between the fields of surface science, catalysis and chemical dynamics at interfaces, thus striving for a "first principles understanding" of technologically important catalytic systems. Members of the team represent diverse scientific viewpoints, from surface chemical dynamics, to theoretical simulations of surface chemistry, to engineering applications of catalysis.
- A major part of the research and education plan involves support for graduate students and postdocs at UCSB and DICP to pursue collaborative research in chemistry. Extended research visits will include Chinese language and cultural sensitivity training for UCSB participants, with similar reciprocal support given to the Chinese participants coming to UCSB. Two summer schools on catalysis will be held at UCSB and a biannual scientific workshop will be held in Dalian.

# PIRE: Collaborative Research and Training in Social Context, Population Processes, and Environmental Change

- Partnership for International Research and Education (PIRE) brings together researchers and students from five U.S. universities and four institutions in Nepal and China to undertake comparative studies on the dynamics of population-environment interaction. Principal investigator, William Axinn of the University of Michigan and colleagues from Michigan State University, *San Diego State University*, the University of North Carolina, and Arizona State University will collaborate with Nepalese partners from the Institute for Social and Environmental Research and Tribhuvan University's Institute of Agriculture and Animal Science, and with Chinese partners from the Research Center for Eco-Environmental Sciences of the Chinese Academy of Sciences and the Wolong Nature Reserve.
- The five-year plan for collaborative research focuses on improving understanding of patterns and processes affecting vegetation and habitats for three endangered species (pandas, rhinos, and tigers), achieving cross-case comparisons of the dynamics of population-environment interaction for Nepal and China, and establishing widely applicable tools needed to make such comparisons in other settings.

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# Postdoctoral Researchers

- Participation in NSF disciplinary awards
- Disciplinary Postdoctoral Fellowships
- International Research Fellowships

# International Research Fellowships

- Designed to introduce young scientists to international research opportunities
- Provides support to carry out research at science and engineering establishments in foreign countries
- Research experiences range from tenures of 9 to 24 months
- Applications from women and minorities, and for work in developing countries are especially encouraged.

# International Research Fellowships – Eligibility Requirements

- U.S. citizenship or permanent residency
- Applicants must have a Ph.D. by the time IRFP tenure begins
- Applicants cannot have had their Ph.D. longer than two years at the time of application
- Deadline in 2008 will be the Second Tuesday In September!

# IRFP: Birds Eating Bugs: The Geographic Mosaic of Predator-Mediated Natural Selection



- Kuchta, Shawn                      University of California – Santa Cruz
- This award will support a twenty-four-month research fellowship by Dr. Shawn R. Kuchta to work with Dr. Erik Svensson at Lund University in Lund, Sweden.
- In natural systems, individuals must avoid being eaten if they are to pass their genes on to future generations. For this reason, predation has a strong impact on organismal fitness. The selective consequences of predation are difficult to study, however, because predation removes individuals from the population and thereby prevents their measurement. Studying the geographic structure of predation intensities is even more difficult. In collaboration with Erik Svensson at Lund University in southern Sweden, this research addresses the geographic mosaic of selection gradients imposed on damselflies (*Calopteryx*) by an efficient avian predator, the wagtail. Wagtails catch damselflies and return to "slaughter stations" where they remove the wings and consume the body. Collecting wings from slaughter stations and comparing them to the variation present in natural populations allows us to calculate the strength and direction of natural selection on various wing traits, such as the shape and size of color patches.

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# Support for Students

- Participation in NSF disciplinary awards
- Integrative Graduate Education and Research Traineeship (IGERT) Program
- Graduate Research Fellowships
- Participation in OISE planning visits or workshops
- Dissertation Enhancement Awards
- East Asia and Pacific Summer Institutes (EAPSI)
- International Research Experiences for Students
- International REU's

# Dissertation Enhancement Research

- Supports doctoral student research in a foreign country
- Must be collaborative, with evidence of intellectual involvement of foreign institution
- U.S. faculty mentor is PI on proposal
- Up to \$15,000 per award for up to 2 years
- Apply to NSF disciplinary program or OISE
- Deadlines: 9/15 and 2/15 annually for OISE; may vary for disciplinary programs

# A Dissertation Enhancement Award – Brazil



- This award will support a dissertation enhancement for Christopher Varney, a Ph.D. student at the University of California, Davis. The Principal Investigator for this award is Dr. Richard T. Scalettar from the *University of California, Davis*. The research will be done in collaboration with Drs. Thereza C. Paiva and Raimundo S. Dos Santos of Brazil's Universidade Federal do Rio de Janeiro. The proposed work will examine topics with high scientific interest, which include the interplay between disorder and interactions on a honeycomb lattice, the spin correlations in graphene nanoribbons, and the role of layering of repulsive and free sites on a rectangular lattice. The scientific technique that will be applied is a reliable technique that has been largely developed at the University of California, Davis.
- This award will have two important broader impacts; it will enhance the education of a graduate student and it will help to strengthen U.S. collaboration with a high quality research group at Brazil's Universidade Federal do Rio de Janeiro. The graduate student will work closely with Brazilian researchers while conducting research at the Universidade Federal do Rio de Janeiro on two extended trips during the two year period.

# EAPSI Applicant Eligibility

- U.S. citizen or permanent resident
- Enrolled at U.S. institution in a research oriented master's, M.D. or Ph.D. degree program
- Fields of science or engineering supported by NSF and represented among host institutions
- December 12, 2006--Application deadline



# National Science Foundation SUMMER 2008

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## EAST ASIA AND PACIFIC SUMMER INSTITUTES

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*For U.S. Graduate Students Pursuing Science and Engineering*

**Australia, China, Japan, Korea,  
New Zealand, Singapore, or Taiwan**

- Biological Sciences
- Computer and Information Science & Engineering
- Education (Science, Mathematics, Engineering, & Technology)
- Engineering
- Geosciences
- Mathematical & Physical Sciences
- Social, Behavioral, & Economic Sciences
- Multidisciplinary Research

Application Deadline:

**December 12, 2007**

*[www.nsf.gov/eapsi](http://www.nsf.gov/eapsi)*

E-mail: *[eapinfo@nsf.gov](mailto:eapinfo@nsf.gov)*

➤ **Unprecedented Number of Howard Students Selected by NSF for International Research**

➤ April 25, 2006

In the Summer of 2006, Howard University will send its largest number of students ever to study and do research in Asia as a result of successful applications to the National Science Foundation by four Howard graduate students in Computer Science and Electrical Engineering.

Three of the four students, Ebonie Loftin, Ngizambote Mavana, and James Tolbert II, all master's students in Computer Science, were selected for the NSF's East Asia and Pacific Summer Institutes to do research in South Korea. With three students selected for South Korea, Howard University led all universities in the United States in students selected for that country. The fourth student, Kenneth Bird, a third-year doctoral student in Electrical Engineering, was selected to do research in China.



# International Research Experiences for Students

- ➔ Can include graduate and undergraduate students
- ➔ Supports small groups of students in a focused field
- ➔ Awards of up to \$50,000 per year for up to 3 years
- ➔ Deadlines: 9/15 and 2/15

# IRES in Poland and Latvia (Berkeley)



- This U.S.-Polish project will provide U.S. undergraduate and graduate students opportunities to conduct collaborative research at the joint Polish/US atomic physics and photonics laboratory at Jagiellonian University in Krakow. Short visits will also be made to the University of Latvia in Riga. The research activities will be in the field of modern atomic and molecular spectroscopy and applications of near-resonant nonlinear-optics systems to sensitive measurements of electromagnetic fields. The principal investigators are Dr. Dmitry Budker from the University of California - Berkeley, Wojciech Gawlik from Jagiellonian University in Krakow and Marcis Auzinsh from the University of Latvia.
- This project in physics research fulfills the program objectives of bringing together leading experts in the U.S. and Central/Eastern Europe to combine complementary efforts and capabilities in areas of strong mutual interest and competence on the basis of equality, reciprocity, and mutuality of benefit. The project will also provide U.S. students with a global perspective and opportunities for professional growth through international cooperative research training, networking and mentoring.

# IRES in Senegal

- When their DC-8 flew into a tropical storm off the coast of West Africa, Aaron Pratt and Tamara Battle realized their lifelong dream--to study storms and weather systems at their source. During that flight, lightning struck their plane. The resulting storm turned into a tropical depression and ultimately became known as Hurricane Helene, one of the strongest Atlantic hurricanes in 2006.
- "African dust is very critical for hurricane formation. One of our flights allowed us to see the dust kicked up in the Sahara Desert," said Pratt, who is pursuing a doctorate in atmospheric science from Howard University in Washington, D.C., as is Battle. "I had never done research overseas before and didn't know what to expect. Working with scientists in both Senegal and Cape Verde helped put our research in the proper perspective."
- The award, to Dr. Gregory Jenkins of Howard University, supports American students' work with a large multinational team of scientists on a project called the African Monsoon Multidisciplinary Analysis (AMMA).

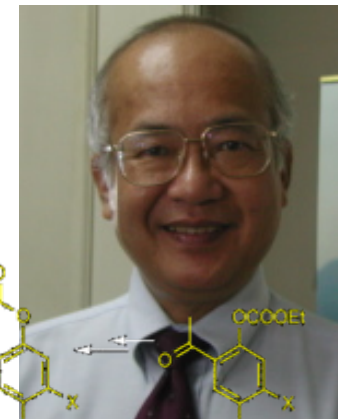


Graduate students study African storms onboard a DC-8 airplane to understand links to U.S. storms.

# REU International - Thailand

Research Experience for Undergraduates  
in Organic Chemistry

NSF's chemistry division and Office of International Science and Engineering jointly co-fund the *University of California-Santa Cruz Research Experiences for Undergraduates in Organic Chemistry site in Bangkok, Thailand* for the summers of 2005-2008. The program director is Rebecca Braslau, UC Santa Cruz, who is assisted by Poonsakdi Ploypradith of Chulabhorn Research Institute, Bangkok, Thailand.



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- This international ten week program is designed to give eight outstanding students from the United States an intensive hands-on research experience in organic chemistry in Bangkok, Thailand in laboratories at Chulalongkorn University, at Mahidol University, and at the Chulabhorn Research Institute.
- Each American undergraduate will be paired with a Thai graduate student.





**Looking Beyond the Borders:  
A Project Director's Handbook  
of Best Practices for  
International REU's**

**[www.nsf.gov/pubs/2006/nsf06204/index.html](http://www.nsf.gov/pubs/2006/nsf06204/index.html)**





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