

# EAR TO THE GROUND

Fall 2012



The Division of Earth Sciences (EAR) is part of the Geosciences Directorate at the National Science Foundation.

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*Kaikoura Peninsula, New Zealand (via Thomas Gardner, Trinity University)*

## Update from the Division Director

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It is a pleasure and honor to be able to introduce myself to the earth sciences community as the new Division Director for EAR. I arrived at NSF in late August and have been warmly welcomed by everyone in the Geosciences Directorate. I want to use this opportunity to thank everyone at NSF for the help you have provided: I already feel quite at home here.

As I meet members of the external community, the status of EAR's budget is always an early topic of inquiry so here is the current update. President Obama's FY13 Budget Request to Congress includes a [3.1% increase for EAR programs](#) – a welcome addition to our funds. However, external matters beyond

our control result in current operations being under an interim appropriation which is in place through a Congressional Continuing Resolution that extends to March 27, 2013. "Sequestration" also creates a level of budgetary uncertainty in future. When I write again in the Spring newsletter some of these matters may have been resolved.

EAR remains committed to the support of core research programs run by single investigators or by small teams. About 2/3rd of our research budget is allocated to such work. However, the nature of earth science is inherently interdisciplinary and integrative and the need for advances in understanding geosystems and society's interface with the Earth are reflected in some of the cross-directorate and Foundation-wide solicitations. The community of earth science investigators has a strong record of success in securing funding from the SEES initiatives – Science, Engineering and Education for Sustainability- and I draw your attention to the newest opportunities including [Hazards SEES](#) and [Coastal SEES](#), as well as EAR's new programs in [Integrated Earth Systems](#) and [Earth-Life Transitions](#) detailed elsewhere in this newsletter.

The Geosciences Directorate was expanded in October, welcoming the Office of Polar Programs as a new Division: this [realignment](#) positions NSF to be even more effective as we work at the frontiers of geoscience to address problems of global change. EAR's staff are excited about the possibilities for new science and education opportunities that will likely arise as this realignment strengthens our already close relationship with Polar Programs. Those of you whose research is jointly supported by Polar Programs and Earth Sciences should see no administrative impact: please feel free to contact us if you have questions.

I have focused my time since August in three broad areas: becoming familiar with the administrative and operational processes and procedures that allow the Division to run smoothly on a day-to-day basis; becoming familiar with the programs within the Division as well as the cross-directorate programs in which EAR participates; and getting to know the community supported by EAR funds. The Geosciences Directorate Advisory Committee met in October and I want to thank the members of the Earth Sciences subcommittee for their genuine interest in and advocacy for our programs: George Hornberger, Louise Kellogg, Don DePaolo, Roberta Rudnick, Lee Allison, and Karen Fischer. I have participated in several briefing meetings with organizations in the Washington DC area including IRIS, the USGS, and the NRC's Board of Earth Sciences and Resources. In October I attended the National Wyoming Supercomputer Center opening ceremonies, the NCAR Board of Directors meeting, and the UCAR Members meeting where I gave a short presentation introducing NSF's Earth Sciences programs to the atmospheric science community: my intent at these meetings is to increase awareness of earth sciences, and lay the path for new collaborations particularly in supercomputing-intensive areas. I was also hosted for a field day by the Boulder Creek Critical Zone Observatory investigators and their students, and visited UNAVCO and the USGS Powell Center for Earth System Analysis and Synthesis in Fort Collins, CO. All these external activities help me become familiar with the frontiers of research that EAR is supporting and importantly, offer opportunities for me to promote our community and to see possible avenues for new initiatives.

I look forward to meeting a broad cross section of the earth sciences research and education community at our upcoming national meetings this Fall.

Finally, a special thank-you to Jun Abrajano who served as Acting Division Director before I arrived and has been a tremendous resource for me and to Bob Detrick, previously Division Director and now Assistant Administrator, Office of Oceanic and Atmospheric Research, NOAA who is missed greatly by EAR's staff.

*Wendy Harrison*  
*Director, Division of Earth Sciences*

## Revised Proposal & Award Guide

A revised version of the NSF Proposal & Award Policies & Procedures Guide (PAPPG), [NSF 13-1](#), was issued on October 4, 2012 and is effective for proposals submitted, or due, on or after January 14, 2013.

Please be aware that significant changes have been made to the PAPPG to implement revised merit review criteria based on the National Science Board (NSB) report, [National Science Foundation's Merit Review Criteria: Review and Revisions](#). While the two merit review criteria remain unchanged (Intellectual Merit and Broader Impacts), guidance has been provided to clarify and improve the function of the criteria. Changes will affect the project summary and project description sections of proposals. Annual and final reports also will be affected. Please read through the documents linked above, and contact your program officer if you have any questions about these changes.

## New Assistant Director for Geosciences

The National Science Foundation has [selected Roger M. Wakimoto](#) to serve as assistant director for the Directorate for Geosciences (GEO). Wakimoto will lead a directorate with an annual budget of approximately \$1 billion in support of core research in the atmospheric, polar, earth and ocean sciences. Currently, Wakimoto is the director for the National Center for Atmospheric Research (NCAR), which is sponsored by NSF. Prior to becoming NCAR Director, he served as associate director for NCAR's Earth Observing Laboratory. Wakimoto is a geophysicist with expertise in tornadoes, thunderstorms and other types of severe weather.

"Roger brings to NSF significant depth and breadth of knowledge in the sciences GEO supports," said NSF Director Subra Suresh. "His record of strong leadership will serve NSF and the scientific community well, given his outstanding work at NCAR and his dedication to basic research." We look forward to welcoming Roger to NSF in February, 2013.

## The Integrated Earth Systems Program (IES)



The Summer 2012 edition of *EAR TO THE GROUND* announced NSF's intent to revise and expand the solicitation for the Continental Dynamics Program (CD). A new Program, [Integrated Earth Systems](#) (IES), is the result and a new solicitation ([NSF 12-613](#)) has been issued.

Earth science research involves the study of physical, chemical, and biological processes that interact and combine in many ways to produce a wide range of dynamic Earth systems. These Earth systems are characterized by their complexity, their non-linearity, and their continuous evolution. They interact with one another over a wide variety of space and time scales and can produce multiple and diverse outcomes. These characteristics present significant hurdles to our ability to understand and forecast the behavior of a complex and evolving Earth, including the human impact or impact on humans. IES is a program in the Division of Earth Sciences (EAR) that focuses specifically on the continental, terrestrial and deep Earth subsystems of the whole Earth system. Overall, the goals of IES are to:

- provide opportunity for collaborative, multidisciplinary research into the operation, dynamics and complexity of Earth systems at a budgetary scale between that of a typical project in the EAR Division's disciplinary programs and larger scale initiatives at the Directorate or Foundation level;

- support study of Earth systems that builds on process-oriented knowledge gained from EAR programmatic research and enables systems-level hypothesis testing and analysis of coupled processes;
- provide a "bridge" among the EAR disciplinary programs in order to foster the exchange of questions, ideas, and knowledge between disciplinary discovery and system-level investigations.

Specifically, IES will provide research opportunities for the study of Earth systems from the core of the Earth to the top of the critical zone with a specific focus on EAR subsystems that include continental, terrestrial and deep Earth subsystems at all temporal and spatial scales. IES will provide opportunities to focus on Earth systems connected to topics which include (but are not limited to) the continents; the terrestrial, surficial Earth systems including physical, chemical and biotic dimensions; linkages among tectonics, climate, landscape change, topography and geochemical cycles including core and mantle processes.

### Hazard SEES - Interdisciplinary Research in Hazards and Disasters

The overarching goal of [Hazards SEES \(NSF 12-610\)](#) is to catalyze well-integrated interdisciplinary research efforts in hazards-related science and engineering in order to improve the understanding of natural hazards and technological hazards linked to natural phenomena, mitigate their effects, and to better prepare for, respond to, and recover from disasters. The program is sponsored by a number of Directorates across the foundation: Geosciences (GEO), Engineering (ENG), Math & Physical Sciences (MPS), Computer & Information Science & Engineering (CISE), Social, Behavioral & Economic Sciences (SBE), and the Office of Cyberinfrastructure (OCI). The goal is to effectively prevent hazards from becoming disasters. Hazards SEES aims to make investments in strongly interdisciplinary research that will reduce the impact of such hazards, enhance the safety of society, and contribute to sustainability. The Hazards SEES program is a multi-directorate program that seeks to: (1) advance understanding of fundamental processes associated with specific natural hazards and technological hazards linked to natural phenomena, and their interactions; (2) better understand causes, interdependencies, impacts and cumulative effects of hazards on individuals, natural and built environment, and society as a whole; and (3) improve capabilities for forecasting or predicting hazards, mitigating their effects, and enhancing capacity to respond to and recover from resultant disasters. *Deadline: February 4, 2013.*

### Coastal SEES

[Coastal SEES \(NSF 12-594\)](#) is a significant new opportunity for geoscientists from a wide variety of backgrounds. A goal and challenge presented by this new program is the interconnection of areas of scholarship about natural and human processes in ways that will better inform societal decisions about the use of coastal systems. It is noteworthy that the Directorate for Geosciences, Directorate for Biological Sciences, Directorate for Social, Behavioral & Economic Sciences, Directorate for Engineering, and Polar Programs are jointly supporting Coastal SEES. Review and funding of the proposals will be coordinated by a cross-NSF management team. While proposals are probably well underway, we wish to highlight a few points: (1) The coastal zone is diverse, and we want to reiterate that the program is interested in proposals dealing with all facets of coastal systems, including land that is closely connected to the sea, with its wetlands, beaches, cities, towns, recreational areas, and maritime facilities; estuaries; the Great Lakes, the continental seas and shelves; and the overlying atmosphere. (2) Because sustainability involves reciprocal interactions between humans and the broader biological and geophysical world, proposals to Coastal SEES must include meaningful and well-integrated contributions from multiple disciplines. (3) PIs are reminded that the review panel will be made up of individuals from

many disciplines and will be specifically looking for integration of elements within each project. *Deadline: January 17, 2013.*

### Earth-Life Transitions (ELT)

The [Sedimentary Geology and Paleobiology program](#) is pleased to announce a NEW funding opportunity for the SGP community! This program, called “Earth-Life Transitions” (ELT) is a direct response to some of the grand challenges posed by the community through a number of workshops and National Academy reports. ELT will support fundamental research into Earth system dynamics, focusing on scientific questions at the frontiers of climate change and biogeosciences. The goals of the Earth-Life Transitions program are 1) to develop the synergistic activities and capabilities of multi-disciplinary scientists to address critical questions about Earth-Life interactions in deep time and 2) to enable team-based interdisciplinary projects involving stratigraphy, sedimentology, paleontology, calibration and application studies, geochronology, and climate modeling at appropriately resolved scales of time and space, to understand the major linked events of environmental, climate and biotic change at a mechanistic level.

This program is Track 2 of the newly revised SGP solicitation [NSF 12-608](#). *Deadline: February 22, 2013 (and pending availability of funds, January 17 in 2015 and 2017).*

### IRIS sponsors Early Career Investigators Working Group

For the past year the [Incorporated Research Institutions for Seismology](#) (IRIS), an academic consortium and NSF-EAR supported science facility, has sponsored an effort to develop practical resources and support programs for Early Career Investigators (ECIs). Specific initiatives designed to benefit ECIs, loosely defined as post-qualifying exam graduate students to pre-tenure faculty, have been implemented based on feedback received from the ECI community at special-interest-group meetings held during the American Geophysical Union Fall 2011 meeting and [2012 IRIS Workshop](#) and through a dedicated [ECI listserv](#) and social networking presence.



The ECI working group, which consists of several members of the IRIS community and an IRIS staff liaison, has [published a website](#) with consolidated information and a growing set of resources for ECI. Visitors are encouraged to visit the site and enroll in the linked ECI listserv. The website includes profiles of volunteer mentors from the seismological community, a roster of ECI speakers available for departmental colloquiums, and [webinars](#) that span topics from software tutorials to teaching advice. More than 80 people attended a recent webinar on data processing software, and all webinars are archived for future reference. The ECI working group is engaged with other NSF-funded programs and professional organizations to build cross-disciplinary collaborations between ECIs in the Earth Sciences. The next event is a [networking workshop](#) co-sponsored by GeoPRISMS and EarthScope, which will be held in San Francisco during AGU on December 4 from 11:30-1:30 at the Hyatt Bayview. Participants at all stages in their careers are welcome to attend.

### Instrumentation and Facilities Highlight: the Institute for Rock Magnetism

The [Instrumentation & Facilities Program](#) of the Division of Earth Sciences (EAR/IF) supports nineteen (19) national, multi-user facilities on behalf of the earth sciences research and education community. Although ranging widely in the scope and cost of their individual operations, all of the facilities share a

common attribute. They provide to their respective basic research and education communities on a national or regional scale certain complex and expensive technical and logistical capabilities that would otherwise be impractical to make available to individual or small groups of investigators.

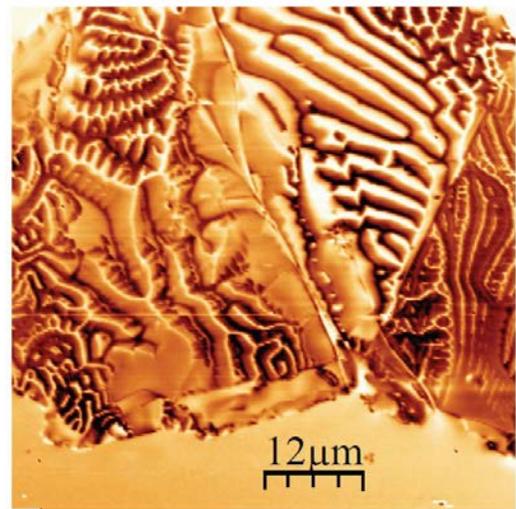
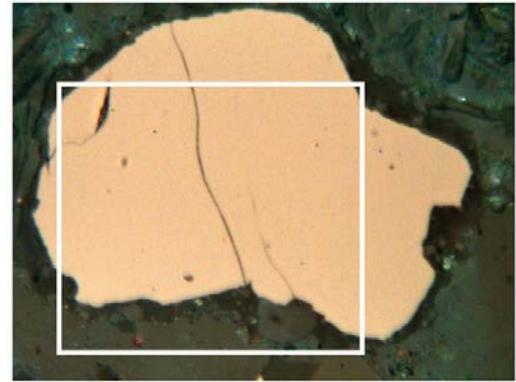
EAR to the Ground is continuing to highlight some of these facilities, to make the community aware of the incredible capabilities sponsored by EAR/IF. You can download the newly-updated guide to multi-user facilities [here](#).

In this issue, we bring you a highlight from the [Institute for Rock Magnetism](#) (IRM). Magnetic force microscopy (MFM) enables the imaging of the micromagnetic structures within individual particles of remanence-carrying minerals, and the study of the interaction of domain walls with crystal imperfections and chemical heterogeneities. At the Institute for Rock Magnetism, MFM observations on natural particles with varying internal microstructures, and in remanent states corresponding to different experimentally-controlled thermomagnetic histories, are improving our ability to understand and quantitatively model the interacting physical and chemical processes involved in the acquisition and long-term storage of remanence in nature and its eventual removal and replacement with artificial remanences in the laboratory. Ultimately such development is critical for improving the recovery rate, accuracy, and quantitative reliability assessment of paleointensity determinations, thereby providing a unique view of the evolution of processes in the Earth's core.

The IRM was established in 1990 to provide the Earth Science research community with access to state-of-the-art facilities and technical expertise for magnetic material characterization. Visiting scholars and resident researchers utilize the resources of the IRM to study contemporary topics in rock magnetism, paleomagnetism, and a broad range of interdisciplinary fields such as biomagnetism, paleoclimatology, archeology, planetary science, and nanomagnetism of iron oxides.

The same physical principles that govern magnetic information storage in audio/video recording media and in computer disks also operate in geological recording media: rocks and sediments. The processes involved in natural magnetic recording are both complex and inefficient, and the characteristics of natural particulate storage media vary strongly with the mineral composition and grain size of the ferromagnetic particles. The recorded signal of geomagnetic field behavior through time is inevitably distorted by variations in these properties of the recording medium, and the signal is moreover subject to degradation and overprinting by stress, thermal perturbations and chemical alteration. Research at IRM thus aims at separate recovery of both the geomagnetic and geological signals in the magnetism of Earth materials as well as understanding the magnetic signatures in extraterrestrial materials.

The instrumentation at IRM enables measurement of the magnetic properties of materials, including AC and DC magnetic moments and Mössbauer spectra, over a wide range of temperatures (4.2 K - 1000 K) and magnetic fields (10<sup>-5</sup> T - 5 T). In addition, magnetic domain structures may be imaged by various means, including the magneto-optic Kerr effect (MOKE) and magnetic force microscopy (MFM).



**Top:** reflected light photomicrograph of homogeneous titanomagnetite grain extracted from an ash layer deposited on Mt St Helens Volcano by the 1980 eruption.

**Bottom:** magnetic domain structure in the same grain, imaged by magnetic force microscopy; the scanned area is indicated by white box in top image. The light and dark areas are areas of negative and positive vertical gradients of the magnetic force exerted by the sample on the magnetic tip of the microscope.

Research goals have both fundamental and applied aspects. Fundamental rock-magnetic and mineral-magnetic studies are leading to a better understanding of the origin and geological stability of remanent magnetization in fine particles (10 nm - 100  $\mu$ m) of magnetic oxides, sulfides, and other natural materials or synthetic analogues. Fundamental research is also leading to improved understanding of how measured magnetic properties depend on particle size, shape, stress, and other physical characteristics. This knowledge is simultaneously being applied throughout the geosciences with the development of sensitive magnetic proxies of chemical and grain-size changes caused by tectonic activities, and climatic and environmental change.

### News from the Board on Earth Sciences & Resources of the National Research Council

The Board on Earth Sciences & Resources (BESR) is very pleased to have been given the opportunity to share information about BESR's activities and recent products in this newsletter. Their hope is that they might reach members of the broad Earth science community who may have an interest in providing feedback, contributing ideas, or otherwise helping the Board to inform and advise government decision making and policy on relevant Earth science issues. This article provides some basic information about the Board. In subsequent newsletter articles, BESR anticipates delving into more detail on one or another of the initiatives or projects the Board is undertaking.

BESR has had long-standing collaborative relationships with the National Science Foundation and other federal agencies and brings to these partnerships a depth of expertise through the Board membership and the Board's standing committees in earth resources, geological and geotechnical engineering, seismology and geodynamics, and the geographical and mapping sciences. The Board itself has a current membership of 18 professionals, who serve *pro bono* for terms of three years and whose expertise spans the spectrum of Earth sciences disciplines, and represents experience from academia, the private sector, and government service. More information about the Board can be found [here](#). To date this year, BESR and its committees have overseen the release of five National Research Council reports:

- [International Science in the National Interest at the U.S. Geological Survey](#)
- [Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future](#)
- [Induced Seismicity Potential in Energy Technologies](#)
- [Dam and Levee Safety and Community Resilience: A Vision for Future Practice](#)
- [Advancing Strategic Science: A Spatial Data Infrastructure Roadmap for the U.S. Geological Survey](#)

Additionally, the Board has collaborated with other units in the Academies who oversaw the release of the report [Disaster Resilience: A National Imperative](#). The Board has several [studies in progress](#), a number of which will be released in the remaining half of 2012 and early 2013. They will be engaging with the Earth science community through several meetings on high-profile topics in Washington, DC.

The [National Academies](#) include the [National Academy of Sciences](#) (NAS), [National Academy of Engineering](#) (NAE), [Institute of Medicine](#), and [National Research Council](#) (NRC), all of which are private, nonprofit institutions. The NRC, under which the Board resides, is the operating arm of the NAS and NAE. One of the Board's goals is to increase communication and engagement with the Earth science and resource community. The National Academies welcome your input through any of several lines of communication. Whether you friend them through [Facebook](#), or contact BESR Director Elizabeth Eide directly at [eeide@nsf.gov](mailto:eeide@nsf.gov) or 1-202-334-2392, BESR looks forward to continuing to provide you with information about their work and how they might engage with the Earth Sciences community in subsequent editions of this newsletter.

### Upcoming NSF Proposal Announcement Deadlines and Target Dates

You can find the full list of active GEO funding opportunities on the [Directorate for Geosciences website](#), but here are some programs particular interest to the EAR community:

[Petrology & Geochemistry](#): Proposal Window: December 6, 2012 - January 6, 2013

[Tectonics](#): Proposal Window: December 6, 2012 - January 6, 2013

[Small Business Technology Transfer Program Phase I \(STTR\)](#): Letter of Intent: January 8, 2013

[Geomorphology and Land Use Dynamics](#): January 16, 2013

[Geobiology and Low-Temperature Geochemistry](#): January 16, 2013

[Coastal SEES](#): January 17, 2013

[Hazards SEES](#): February 4, 2013

[Critical Zone Observatories \(CZO\)](#): February 5, 2013

[Instrumentation and Facilities \(IF\)](#): accepted anytime



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This newsletter is designed to share information about NSF's Division of Earth Sciences. If you have comments or questions, please contact [Dr. Shemin Ge](#) at [sge@nsf.gov](mailto:sge@nsf.gov).

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