EAR TO THE GROUND

Spring 2014

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

IN THE ISSUE

Homestake Gold Mine
Lead, SD
Image Credit: Rachel Thornton

EAR Transitions: EAR's New Acting Division Director

Paul Cutler

I begin by extending the Division of Earth Sciences' sincere thanks to Wendy Harrison for her work as Division Director and for her service to the Earth Sciences community. She has now returned to Colorado School of Mines, and we send our best wishes for a smooth return transition. Roger Wakimoto, NSF Assistant Director for Geosciences, asked me to act as Division Director while NSF begins the search for Wendy's successor. Having acted as Section Head for Surface Earth Processes last year, and being involved with the Geomorphology and

Land-use Dynamics (GLD) and Frontiers in Earth System Dynamics (FESD) programs for the past 3.5 years, I have had ample opportunity to work with all of my EAR colleagues. They are a dedicated team of more than 40 individuals with a diverse and deep experience of Earth Sciences and NSF. The Foundation will soon advertise the Division Director position, and we work towards a smooth transition of our own while continuing the positive momentum created during Wendy's tenure. In parallel, we inch towards solid information on the Earth Sciences budget for this fiscal year. Details will come in a subsequent issue.

Thinking Strategically in EAR, Former Division Director — *Wendy Harrison*

One of the most engaging challenges as a Division Director was thinking about how to position EAR strategically, both from intellectual and pragmatic perspectives. Like me, some of you have been involved in one way or another with strategic planning activities in higher education, or within research organizations of various sizes. However, thinking and planning strategically within NSF was a different affair so I'd like to share some of my insights on the process and outcomes.

The National Science Foundation has a single strategic plan, *Empowering the Nation Through Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2011-2016*. As operational units, the Geosciences Directorate and Earth Science Division align with this plan as an overarching and guiding document. The NSF Advisory Committee for Geosciences and Assistant Director Dr. Roger Wakimoto are updating *GEO Vision* to reflect new opportunities and challenges. At the American Geophysical Union Town Hall on 12/9/13, Dr. Wakimoto provided 5-year vision "imperatives" and "frontiers" for the Geosciences Directorate.

EAR needs to be responsive to community-sourced ideas that are pushing the frontiers of our disciplines. Input from the community comes in many forms – informal and formal, including workshops, community organizations, thematic sessions at meetings, discipline-based grand challenge reports, and the expert reports we sponsor from the National Research Council. Ideas also come from the program officers at NSF who can synthesize emerging concepts because of their exposure to a broad spectrum of proposals and interactions with their colleagues. The Division Directors gather from the cross-Foundation and interagency partnering that is part of their position responsibility. GEO is working to synthesize these various inputs in a systematic and logical framework to describe imperatives & frontiers over a 5 year span.

Perhaps lesser known input into EAR strategic thinking comes through the offices of the White House including the Office of Science and Technology Policy (OSTP) and the Office of Management and Budget (OMB). The annual unveiling of the President's Budget Request to Congress lays out Agency priorities: these have been developed through an iterative process typically involving NSF's Director and Assistant Directors, informed by dialog with OSTP and OMB. The Administration's input is on a well-defined annual cycle reflecting the Nation's priorities. OSTP and OMB Science and Technology Priorities for the FY 2015 Budget identify needs relevant to earth science. Their memo includes directives such as:

> *Help the Nation become more resilient to natural and technological disasters...enhancing the **understanding of the natural processes that produce hazards**, developing better hazard mitigation strategies and technologies, reducing the vulnerability of interdependent critical infrastructure, improving assessments of disaster resilience, and promoting risk-informed behavior.*

November 2013, Executive Order – Preparing the United States for the Impacts of Climate Change identified additional priorities in the geosciences:

> *Including…excessively high temperatures, more heavy downpours, an increase in wildfires, more severe droughts, permafrost thawing, ocean acidification, and sea-level rise…encourage investments, practices, and partnerships that facilitate increased resilience to climate impacts, including those associated with extreme weather*.

The National Science Foundation and the other Federal agencies respond to these priorities according to their individual missions. You can read the President's Budget request to Congress when it becomes public later this spring to see how the geosciences will respond.

I provide you with this insight into the various input streams into NSF because it provides clarity into the origin of many cross-Directorate research initiatives and identifies engagement opportunities for EAR within the bigger role and mission of the National Science Foundation.

The GEO Directorate is developing a draft plan to identify "imperatives" in Research, Diversity & Education, Cyberinfrastructure, and Facilities/Logistics and "frontiers" where NSF will make investments as funding allows. EAR encourages you to provide input into the Directorate's draft document when it is posted on the Geosciences webpage and through ongoing conversations with your POs.

In a parallel manner, EAR is working on behalf of, and in consultation with the community to identify *Imperatives* and *Frontiers* that align with GEO but also identify initiatives focused on earth science needs. During my time as Division Director, I found two recent National Research Council expert reports to be useful in guiding strategic thinking: New Research Opportunities in the Earth Sciences and Challenges and Opportunities in the Hydrologic Sciences. These are thoughtful documents produced by experts who distill, analyze, and synthesize the broad fields of earth science that the Division supports. Neither sets priorities, yet both provide sufficient input to enable new directions to be identified according to the budget flexibility EAR has.

If one objective of strategic thinking is to inform investment, the ability of the Division to articulate its science priorities is never more critical than in the recent budget-limited environment. With modest funding, NSF has the capacity to support workshops and small awards that continue to catalyze emerging initiatives: when new funding becomes available we are thus prepared to take action. Strategic thinking is indeed an engaging challenge!

Broader Impacts- Examples from the Ground

Justin Lawrence

In collaboration with EAR program directors, we have compiled a great list of examples of broader impacts that we will share with you in coming issues of *EAR to the Ground*. These examples range in scope, audience, and approach. However, they share some common traits: engaging relevant partners during the planning of the activity, implementation focused on the audience, and follow up activities. These examples include broader impacts activities related to outreach to the scientific community, undergraduate education, instrumentation, international collaborations, broadening participation, K-12 education, informal science education, and applications of research results. Our intent is not to have all the broader impacts in EAR look alike, but to have the broader impacts be as well informed, planned, and executed as the research projects.

Broadening Earth Science Participation with International Collaboration and Storytelling

Award Number: 1124303
Collaborative Research: Testing Himalayan tectonic and erosional history via chronostratigraphic correlation between the Lesser Himalaya and Indian craton
PI: Nigel C. Hughes, University of California-Riverside

Research: This Sedimentary Geology & Paleobiology award was made to conduct research on stratigraphic relationships between rocks of comparable depositional age in different locations in India.

Broader Impact Activity: Two undergraduate students from historically underrepresented groups in the sciences travelled with the PI to India where they helped distribute a children's book "Monisher Pathorer Bon" (Monisha and the Stone Forest) that was published in collaboration with the Geological Society of India. It is written on the subject of fossilization and understanding life in the past. The story describes the quest and adventures of Monisha, a young teenage girl from rural West Bengal, India, to unravel the truth of fossilized stones. Through a process of rational observation (i.e., the scientific method), Monisha eventually finds the answer to how trees turn into stone. The book is available in both the English and Bengali language.

Illustration from children's book "Monishar Pathorer Bon" (Monisha and the Stone Forest)

Implementation: Undergraduate students helped distribute the book and gave educational presentations in the Bengali language to 16 different schools, madrasehs, and learning centers. They distributed over 2000 copies of the book to schools in rural Paschim Banga (West Bengal), India, and an additional 1000 copies through teachers unions and organizations that promote science education in the state. Several hundred copies were also distributed in Bangladesh partly with the help of the American Center.

Impact: This activity benefits society through its international collaboration promoting the scientific method and the high quality mentorship of two undergraduate students, which gave them skills that will help them succeed in their careers. Moreover, the selection of these students broadened the participation of underrepresented groups in science, which is important for ensuring that a diverse set of worldviews is represented in the future scientific workforce.

More info on YouTube and Facebook
https://www.youtube.com/watch?v=ggw0RCj2oHo
https://www.facebook.com/groups/420004054701487/

CZO Awards: Four New Observatories

Enriqueta Barrera

NSF has recently awarded an additional four Critical Zone Observatories (CZOs), expanding the network to a total of ten operating observatories that address pressing interdisciplinary scientific questions concerning geological, physical, chemical, and biological processes and their couplings that govern critical zone system dynamics. This zone spans from the top of the vegetation to the base of weathered bedrock and provides most of the ecosystem services on which society depend. The CZO network is an infrastructure for research available to the scientific community. Scientists and educators interested in working with any of the sites can contact the site's Principal Investigator and apply to NSF programs for funding. Information about the

network and individual sites is available at www.criticalzone.org. Take a look at the map below to see our newly expanded CZO network. Watch this short video introduction to the CZO Project to learn more! Read more about the network in *"Discoveries in the Critical Zone: Where Life Meets Rock"*

Current CZO sites: New Sites are indicated with yellow stars, and existing in red.

New CZOs appear yellow; Full NSF Press Release about New CZOs can be found on our webpage

UAV Flight Opportunities

Robert Dahlgren, Cal State University, Monterey Bay

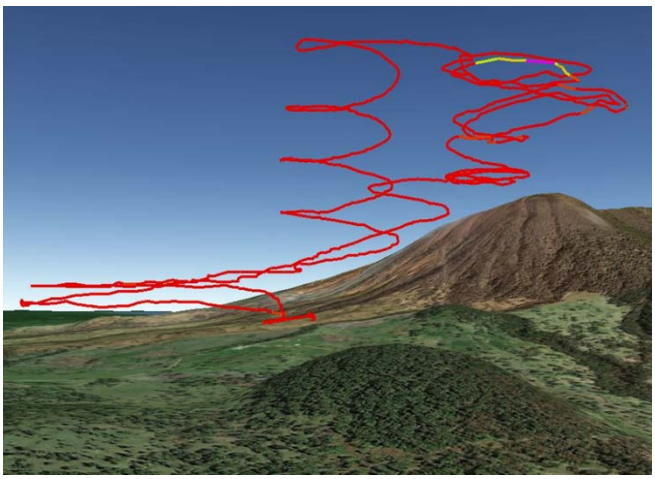
The Ames Research Center (ARC) in Mountain View, California is the lead for small and medium sized Unmanned Airborne Vehicle (UAV) science at National Aeronautics and Space Administration NASA. The ARC Airborne Science Program's current fleet consists of the medium class SIERRA, with a wingspan of 20 ft (6 m) and the small RQ-14 DragonEye manufactured by Aerovironment Corporation. The DragonEye is a category I UAV (under 55lbs) and along with their ground stations and support equipment are sometimes referred to as a Small Unmanned Aircraft System (sUAS), and are being repurposed for science experiments.

Repurposed DragonEye UAV showing the SO_2 sensor (side), barometric pressure, temperature, and humidity sensors (front) used at Turrialba, Costa Rica. Photo credit: Justin Linick, JPL

These assets are currently available to support a variety of experiments for NASA-funded researchers but can also be available to NSF researchers. The Dragon Eye has a modular design which makes it particularly convenient for integration of miniature sensing systems: The empty nose subassembly can be shipped to your facility for instrument installation and returned to ARC for flight testing at one of our test ranges prior to deployment.

One example of a science campaign that takes advantage of this unique approach is a 2013 mission in collaboration with JPL and the University of Costa Rica to measure volcanic plume gases at the Turrialba volcano in Costa Rica. In this case the modified nose assembly housed an instrumentation package including a sulfur dioxide sensor developed at Caltech/JPL and a thermal infrared camera. The sUAS demonstrated capability to measure volcanic plume gases while aloft over the summit crater and volcano flanks, at approximately 12,500 feet (3,810 meters) above sea level.

The figure shows the modifed DragonEye nose and data obtained during one flight. The color of the flight path indicates the concentration of SO_2 detected, with red indicating baseline levels and purple indicating the maximum concentration of SO_2 gas observed, approximately 7 parts per million by volume. This mission provided in situ validation and calibration of remotely sensed volcanic emission data and models.



DragonEye Unmanned Aerial System (UAS) mission flight track (red) above Turrialba Volcano, Costa Rica, 12 Mar 2013. The multi-colored part of the flight track highlights the presence of SO_2 as the aircraft intercepted the volcanic plume emanating from the summit vent. Photo Credit: Google Earth™

ARC is also pursuing acquisition of eight additional medium-sized Viking 400, manufactured by L-3 UAVs. These were donated by the U.S. Navy and are being converted from military use, and will be available for science missions in early 2015.

Our new science platforms will enable ARC to collaborate with you on your project. For more information on NASA's Airborne Science Program, refer to the program website https://airbornescience.nasa.gov/. Requests to propose to use NASA aircraft can be submitted using the "Flight request" link or simply going to https://airbornescience.nasa.gov/sofrs

For more information, please contact matthew.m.fladeland@nasa.gov

The Crafoord Prize in Geosciences 2014, Dr. Peter Molnar

Leonard Johnson

The Royal Swedish Academy of Sciences (RSAS) has awarded the Crafoord Prize in Geosciences 2014 to Peter Molnar, University of Colorado "for his ground-breaking contribution to the understanding of global tectonics, in particular the deformation of continents and the structure and evolution of mountain ranges, as well as the impact of tectonic processes on ocean-atmosphere circulation and climate".

The Crafoord Prize, one of the most prestigious honors in science, is awarded by the Royal Swedish Academy of Sciences, the same body that awards the Nobel Prizes. It covers research in fields of science not addressed by the Nobels, including astronomy and mathematics, geosciences, biosciences and polyarthritis.

In recognizing Molnar, the RSAS said, "The Laureate focused his investigations on southern Asia and the collision between India and Eurasia, a process that began 50 million years ago and continues today, involving frequent major earthquakes in the Himalayas and Tibet." Most of this research has been funded by EAR. More recently, with funding from EAR and Atmospheric and

Geospace Sciences, Molnar has focused on the upward and outward growth of eastern Tibet and how that might have affected Asian climate, and specifically, the South Asian monsoon.

For more information see:
http://www.crafoordprize.se/press/arkivpressreleases/thecrafoordprizeingeosciences2014.5.bc93e6614373c935089a3.html

Abrupt Impacts of Climate Change: Anticipating Surprises *Rich Lane*

The National Research Council recently sponsored a study of Abrupt Impacts of Climate Change, which the Sedimentary Geology and Paleobiology Program at NSF co-sponsored with National Oceanic Atmospheric Administration (NOAA) and other U. S. agencies. A publication with the above title has been recently issued and can be accessed at www.national-academies.org. A brief summary of the publication follows.

Both abrupt changes in the physical climate system and steady changes in climate that can trigger abrupt changes in other physical, biological, and human systems present possible threats to nature and society. Abrupt change is already underway in some systems, and large scientific uncertainties about the likelihood of other abrupt changes highlight the need for further research. However, with recent advances in understanding of the climate system, some potential abrupt changes once thought to be imminent threats are now considered unlikely to occur this century. This report summarizes the current state of knowledge on potential abrupt changes to the ocean, atmosphere, ecosystems, and high latitude areas, and identifies key research and monitoring needs. The report calls for action to develop an abrupt change early warning system to help anticipate future abrupt changes and reduce their impacts.

Upcoming Workshops Organized by InTeGrate and On the Cutting Edge *Lina Patino*

Getting the Most out of Your Introductory Courses *Virtual Workshop*
March 10-12 and March 17-18, 2014
Accepting late applications!

All On the Cutting Edge workshops:
http://serc.carleton.edu/NAGTWorkshops/workshops.html

All InTeGrate workshops:
http://serc.carleton.edu/integrate/workshops/index.html

5,6,7,8 How To Keep Your Due Dates Straight *David Fountain*

With the recent migration of the project report system from FastLane to Research.gov and the significant changes in the project report format, it seems an appropriate time to remind awardees about some important aspects of the annual and final project reports.

Annual and final project reports should address progress in all activities of the project, including any activities intended to address the Broader Impacts criterion that are not intrinsic to the research. **Annual and final reports are not cumulative** and should be written specifically for the most recently completed budget period, which is listed in Research.gov. The final report is actually the final annual report.

Due dates:
Annual project reports are due 90 days ***prior*** to the end of the current budget period and become overdue ***after*** the 90 day period ends.

Final project reports are due within 90 days ***following expiration*** of the award and are overdue the day ***after*** the 90 day period ends.

For example, an award with a start date of 2/1/12 has the following reporting periods, due dates, and overdue dates:

Reporting period	Type	Due Date	Overdue Date
2/1/12 - 1/31/13	Annual	11/2/12	2/2/13
2/1/13 - 1/31/14	Annual	11/2/13	2/2/14
2/1/14 - 1/31/15	Final	2/1/15	5/2/15

An overdue project report will block processing of any new award actions, funding increments for continuing awards, and administrative actions (e.g., no cost extensions, award transfers, PI replacements, etc.) that the PI or any CoPI is associated with.

The Research.gov report system sends e-mail reminders to the PI, CoPI, and their sponsored projects office when reports become due and overdue. Further details about the annual and final project reports as well as the project outcomes report can be found in Chapter II of the NSF Award & Administration Guide (NSF 14-1).

Sharing and Co-Review of Proposals Submitted to EAR programs *Sonia Esperanca*

Investigators commonly ask us what they should do if they think their proposal fits between two or more programs at NSF. Many are also concerned that a proposal that is co-reviewed will suffer double jeopardy and have a lower chance for success if more than one panel evaluates it. On the latter point, a recent evaluation of the success rate of co-reviewed proposals at NSF showed that they have a higher and not lower success rate than proposals submitted and reviewed in one program only. There are a number of reasons why that could be the case. For instance, a proposal that falls on the border between programs tends to be one that appeals to more reviewers and panelists because it is interdisciplinary and novel. Second, if two or more Program Directors of distinct programs agree that the proposal is appealing to more than one disciplinary audience and they agree to co-review, they are also partly committed to following-up on the promise of sharing the costs of the budget, should the proposal be deemed competitive for support. Thirdly, Program Directors are interested in broadening their portfolio of research topics. Sharing in the review and funding of a cross disciplinary proposal is a good way of extending the intellectual boundaries of the disciplinary science.

What can investigators do if they are unsure of where the proposal fits or if it should be co-reviewed between programs? We encourage investigators to do a bit of homework before submitting the proposal via FastLane. The NSF website (http://nsf.gov/awardsearch/) has a variety of search modules that allow the external community to query topics, word associations, and awards recently made by any program. If it is still unclear to which program/s to submit, the best plan of action is to communicate with their associated Program Directors. Once the proposal is submitted, Program Directors will also discuss internally whether a project would be better accepted or better reviewed in one program or another, or if the feedback from both panels may be required for a more thorough evaluation of the proposal. Program Directors may weigh a number of factors such as the history of both the proposal and the PI, the likelihood that the results will impact the science in their disciplinary communities, the novelty of the approach, and the composition of their panel. Sometimes, the best panel experts for a particular project may be in a different program. In EAR, a sizeable number of projects are co-reviewed and

funded between programs. The list of awards downloaded from the NSF award search website also has the names of the programs that contributed to the funding of the project.

Instrumentation & Facilities: GAGE

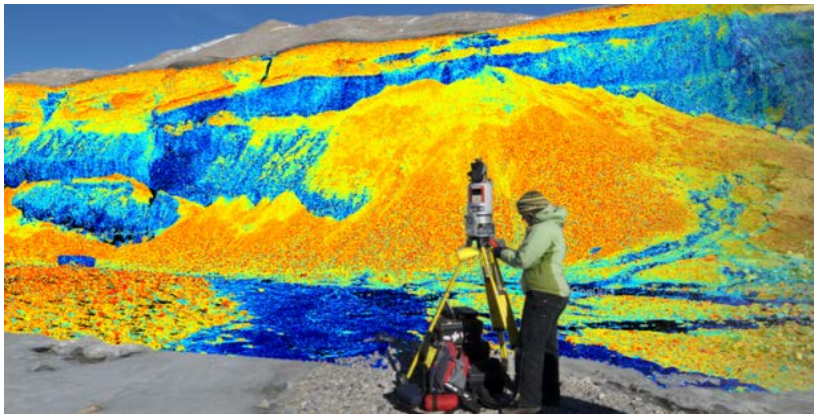
Russ Kelz

The Instrumentation & Facilities Program of the Division of Earth Sciences (EAR/IF) supports eighteen (18) 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 guide to multi-user facilities here. In this issue, we highlight terrestrial laser scanning support from the UNAVCO GAGE Facility.

UNAVCO, a non-profit university-governed consortium, facilitates geoscience research and education using geodesy. The GAGE (Geodesy Advancing Geosciences and EarthScope) Facility is the primary operational activity of UNAVCO and exists to support university and other research investigators in their use of geophysical sensor technology for Earth sciences research. The GAGE Facility performs this task by providing state-of-the-art geodetic instrumentation, ancillary equipment, and field engineering support for projects; installing, operating and maintaining continuous GNSS/GPS networks globally; undertaking new technology development and evaluation of commercially available products for research applications; and by archiving geophysical sensor data and data products for future applications. UNAVCO-supported projects span the breadth of Earth Science (in both the Deep and Solid Earth Processes Sections of EAR), Polar Programs (PLR), as well as interdisciplinary applications that include Atmospheric and Geospace Sciences (AGS).

Terrestrial Laser Scanning (TLS) is a new, versatile geodetic imaging technology in the Earth sciences. TLS, also known as ground-based lidar (light detection and ranging), offers unprecedented sub-centimeter-resolution of topographic and other surfaces, including 3-dimensional imagery of topography, rock or ice outcrops, caves, trees and vegetation, and cultural objects. TLS instruments are extremely precise, reasonably portable, relatively easy to operate, and have been used successfully in a variety of environments to support a wide range of geoscience investigations including detailed mapping of fault scarps, geologic outcrops, fault-surface roughness, frost polygons, volcanoes, lava lakes, dikes, fissures, glaciers, columnar



UNAVCO Field Engineer Marianne Okal performing a terrestrial laser scan in the Garwood Valley, in the McMurdo Dry Valleys, Antarctica. Overlain on the photograph is the TLS scan data colored by return intensity. Cool colors are low return intensity due to melting ice exposed in the outcrop. Publication: Levy, J.S. et al. Accelerated thermokarst formation in the McMurdo Dry Valleys, Antarctica. Sci. Rep. 3, 2269; DOI:10.1038/srep02269 (2013)

joints, hillslopes, and drainage morphology. Moreover, repeat TLS surveys allow the imaging and measurement of surface changes through time, arising, for example, from fluvial erosion or landslides, volcanic deformation, ice flow, beach morphology transitions, and post-seismic fault slip. TLS is applicable to problems with length scales from the 10s of meters to kilometers. Concurrent GPS measurements are used to georeference the TLS data in absolute 3D coordinates. Coincident high-resolution digital photography allows for the generation of photorealistic 3D images.

The Earth sciences have embraced the application of TLS in many facets of research and education. UNAVCO provides a pool of TLS instrumentation and trained staff to make TLS technology more easily accessible to the Earth science community. UNAVCO is also a nexus for community activities such as workshops, short courses, and education and outreach efforts on multiple scales.

Since 2008, UNAVCO has supported more than 150 TLS field projects, community training courses, and education and outreach activities.

UNAVCO GAGE TLS Support Resources

The UNAVCO TLS instrument pool consists of five scanners: one Leica ScanStation C10, two Riegl VZ400s, one Riegl LMS-Z620, and a Riegl VZ1000. Another Riegl VZ400 is shared on a half-time basis with Central Washington University. This pool of TLS instruments provides a suite of capabilities in terms of instrument range (10cm to 2km), size and portability, scan speed, field of view, and multi-return and full waveform data capture. This diversity of instruments allows UNAVCO to support a wide range of Earth science applications.

In addition to instrumentation, UNAVCO provides trained field engineering staff to support TLS data collection in the field, data processing, management, and archiving. The standard UNAVCO deliverable is a *merged, aligned, georeferenced point cloud*, which is accompanied by pertinent metadata products such as site photos, meteorological information, field notes and other ancillary project information. An online TLS data archive is under development, and all data will be freely available to the public consistent with UNAVCO's open data policy.

UNAVCO GAGE TLS Education and Outreach

In order to address the Earth science community's interest in TLS technology and applications, UNAVCO organizes several short courses per year. For example, six consecutive *Introduction to TLS* short courses taught by UNAVCO staff at the Geological Society of America annual meeting have been sold out.

UNAVCO has also pioneered the use of TLS at geologic field camps. Over the past several years, UNAVCO has developed a growing program that involves bringing TLS systems to geology field camps throughout the West. In 2013, UNAVCO supported four geology camps and one graduate seminar class with TLS instrumentation, giving nearly 100 students the opportunity to design a TLS survey, operate the instruments, process data, and make geologic analyses using the high-

Dr. Bruce Douglas (right) of Indiana University partners with UNAVCO by offering a summer geophysics field course "G429 Field Geology In the Rocky Mountains" in SW Montana where students operate a UNAVCO Riegl VZ400 TLS system

resolution 3D datasets. The TLS and education program has been quite successful, growing annually, and nicely complements more traditional methods taught during field courses.

Please contact Christopher Crosby (crosby@unavco.org), UNAVCO Geodetic Imaging Project Manager, for information about TLS project support, training and education.

Upcoming Deadlines and Target Dates

EarthCube
(NSF 13-529) Full Proposal Deadline: March 12, 2014

Innovation Corps Teams Program (I-Corps Teams)
(NSF 12-602) Full Proposal Deadline: March 17, 2014

Catalyzing New International Collaborations (CNIC)
(NSF 13-605) Full Proposal Deadline: April 22, 2014

Genealogy of Life (GoLife)
(NSF 14-527) Full Proposal Deadline: March 26, 2014

Sustainability Research Networks Competition (SRN)
(NSF 14-534) Full Proposal Deadline: April 29, 2014

Instrumentation and Facilities
Full Proposals Accepted Anytime

The revised version of the NSF Proposal & Award Policies & Procedures Guide (PAPPG), NSF 14-1 is effective for proposals submitted, or due, on or after February 24, 2014.

@NSF_EAR : Earth Science news from the Division and beyond
@NSF : News and highlights from all directorates at NSF
@EarthScopeInfo : News, updates, and fun facts from the EarthScope Office
@GeoPRISMS : News and updates from the GeoPRISMS Office

The Division of Earth Sciences
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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.

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