NATIONAL SCIENCE FOUNDATION

Advisory Committee for Geosciences Directorate

(AC-GEO)

April 13-14, 2011

Room 1235, Stafford I

 MINUTES

Members Present:

Dr. Louise H. Kellogg, Geology Department, UC-Davis, Chair, AC-GEO

Dr. M. Lee Allison, State Geologist and Director, Arizona Geological Survey, Tucson, Arizona

Ms. Vicki Arroyo, Executive Director, Georgetown Climate Center, Georgetown Law, Wash., D.C.

Dr. Jillian Banfield, Dept. of Earth and Planetary Science, UC-Berkeley

Dr. Donald J. De Paolo, Director, Center for Isotope Geochemistry, Professor of Geochemistry, Dept. of Earth and Planetary Science, UC-Berkeley; Director, Earth Sciences Division, Lawrence Berkeley National Laboratory

Dr. Douglas E. Erwin, National Museum of Natural History, Smithsonian Institution, and the Santa Fe Institute

Dr. Steven D. Gaines, Dean, Bren School of Environmental Science & Management, UC-Santa Barbara [via phone]

Dr. George M. Hornberger, Director, Vanderbilt Institute for Energy and Environment, Vanderbilt University

Dr. M. Susan Lozier, Nicholas School Faculty, Dept. of Earth and Ocean Sciences, Duke University [via phone 4/13 only]

Dr. Norine E. Noonan, Vice Chancellor, Academic Affairs, University of South Florida, St. Petersburg

Dr. Walter A. Robinson, Dept. of Marine, Earth and Atmospheric Sciences, NC State University

Dr. Andrew A. Rosenberg, Senior Vice President for Science and Knowledge Conservation International, Arlington, Virginia

Dr. David S. Schimel, Principal Investigator and CEO, NEON, Inc., Boulder, CO

Dr. John T. Snow, National Weather Center, University of Oklahoma

Dr. Brian Taylor, Dean, School of Ocean and Earth Science and Technology, University of Hawai’I at Manoa

Dr. Orlando Taylor, President, Washington D.C. Campus, The Chicago School of Professional Psychology [via phone 4/13 and present 4/14]

Members Not Present:

Dr. Daniel N. Baker, Director, Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder

Dr. Margaret L. (Peggy) Delaney, Professor of Ocean Sciences, Ocean Sciences Department, UC-Santa Cruz

Dr. Joseph S. Francisco, Dept. of Chemistry, Purdue University

Dr. Roberta L. Rudnick, Department of Geology, University of Maryland

Dr. Harlan Spence, Director, Institute for the Study of Earth, Oceans and Space, University of New Hampshire

Dr. Lonnie G. Thompson, Byrd Polar Research Center, The Ohio State University

GEO Staff Present:

Dr. Tim Killeen, Assistant Director, GEO

Dr. Margaret Cavanaugh, Deputy Director, GEO

Dr. Jill Karsten, OAD

Dr. Robert Detrick, Division Director, Earth Sciences

Dr. Michael Morgan, Division Director, Atmospheric and Geospace Sciences

Dr. David Conover, Division Director, Ocean Sciences

Dr. Pam Stephens, OAD

Mr. William Smith, Staff Associate for Budget

Ms. Elizabeth Zelenski, Staff Associate, OAD

Dr. Maria Uhle, Senior Staff Associate for International Science Affairs, OAD

Ms. Melissa Lane, Executive Secretary, AC-GEO

Dr. Cliff Jacobs, OAD

Dr. Eva Zanzerkia, EAR

Dr. Rita Teutonico, SBE

Dr. Greg Anderson, EAR

Dr. David Lambert, EAR

Capt. Bob Houtman, OCE

The meeting of the Advisory Committee for Geosciences Directorate (GEO) was held April 13-14, 2011, at the National Science Foundation in Arlington, Virginia.

**Wednesday, April 13, 2011**

**Welcome and Introductory Remarks**

The meeting was called to order at 8:38 a.m., by Dr. Louise Kellogg, Chair, AC-GEO. Dr. Kellogg welcomed all those present in the room, as well as the three AC-GEO members participating by phone, and she thanked Ms. Melissa Lane, Executive Secretary for AC-GEO, for her help in handling all meeting arrangements, particularly in light of the logistical challenges posed by the timing of this meeting. She invited all members present or attending by phone, as well as all NSF staff and visitors, to make brief self-introductions.

After a few preliminary administrative remarks, Dr. Kellogg noted the many geological and natural, as well as human, events that have occurred in the past year have highlighted the importance of the geosciences for society and give context for the Committee’s work.

She briefly previewed the agenda for the next day-and-a-half and then invited Dr. Tim Killeen, Assistant Director for GEO, to give his presentation on the state of GEO.

**The State of GEO, Dr. Tim Killeen, AD, GEO**

Dr. Killeen’s overview highlighted the following:

* GEO is both a healthy and engaged directorate:
	+ One measure of success is the rate of proposals that get funded. 30 percent plus success rate of proposals funded makes it worthwhile for PIs to submit their best ideas.
	+ GEO has been heavily involved in writing National Ocean Policy.
	+ **Requests AC interaction with program officers generally because they are the strength of geosciences and shape the intellectual future of geosciences.**
* GEO is only directorate with a strategic plan: Geovision.
	+ Mission is to understand more deeply the complex planet and its interactions.
	+ Challenge is to be even more interdisciplinary in the future.
* GEO has responded to the Strategic Plan goals and vision in four subcomponent areas: (1) international; (2) education and diversity; (3) data and informatics; and (4) facilities.
	+ Paired teams of program offices and subgroups of the AC are developing strategic “planlets” in the four areas.
	+ Each major division of GEO also has strategic planning process.
	+ All are linked to Geovision and NSF Strategic Plan.
	+ **Requests AC-GEO members to communicate with the community re these strategic plans and resultant documents as a way to foster greater community engagement with the agency.**
* NSF, and GEO, are part of the executive branch, and thus reflect administration priorities: emphases on innovation, clean energy and climate science.
* Examples of GEO engagement in supporting NSF mission of promoting national prosperity and science and technology are:
	+ USGCR program. $2.6 billion annually, 13 agencies. Program seeks to coordinate agencies across the government in understanding global change. A ten-year strategic plan document which will lay out federal government plan for global change research will be on Web site soon.
	+ International engagement. (1) Belmont Forum. Dr. Killeen co-chairs this group, which was set up two years ago and is focusing now on efforts to co-align/co-design research solicitations across international space recognizing commonality of interests of member countries. (2) ICSU. New 18-member transition team appointed to manage the design and rollout of ten-year initiative in global environmental sustainability to be presented at Rio Plus 20.
	+ Partnerships. GEO maintains important partnerships with NOAA, NASA, USGS, USDA and DOE and others, as well as a new one with European Commission’s Directorate for Environmental Research Infrastructures. **Requests AC help in prioritizing partnerships which have the most critical activities for GEO’s involvement looking forward.**
* FY12 Budget Request reflects return to doubling track. Request for $979 million. An AC member asked whether Congress has signaled its comfort level with areas of emphasis proposed by GEO? Dr. Killeen responded there have been both “probing” and “supporting” questions from Congress.

Major proposed investments in FY12 include:

* SEES (Science, Engineering and Education for Sustainability). Agency-wide initiative looking at environment-economy-energy nexus. Over ten percent of NSF funding base.

GEO has two foci in the SEES Initiative: (1) Sustainability Energy Pathways; and (2) Sustainability Research Networks (SRNs). SRNs will begin as RCNs (Research Coordination Networks) that will ultimately build towards a knowledge system that supports the entire SEES portfolio. **As there is funding available this year to fund RCN proposals to support groups of investigators to communicate and coordinate to seed SRNs, Dr. Killeen requests AC input on how to engage the community.**

Dr. Erwin asked if GEO is planning collaborative involvement with SBE? Dr. Killeen responded that SEES engages all parts of the organization.

* CIF21 (Cyberinfrastructure Framework for 21st Century Science and Engineering). Agency-wide initiative designed to be the next generation cyberinfrastructure. Challenge is a “sea of data” exits that must be “navigated.”
* CaMRA (Creating a More Resilient America). $10 million GEO-wide program. **Dr. Killeen requests Committee input on this program as formal solicitations are being prepared for the FY2013 budget discussion.**

Dr. Robinson asked will CaMRA go forward without the increased budget requested? Dr. Killeen responded there is commitment to all of the above- described programs and a way will be found to support them cross-divisionally.

* Continuing investments in Basic Research, Education and Diversity, and Infrastructure. GEO has particular commitment to infrastructure investments in (1) Ocean Observatories Initiative; (2) construction of Arctic Research Regional Vessel SIKULIAQ; (3) NCAR/Wyoming Supercomputing Center; (4) Alvin upgrade; and (5) construction of three new Regional Class Research Vessels.

**Dr. Killeen requests that the Advisory Committee challenge GEO to do more to promote CAREER awards and GRFs.** Dr. Snow suggested that you need to advertise this opportunity to the right audience; you need a proactive department head. Dr. Noonan suggested doing a “road show,” and putting up a tutorial with examples of successful CAREER proposals.

There is agreement that a diversity crisis and curriculum challenges exist. The role of earth sciences in K-12 is one problem area. Poor teacher preparation exists and there is need to raise the visibility and stature of earth sciences. There is a new internal group in GEO looking into the areas of retention of undergraduates and teacher preparation.

* Another new program in GEO is a partnership with EHR to establish a STEM STEP (STEM Talent Expansion Program) Center, which will be a five-year center with the goal to increase the number of STEM and non-STEM students enrolled in undergraduate courses and educating students about essential earth system sciences.
* **Dr. Killeen requests input from the Advisory Committee on merit review criteria, the focus of the NSB Task Force on Merit Review, and he stated comments can be made directly to Dr. Suresh or through the open Web site.** He noted there are two merit review criteria which were established in 1997 by the NSB: intellectual merit and broader impacts. The task force has been exploring the strengths and weaknesses of the criteria. Dr. Killeen stated pervasive confusion exists about how the review criteria are applied in panels and adopted by institutions and PIs, and he noted the role of the institution is likely to be a large component of a new recommendation.
* Re staff surveys, Dr. Killeen stated since the last AC meeting, action teams have been formed to respond to the five areas of particular concern to staff: (1) promoting a respectful workplace; (2) improving communication; (3) improving performance management; (4) bringing staff’s voice more clearly and earlier into strategic decision-making; and (5) improving transparency of decision-making regarding initiatives.

Some efforts taken to address the areas of concern include: articulating a statement of workplace values; revising management structure to replace management teams with leadership teams, which will improve bidirectional communications; utilizing ad hoc working groups; holding more town hall meetings; mandatory training for supervisors; and emphasizing professional development.

* Dr. Killeen congratulated Dr. Banfield, a new member of the Advisory Committee, for being the recipient of the 2011 L’Oreal-UNESCO Women in Science Award.
* In conclusion, Dr. Killeen noted there were a number of new staff in the directorate, **and he stated because GEO is committed to sustainable practices itself and not just studying sustainability, any ideas the Committee has to further that goal would be appreciated.**

Dr. Kellogg thanked Dr. Killeen for his presentation and offered the Committee members opportunity for questions and comments, to which NSF staff responded as follows:

* Dr. Snow asked about the status of A-10 aircraft. Dr. Morgan responded a Memorandum of Agreement has been signed with the Navy for management of the aircraft and once budget issues are resolved, it should move forward in the next month or so.
* Dr. De Paolo commented that he viewed the CAREER program proposal requirements as onerous and a distraction to young people trying to get tenure. He suggested that it be rewritten and limited to two requirements: a focus on research and just one other specific requirement. He also stated the overreaching issue is a problem with Science Centers. Dr. Killeen agreed that sometimes the process does overburden people and that this is a subject that needs more analysis.

Dr. De Paolo also asked how will performance evaluation be affected during the next two years when merit increases will not be allowed? In response, Dr. Killeen described other ways to support staff, such as additional professional development/training and job characterization changes, while still adhering to federal government regulations.

* Dr. Noonan noted that in public universities, there is emphasis on credit hour production, and she inquired what is the NSF metric for determining success on diversity? Dr. Karsten responded that the Education and Diversity Strategic Framework, which was established in fall 2010, has identified two goals: (1) increasing public literacy in the earth system sciences; and (2) preparing the workforce. For workforce, the metric is number of degrees, advanced degrees, in the geoscience subdisciplines, and she noted there is anecdotal evidence of increased number of minorities getting master’s degrees and some Ph.D.s. It is harder to get understanding of the public literacy aspect within underrepresented communities, but work is ongoing to define some program/portfolio metrics.
* The positive life-changing effects of mentoring students from underrepresented communities was extolled by Dr. Arroyo.

Dr. Arroyo then asked Dr. Killeen how the research vessels are used in events such as the recent oil spill and how their value can best be articulated to the community? Both Dr. Killeen and Dr. Conover responded, explaining how investigators can quickly go out in the field in response to a catastrophe through the use of the RAPID grant mechanisms. GEO funding has been utilized for recent hazards very effectively because the program officers know the community and who can respond and who can evaluate things quickly.

* Dr. Brian Taylor asked about the “culture clash” that results from an implementation of programs in the disciplines by the offices and the interdisciplinary vision for the directorate. Dr. Killeen stated it is not seen as a culture clash within GEO, but more a balancing of effort, and although there is the added burden of crossing lines and working together across disciplinary boundaries, program officers are able to do that. There has been some collocation of program officers in the GEO/BIO to achieve interface. He noted because GEO is naturally interdisciplinary, it has performed well and is leader in the agency on interdisciplinarity.
* Dr. Hornberger asked the status of the new program, FESD (Frontiers of Earth System Dynamics). Dr. Detrick responded it’s a GEO-wide program that’s designed to support larger interdisciplinary teams of investigators working on problems that are potentially transformative at the really cutting-edge of geosciences. 60-70 preliminary proposals were received, and approximately 30 were invited to submit full proposals. These will be panel-reviewed in May. Awards totaling $24 million will be made with FY11 and FY12 funding. Dr. Killeen noted that FESD was a direct outcome of the discussions of this Advisory Committee.

Dr. Kellogg thanked everyone for the discussion, and the Committee then took a brief break before considering the next agenda item.

**Preparation for Meeting with the Director**

Dr. Kellogg stated the following as main topics to be discussed with the Director: (1) SEES; (2) international work; (3) interdisciplinary work; (4) cyberinfrastructure; and (5) diversity and workforce development. She then opened the floor for discussion on additional topics members would like to discus with Dr. Suresh. Two other areas suggested were clean energy as it relates to collaboration with different agencies and the status of partnerships with other agencies. The members also requested guidance from Dr. Killeen as to what type of advice would be helpful to the new Director? Dr. Killeen stated topics might include those related to: international; interdisciplinary; effective management of facilities; communication, both internal and external; diversity and family-friendly suggestions; and SEES.

Other areas brought up by members included the status of DUSEL; the administration’s priority for outinnovating—how this impacts the way NSF approaches the work it funds; issues related to science literacy in both Washington and the nation’s schools; issue of science becoming political and the challenge that poses to NSF; NSF’s role in the federal government’s overall structure for supporting science relative to the role other agencies play; the implications of political aspects of SEES; re cyberinfrastructure, the challenge of cutting-edge computer science versus cutting-edge domain science; ramifications of a flat budget scenario with regard to new initiatives; staffing issues facing NSF re balancing permanent staff and rotators, and making rotation attractive.

Dr. Kellogg noted this is an opportunity for the new Director to get to know GEO as well as an opportunity for the Committee to ask questions and convey information to him.

**Meeting with the Director**

Dr. Kellogg welcomed Dr. Suresh and Dr. Marrett to the Committee. She invited the Advisory Committee members and NSF staff sitting at the table to briefly introduce themselves to the Director. Before members asked their specific questions, Dr. Suresh made a few opening remarks in which he first thanked the Committee members for their time and service to the NSF. He stated the ideas and suggestions of the Advisory Committee are critical for the agency’s success and all are considered seriously.

Highlights of Dr. Suresh’s introductory remarks follow:

* Acknowledging there are fiscal constraints, Dr. Suresh asked what are the areas that, as a matter of principle, NSF should protect and how should NSF adapt to meet today’s new challenges? How does NSF sustain its leadership role among science agencies both nationally but also internationally?
* Emphasized commitment to fundamental basic scientific research and disciplinary excellence, as well as multidisciplinary research and the need for expanding opportunities that lie at intersections of disciplines.
* Stressed the need for seamless integration of research and education so that education becomes an integral part of all NSF activities.
* Noted the “era of observation” has created “era of data and information.” NSF is uniquely positioned to support these areas of focus with its facilities.
* Stated two major activities articulated in FY2012 Budget Request are SEES and CIF21. Activities which feed into these include: clean energy; National Robotics Initiative; advanced manufacturing; and the National Nanotechnology Initiative.
* Recognized the role of GEO as integral to these new initiatives, not only with respect to supporting research but also in creating new infrastructure, new frameworks, and new networks around the globe.
* Described OneNSF, a vision for NSF which recognizes that although directorates and offices have different cultural flavors, serve different communities, and have different intellectual pursuits, there is shared commonality and a unifying theme to all the activities as well as the principles that underlie them.
* Noted INSPIRE, a new program for 2012, has been created to help address the way NSF does business and help the community come up with transformative ideas across disciplinary boundaries. **He asked the Committee for input as to how NSF can best identify new and transformative ideas at the intersections of multiple disciplines that do not talk to each other?**
* **Asked for Committee input on the merit review process.**

Before opening the floor to questions, Dr. Kellogg thanked Dr. Suresh for his remarks and noted that they greatly resonate with GEO’s own strategic plan, as laid out in the Geovision document. Questions/comments from members and the Director’s responses follow:

* Dr. Noonan asked re strategic decisions related to international investments by NSF, what is Dr. Suresh’s thinking about kinds of initiatives that will achieve the greatest benefits?

Dr. Suresh responded that large numbers of countries want to collaborate with NSF, and given the constraints with respect to bandwidth and resources, strategic engagement is critical. He asked how can NSF best provide expertise and infrastructure that is leveraged strategically with global partners to enable the NSF grantee community to benefit? He noted the importance of overcoming barriers to meaningful multilateral collaboration on a global scale, particularly in rapidly developing countries that lack articulated principles that are at least minimally acceptable to NSF, i.e., establishment of scientific ethics; merit review processes; peer-review processes.

He further responded that as networks become increasingly important, and data is shared globally, two important issues that need to be addressed are cybersecurity and intellectual property. In determining how we engage globally, he emphasized we need clarity in two areas: (1) what does NSF want to do on grounds of principle; and (2) what will NSF never do on grounds of principle no matter what the opportunity is?

* Dr. Hornberger asked what will be NSF’s commitment to SEES in the intermediate term over the next five years, particularly as it relates to clean energy? Dr. Suresh responded that NSF throughout its history has funded energy research and noted that by design it is not a mission-driven agency, which allows it to fund research that other agencies such as Department of Energy cannot. With respect to energy, the science is important, but understanding the social consequences is critical, and with SBE, NSF is uniquely positioned to address that aspect.

With respect to how SEES will play out in this budget climate, the Director acknowledged “we don’t know,” but that as sustainability is so important, not just in energy and environment, but also areas such as transportation and infrastructure, NSF will continue to support new science and engineering.

* Dr. Brian Taylor asked about flat budget implications. Dr. Suresh stated the “doubling path” in funding is not reflected in the FY12 budget. Therefore, priorities based on principles must be determined. The leadership team has agreed to protect support for graduate students and CAREER awardees and to support workforce development, particularly participation from diverse groups. These are all areas NSF sees as critical to the country as it positions itself over the next 20-30 years to remain a global leader. **He asked the Committee for its ideas on both new things NSF should be doing as well as what things might be sunsetted. Dr. Marrett reiterated an appeal to the Committee for its insight related to the challenges.**
* Dr. Lozier asked if and how the challenge for more innovation, or even outinnovation, has changed the way NSF does business? Dr. Suresh responded the challenge is for NSF to continue to take the longer-term view, which requires nurturing of basic research, but also nudging along the products of basic research in new and interesting directions. He asked how does NSF in partnership with other federal agencies help create the right ecosystems for nurturing innovation in our grantee community and in scientists generally? Additionally, how do we do business differently, for example, with proposal reviews utilizing technology to improve the process?

Dr. Marrett added there are organizational/managerial innovations as well, and she asked what can NSF do internally to enhance innovation?

* Dr. Robinson asked about NSF workforce challenges presented by its unique workforce that is comprised of both permanent staff as well as rotators from the scientific community. Dr. Suresh agreed the workforce, which is approximately 50 percent rotators, does present challenges, and he stated he has asked university leadership for their help and ideas on how NSF can help universities; how can tools, technologies, and different modes of communication be utilized to help younger people, younger faculty, participate more, i.e., panel reviews?
* Dr. Orlando Taylor noted the demographic shifts occurring in the U.S. population and the role this diverse population will play in ensuring American competitiveness. He asked what new strategies NSF envisions to reinvigorate or reinvent efforts to increase participation of women and minorities in the STEM workforce?

Dr. Suresh reiterated the importance of broadening participation and stated that this issue has been a focus of NSF conversation. The Foundation is presently developing a set of policies that will help address this particular issue. He noted, for example, the former military workforce, which is diverse and also includes a relatively high percentage of disabled people, could be tapped and offered opportunities for science and engineering education. He also noted the U.S. has been the unquestioned destination for global talent and asked for ideas on how to sustain this into the future.

Following the discussion, Dr. Kellogg thanked Dr. Suresh and Dr. Marrett for their time spent with the Committee today. After they departed, she asked what is the best way for the Committee to respond to the questions from the Director and Dr. Marrett? **Dr. Killeen suggested a letter from the Committee containing input in the requested areas be sent to the Director following the meeting.**

Dr. Snow and Dr. Rosenberg stressed the importance of industry representation on the Advisory Committee. Dr. Rosenberg suggested a follow-on meeting with the chief scientists of BNGOs (the Big NGOs) would provide another perspective on the issues discussed. **Dr. Killeen requested a list of names be submitted of appropriate potential new members that would bring these additional perspectives.**

At 12:04 p.m., the Committee took a short recess to get lunch and return for the working lunch presentations.

**Working Lunch: Topical Subcommittee Update: Data and Informatics (Committee of the Whole): CyberInfrastructure Framework for the 21st Century (CIF21) Science and Engineering , Dr. Lee Allison, AC GEO; Dr. Michael Morgan, AGS/GEO; Dr. Cliff Jacobs, OAD/GEO; and Dr. Eva Zanzerkia, EAR/GEO**

The Advisory Committee reconvened at 12:35 p.m., for the working lunch presentation on CIF21. Dr. Morgan introduced the topic by noting NSF investments in computing, observing and modeling are creating large volumes of data, which can be used to answer some of the most challenging questions we have in science. To help us understand how we do this, CIF21 has been designed. CIF21 includes data enabled science, new computational infrastructure, communications, research networks and access, and cyberinfrastructure facilities.

Next, Dr. Cliff Jacobs reviewed the CIF21 program, which is presently planned as a five-to-ten year program which hopefully will result in the construction of a national infrastructure for science and engineering that will enable cyberinfrastructure. The initiative is intended to transform the conduct of science generally, as the goal will be to increase the capacity of scientists to do their work. He noted the importance of understanding the role of the social element: how is society going to behave in terms of modifying the environment? He concluded his presentation with some comments on the outcomes of a recently held GEO-data informatics workshop, “Exploring the Life Cycle, Citation and Integration of GEO-Data,” which was a recent effort to solicit input from the external community and help address the challenge of the full life cycle of data. A recurring theme that emerged in the workshop was the need to have computer-savvy, life-cycle savvy people in the workforce, which is presently missing from the community. Another issue raised in the workshop is who bears responsibility for data management and where should the data reside? A report detailing the workshop findings is planned for April 2010 with possible follow-on workshops and white papers as a way to continue to engage the community.

Questions and discussion followed. Highlights were:

* Importance of developing software with the capabilities to deal with petascale computational facilities.
* How can the scientific community avoid reinventing what a good software engineer would know already?
* Necessity to make the argument externally that funding investments in CIF21 will have the most far-reaching effects for the community.
* Issue of interface between computer scientists and people with scientific problems and how to enhance their ability to work together systematically to solve problems.
* Cultural implications for scientific careers (obtaining tenure) when research is based on mining data.
* How long do we save data? The need to extract the actual information imbedded in the data. When considering the life cycle question, the last life cycle might be data is discarded.
* Link with librarians and the museum community who have been dealing with this for decades.

In response to Dr. Allison’s question, what is the Foundation asking GEO to do, Dr. Killeen responded GEO is well positioned to lead. We now need to concretize the vision in a way that is community-based and community-supported and driven by scientific challenge, as stated in Geovision. **He asked for input from the Committee on the following:**

* **What should the “stretch” goals look like? What should we aspire to look like in ten years?**
* **How should a graduate student 15 years from now hypothesize a problem and solve it and get access?**
* **How do we move beyond the bottleneck of creating ontologies for each subdiscipline?**

Dr. Eva Zanzerkia then gave an update on data management plans, noting as of January 2011, all proposals must have a data management plan, a two-page supplementary document that describes how the data products from the research will be managed. One goal of the requirement is for PIs to think of data management as an integral part of scientific discovery, and not just a compliance issue. Dr. Zanzerkia stated this is an evolving process for everyone; divisional policies will be updated continually. Broad guidelines will be formulated for GEO program directors to use in their panels.

**She requested input from the Committee on the above.**

Questions/comments were as follows:

* Does NSF interact with scientific journal publishing industry which has similar issues? Dr. Killeen responded NSF has engaged with that community as well as others, including engaging with the Europeans who are developing an open data policy initiative.
* Scientists are challenged by data management issues. Should resources be provided to PIs for data management/storage?
* Looking forward is great, but what about data from the past? Who should take responsibility? Should NSF set up repositories around the country for data? How is misuse of data to be handled?

Dr. Killeen noted that in studying earth systems, trends are important; the older the records the more valuable they are**. He requested input from the Committee on the articulation of principles/scientific drivers. He suggested that the Committee be aggressive in putting forth its ideas. For example, should there be a requirement that OOI be interoperable/ interworkable with NEON? Principles are needed re accessibility of data. To what extent is that disciplinary? What are the boundaries?**

Dr. Allison concluded that perhaps the role NSF can play is similar to the one it played with the Internet, where it helped to set the standards, protocols, procedures and processes.

Dr. Kellogg thanked all the presenters for the very useful and stimulating presentation, and the Committee moved immediately to consider the next agenda item.

**NSF Investment Area Update: Science, Engineering and Education for Sustainability (SEES), Dr. Louise Kellogg, AC GEO; Dr. Rita Teutonico, SBE; Dr. Robert Detrick, EAR/GEO; Dr. Michael Morgan, AGS/GEO; and Dr. Jill Karsten, OAD/GEO**

**SEES.** The first presenter was Dr. Teutonico, chair of the Implementation Group for SEES, who gave a general overview of the SEES program, which is a large portfolio crossing all programs in NSF. She stated that SEES encourages systems-based approaches to complex issues of sustainability science, focusing on interactions between natural and social systems. She noted one of NSF’s unique features is its ability to integrate the social and behavioral sciences with the natural sciences.

**Dr. Teutonico requested input from the Committee on SEES areas of focus proposed for FY 2012, which include: (1) Sustainable Energy Pathways; (2) Sustainability Research Networks; (3) fellowships, which address the need to develop people who can talk across disciplines to address sustainability issues; and (4) PIRE (Partnerships for International Research and Education). She additionally asked for input on how the Web site could be better formulated to help people understand what NSF is looking for with respect to the SEES program; could the FAQs (Frequently Asked Questions) be improved?**

Questions/comments and responses were as follow:

* Regarding CNH (Coupled and Natural Human Systems) solicitation, some in the community believe whole types and classes of social science activities have been excluded. Dr. Teutonico responded that is probably true, but every effort is being made to write solicitations so that social scientists see themselves represented and see that they can be part of the team.
* Re “Dear Colleague” letters, can they be improved? **Dr. Killeen requests Committee input on how they can be improved as a communication vehicle and on developing a better communication strategy generally?** Suggestions from the Committee include: a FAQ on “Dear Colleague Letters and You;” using the headline “opportunity” or “research opportunity,” not “Dear Colleague;” using different vehicles, i.e., Facebook, Twitter, to reach untenured, younger research faculty.

**Climate Change Education Program.** Dr. Jill Karsten presented on the Climate Change Education Program. She reviewed the history of the program, which began several years ago with discussions internally with NSF program officers throughout the Foundation. Those discussions laid the ground work, and when dedicated funding became available in FY09 ($10 million received through the EHR Directorate), because of time constraints, “Dear Colleague” letters were used to solicit proposals. Areas of emphasis articulated by NSF for the shaping of the portfolio included: workforce preparation; scaling up of effective practices; establishing ways to assess student learning about complex topics like climate change; addressing state and local policies that restrict access to climate change education at the K-12 level; and shaping professional development activities with regard to educating policymakers about the topic. Ten awards were made.

One award was made to the National Research Council to establish a Climate Change Education Roundtable, which was part of the congressional mandate. The roundtable format allows for a convening of academic, private sector, nonprofit, and federal employees for a “conversation” about a topic. Two meetings and one workshop have been held. A second workshop is planned for summer 2011 with a focus on K-12 education.

In FY10, another $10 million was received and shared among four directorates: EHR, GEO, BIO and the Office of Polar Programs. A new program, the Climate Change Education Partnership (CCEP), was created. The focus of this program was on establishing a national network of regionally or thematically based partnerships that are trying to work to increase the adoption of effective, high quality educational programs in resources related to climate change science and its impacts. 15 awards were made to partnerships, each of which were required to have climate scientists, learning scientists/education researchers, and education practitioners. These partnerships presented an opportunity for less quantitative scientists to be involved. The awards were for two-phased programs. Phase one is a two-year award for strategic planning, and phase two, for which funding will begin in FY12, is a five-year award for implementation of the strategic plans developed in phase one.

Dr. Karsten noted there are cross-agency activities involving NASA, NOAA, and USDA related programs and support among the agencies includes sharing resources and best practices.

Following the presentation, Dr. Rosenberg asked is there a way to link the National Climate Assessment (NCA) with the roundtable discussions as a way to get additional input? Dr. Karsten responded there is work currently being done to support continuation of the roundtable as a useful forum to support the goals of both the USGCRP (U.S. Global Change Research Program) and comingled with that would be the NCA activities.

**Sustainability Research Networks.** Dr. Michael Morgan presented on the Sustainability Research Networks (SRNs), one of the two major components of SEES. SRNs are readymade to allow GEO to engage more effectively with the international community on sustainability issues and are designed to bring together a variety of disciplines, not just the traditional disciplines of geosciences. SRNs will be comprised of teams focused on filling knowledge gaps that exist that will catalyze research in specific areas where we need to make progress in order to enhance our sustainability science.

Requirements for the networks are that they address observations of physical systems, ecological systems, and human systems, as well as economic consequences of what is going on. Challenges include developing ways to value systems which have not normally been valued economically, such as ecosystems and biodiversity, and once that value is understood and established, how do we make decisions based on those values?

Presently, a working group, a team representing different directorates, has been developing the initial language for the solicitation. A working document will be disseminated to various directorates for their input. **Dr. Morgan requested Committee input/ideas on what these SRNs should look like? What should their requirements be?**

Comments/questions and responses were as follows:

* One challenge is time it takes to build social connections among the different communities. Is it envisioned that participants will include government representatives and people who have responsibility for managing the landscape? Dr. Morgan responded that participation by all stakeholders, including the private sector, is desired. Solicitations are being written to encourage the various communities to engage early in the process and form Research Coordination Networks (RCNs) because these are where the seeds for the SRNs will be planted.
* Encourage engagement with the engineering community.
* In response to Dr. Teutonico’s question as to the best language to use in solicitations when referring to non-profits, Dr. Rosenberg responded the term used most often internationally is “civil society,” or “civil society organizations.” “NGOs” (Non-governmental Organizations) and “not-for-profits” are other terms used.

**Sustainable Energy Pathways.** Dr. Bob Detrick presented on the Sustainable Energy Pathway Initiative (SEP), noting that SEPs and SRNs comprise the two largest areas of emphasis for SEES in the FY12 budget. SEPs will address the problem of sustainable energy in a holistic way, beginning with the energy source, extending through the energy production cycle, including energy transmission, energy utilization, to the eventual impact of widespread adoption of any particular clean renewable energy. He noted that two areas particularly well-suited for geoscience participation are at either end of the pathway: understanding the physical processes associated with energy sources and looking at potential impacts.

Although NSF has invested heavily in energy in the past, investments in the geosciences have been limited; thus, the challenge now is getting the geoscience community involved in this kind of research.

Because the NSF is still formulating internally its own ideas on what SEPs should be and also how GEO might participate, this is a particularly good time for input from the Committee. **Dr. Detrick asked is the geosciences community ready to be involved? Will proposals come from this community to address the SEP concept? He requested Committee ideas on how best to involve the community to participate in the SEP initiative, how to communicate the opportunities, and asked are there things NSF should be doing to help this community organize themselves to participate in this?**

Comments/questions and responses were as follows:

* Are other sources of clean energy like natural gas and nuclear, which may have water quality impacts, being studied? Dr. Detrick responded they are encompassed within the initiative.
* Opportunity for research exists in the atmospheric boundary area.
* Huge void at the national policy level exists because there is no national program to fund mineral resource research. Congress has some proposed legislation looking at rare earth minerals. Could NSF provide funding for this as part of this energy life cycle approach?
* Challenge exists getting industry cooperation to get data that is needed for research.
* Dr. Killeen commented SEP will be the flagship SEES project for FY12. He stated that SEP was chosen carefully to be inclusive of multiple technologies, different branches, social sciences, decision-making. GEO has a stake.
* Dr. Robinson noted he believes that there will be a good response from the geoscience community.
* Dr. Snow stated NSF is not perceived as the go-to place to get energy research funded and noted better proposals may result if SEP allows for individuals or a small number of investigators to work on a critical piece of the pathway without the integration of social sciences/economics. Is SEP going to allow for the typical core type niche proposals going after a particular piece of the pathway or is it going to require that proposals be integrative like the rest of SEES where you have to form big partnerships?

Dr. Detrick responded this is a point of discussion within the program officer group. There is desire to promote broader interdisciplinary approaches, but a successful proposal does not need to attack the whole pathway.

* Make solicitations relevant to real world questions. Decision-makers want answers.
* Write solicitations with language that encourages people to look at the integration of technologies and other management activities that will allow for successful implementation of alternative energy pathways rather than language that encourages people to look at just harmful consequences. Focus attention on solutions.

Following the discussion, the Committee took a short break. The Chair then reconvened the Committee to consider the next agenda item.

**Topical Subcommittee Update: International Activities (Committee of the Whole), Dr. Norine Noonan, AC GEO; and Dr. Maria Uhle, OAD/GEO**

Dr. Noonan briefly reviewed the history of the Advisory Committee’s involvement in the international effort, noting that it began over a year ago with Dr. Killeen’s challenge to the Committee to help GEO think through becoming more strategic about its international activities. The Committee’s efforts have involved helping GEO develop a framework to prioritize these activities to achieve the most leverage and the biggest “bang for the buck,” including increasing the number of PIs and students engaged in international activities.

Dr. Noonan stated International global environmental change research activities have been identified as the huge “umbrella” for GEO’s strategic involvement and a significant target for GEO resources.

Dr. Maria Uhle, Program Director for International Activities, presented an overview of the international landscape in terms of global environmental change research, including how it is evolving and what GEO’s involvement is in terms of participation and leadership. She underscored the benefits of international collaboration and stated that because the challenges are greater than the U.S. can handle alone, resources must be leveraged to enhance and complement U.S. strengths. Goals include providing access to both global scale data sets and critical research sites. Dr. Uhle recognized the complexity of the landscape, noting there are many international programs involved in research, e.g., ICSU-run programs, numerous regional programs, and bilateral agreements.

Global environmental change research has been going on for about 30 years, much of it through the ICSU programs. Reviews of these programs have indicated we need to move forward in our approach to this research with an increase in focus toward policy development. There has been acknowledgment this will require the involvement of social scientists and economists, as well as stakeholders and decision-makers.

Five “grand challenges” were identified by ICSU, and in 2009 the Belmont Forum, comprised of a small group of national funding agencies, was created to jumpstart thinking about these challenges. This resulted in the Belmont Challenge: “to deliver knowledge needed for action to mitigate and adapt to detrimental environmental change and extreme hazard events.”

Following the articulation of the challenge, the Belmont Forum became the “Council of Principals” for IGFA (International Group of Funding Agencies for Global Research). Dr. Uhle reviewed the activities of the Belmont Forum and the ICSU visioning process and stated this work has culminated in a new proposed ten-year initiative, the “Alliance,” a strategic partnership that involves scientists, funders, operational service providers, and end-users that are all seeking sustainable solutions to the global environmental challenges. She emphasized the Alliance is a very informal, non-binding, voluntary group of willing participants.

The importance of having corporations/industries, “.orgs,” foundations, et cetera, represented in the process from its beginning was noted by several members. Dr. Killeen acknowledged these “interface” matters are important, but he stated the immediate focus is to build a functional research program internationally and not to take on too many interfaces too quickly. Dr. Rosenberg noted he appreciated that view but suggested a way should be found to at least make people aware of the process before the end. Dr. Killeen further responded that there is a new Web site for IGFA/Belmont, and Dr. Uhle noted an article will soon be appearing in either Science or Nature.

Dr. Uhle concluded her remarks by enumerating next steps for the Belmont Forum and noted GEO will be holding workshops on water sustainability and coastal vulnerability in fall of 2011.

Dr. Noonan observed these efforts have set the framework for considering NSF GEO international activities, and other areas of research will be identified as important for global environment change research. She stated the Committee hoped that other directorates might also consider becoming more proactive in the international arena and more receptive to international inputs. She concluded by stating barriers to collaboration with developing countries exist, as also noted earlier today by the Director, and these barriers will be high bars to jump.

Questions/comments and responses follow:

* Dr. Schimel stated the real successes of international programs are the exchanges among scientists, the collaborative research between the developed and developing world, which is being done on an ethical basis, the large international field campaigns and the synthesis that results, and the entrainment of young scientists into global science. He stated the worry is that it will become too policy driven and applied. Will we be able to harness the power of the international science community to answer fundamental unknowns that are needed for decision-making? Dr. Killeen responded the intent is to do all of that and to do it better. It’s suboptimal now, and realignment, particularly with the funding agency and academic community, will hopefully reduce frustration on both sides.
* Dr. Brian Taylor asked if other international programs were addressed and where is the rest of the portfolio? Dr. Noonan responded the Committee focused on giving NSF principles for assessing international programs and making decisions going forward. Dr. Killeen responded a whole portfolio analysis was done and a strategic plan is being written presently for GEO’s international programs; they will be fewer in number, more strategic, and follow the principles. The analysis will be made available to the whole Committee.
* Dr. Schimel stated observing sites are not generally located in undersampled areas and suggested that international aid development packages include the building of observing infrastructure, which could provide the capability to tie water management, agriculture, and energy to climate and environmental teams in a way that allows for adaptation, and that these environmental observations should be freely and openly available for science and education globally.
* Dr. Snow stated several aid agencies do fund environmental monitoring systems, but it is difficult to find quality technical staff in these countries that can maintain the equipment.

Following the discussion, Dr. Kellogg and Dr. Killeen thanked the members of the Subcommittee for their work. Dr. Killeen particularly thanked Dr. Noonan for her leadership and noted as a result of the work a great deal of activity has been stimulated for which GEO is very appreciative.

**Summary of Review on San Andreas Fault Observatory at Depth (SAFOD). Dr. Donald De Paolo, AC GEO; Dr. Greg Anderson, EAR/GEO; Dr. Alan Linde, Carnegie Institute of Washington; and Dr. Tom Henyey, USC**

Dr. Kellogg stated that last year AC GEO was asked to form two subcommittees to review particular topics. The following is a report of one of those subcommittees, the SAFOD Engineering Subcommittee of AC GEO. Expertise from outside the membership of the Committee was part of this Subcommittee. Dr. De Paolo served as the liaison between ACGEO and this Subcommittee.

Dr. Henyey [via phone], Professor Emeritus, Earth Sciences, USC, served as chair of the Subcommittee. He reviewed the Subcommittee’s work and summarized the general conclusions and findings as follows:

* Subcommittee began its work by first observing the removal of the instruments from the deep well at Parkfield; it subsequently met in Houston to continue its analysis of what went wrong by observing the instruments as they were pulled apart; and it held a final meeting in Denver to attempt to pull everything together and assess what actually happened.
* Subcommittee noted that the instrument had sat in the well for a full two years after it was deployed and had failed, and this added to the complexity of the analysis.
* Subcommittee noted virtually all instruments failed and most of them gave out fairly quickly within a two-week span.
* Subcommittee is fairly certain that at least some of the instruments, particularly the seismic instruments, failed because of a leak in one of the pipe threads.
* Subcommittee believes the elevated temperatures played a role in some regard.
* Subcommittee believes the tilt meter seemed to fail both mechanically and by thermal effects.
* Subcommittee believes this is an important experiment and needs to be done.
* Subcommittee noted there were problems with the way things were done; oversight on the part of scientific community was inadequate; too much authority/responsibility was left to the commercial operator; proper testing was not done.

Dr. Linde stated he agreed with Dr. Henyey’s analysis, but offered one additional point on behalf of the scientific people who were working on this experiment: they were put in a very difficult situation. There was no mechanism for safeguarding a chunk of money for the experiments that were to be done by the downhole instrument package (DIP). Because of the reduced budget, they were forced to go to the solution that they did, which was not what they initially envisaged doing, and it was a compromise solution.

Dr. De Paulo next summarized the actual SAFOD project, noting it was a component of EarthScope and designed to determine the structure and properties of the fault zone at depth and monitor activities in the fault zone over a long period of time. The original budget for the project was reduced from $2.56 million to less than $0.4 million. The Subcommittee found there was a lack of engineering, a lack of time, a lack of money, and a lack of personnel, all contributing to project failure. The end result was the instruments (DIP) that were placed in the borehole were exposed to hot acidic water and then failed to function.

The Subcommittee concluded SAFOD remains an important project and should be done if possible. Some recommendations were:

* Future observatory must be deployed in stages.
* Observatory must be isolated from the wellbore fluids.
* Full-time project management is required; must have individual in charge of the contractors but independent of the contractors
* More documentation of what is done.
* Need a geochemist working with a materials engineer.
* If instruments fail, they need to be removed quickly for inspection and testing.
* Use of motor oil questioned.
* Preference should be given to installing DIP without a drill rig.
* Successful design of hardware, electronics and sensors, while challenging, can be achieved, and metal-to-metal seals are recommended.
* Detailed investigation of success and failure of electronic components and sensors should be carried out.

Comments/questions and responses were as follows:

* Dr. Erwin asked if the Subcommittee had been able to assess the likelihood of success had the original budget not been reduced? Dr. Linde responded that was not specifically addressed. Dr. Henyey added that portions of the experiment were eliminated or cut back when the budget was reduced, and probably even with the additional funds, the project would not have been successful. He noted several other factors contributed to failure including that designs were done before drilling so problems that occurred with presence of hydrocarbons were not anticipated.
* Dr. Snow stated that any project that involves drilling a hole, particularly when drilling in a fault zone, is difficult, and he suggested these projects should be labeled “high risk ventures,” and to minimize the risk, there should be an independent risk assessment group.
* Dr. Snow also suggested sampling the fluids in the well at various depths.
* Dr. Henyey suggested as there was no evidence of formation oil in the leaked part of the instrument packages, one recommendation for the future would be to go back to the wire line type deployment and try to get that right as opposed to going in with very expensive drill rig deployed tubing systems.
* General discussion re lessons learned and the path going forward. Points made included:
	+ Management flexibility is critical. Deadline pressures related to both science and end-of-fiscal year constraints needed to be better managed.
	+ This technical evaluation will serve as a first step for GEO as it considers its options going forward.
	+ The Subcommittee’s charge did not include a review of the science, which had previously been rigorously evaluated by the community during the EarthScope review.
	+ Determining the “mode of failure” was important. Putting electronics in this kind of hostile environment and making measurements long-term presented problems that require a rethinking of the approach.
	+ An incremental approach, as recommended by the Subcommittee, is probably the best approach.

As a final comment, Dr. Linde stated this is important science and represents an opportunity for an invaluable close look at real earthquakes. The hole has been drilled, and he believes it would be irresponsible not to finish the experiment and establish this facility, which could be made available to the community as a whole for testing new ideas and new instrumentation packages.

Following the discussion, Dr. Kellogg requested a motion to approve the report. **Dr. Noonan so moved, it was duly seconded, and the Committee voted unanimously to approve the report.**

In response to a final question by Dr. Noonan as to the actual amount of the loss to the Foundation of this failed portion of the project, Dr. Greg Anderson stated the cost of the instrumentation package was about $400,000.

On behalf of GEO, Dr. Killeen and Dr. Anderson both thanked the Committee for the extensive work that went into producing this invaluable review.

**Wrap Up, Dr. Kellogg, Chair, AC GEO**

Dr. Kellogg briefly previewed Thursday’s agenda noting the day will begin with a two-hour breakout session for the division subcommittee meetings, followed by a reconvening of the whole Committee for the reports and to consider the remaining planned agenda items.

There being no further discussion, the Advisory Committee recessed at 5:25 p.m., to reconvene at 8:30 a.m., Thursday, April 14, 2011, in the division subcommittee breakout groups.

**Thursday, April 14, 2011**

Day two of the Advisory Committee activities began with individual division subcommittee meetings. Upon conclusion of the subcommittee meetings, at 10:48 a.m., the Advisory Committee reconvened as a Committee of the Whole to consider the remaining agenda items.

**Division Subcommittee Meeting Reports**

**Atmospheric and Geospace Sciences, Dr. Walter Robinson, AC GEO**

Dr. Robinson presented on the AGS Subcommittee meeting, noting it was an informative session with lots of good discussion. He thanked Dr. Morgan and the program directors for their presentations to the Subcommittee. Topics covered, as well as comments/questions and responses, included:

* Division retreat in November 2010 focused on strategic alignment. Mission statement was formulated which aligns with Geovision and NSF’s strategic plan. Internal organization matters were discussed related to creating greater efficiency in proposal review and creating career and promotion opportunities for staff.
* NCAR is proceeding. University of Wyoming Cooperation for Education, Outreach and Research needs further work and perhaps additional management on NSF’s part. Dr. Killeen noted Wyoming is an EPSCoR state, and more resource support through EPSCoR may become available.

Also, it was suggested that more venues be developed for interaction between NCAR and NSF to lessen perceptions of divergence in directions between the two entities.

* It was noted field programs are becoming more complicated and more expensive.
* Use of data in field programs has been noted. Data are being used and requested. The data seems to support that investments in field programs are a worthwhile investment and should be continued.
* The update on Climate Research Initiative, a cross-NSF initiative, noted that solicitations were written; wide-ranging proposals were received; and a funding success rate of about 30 percent was achieved. Another solicitation is planned in FY2013.
* Discussion of tradeoff between initiatives and core science programs, particularly in flat-budget circumstances**. Recommendation was made that initiatives such as CRI and SEES should be subject to a formal evaluation, possibly done through a CoV type mechanism, to determine if real synergy is achieved and are we getting science that we would not get out of core programs; is it the best way to invest money; how can these initiatives be tweaked to return more on investment?**
* Re SEPs, SRNs, and CaMRA, discussion on how to get the word out to the community to elicit best quality proposals in the appropriate number? Recognizing that the team building part of these proposals takes the longest lead time, it was suggested that the most effective place to catalyze this team building might be at the administrator level of institutions.

It was reiterated that “Dear Colleague” letters may not be the best way to communicate. Dr. Erwin asked if NSF has analyzed who actually reads “Dear Colleague” letters and whether any data exists on their effectiveness? Dr. Killeen responded their use varies across institutions, but there is no formal data that exists on their effectiveness.

Dr. Killeen noted a formal review of all these programs will be done as part of the strategic plan and part of the roadmap negotiated with OMB.

* Dr. Arroyo noted she has observed a lot of creativity among junior faculty and a lot of relationship building across campuses that does not come from the top down.

**Earth Sciences, Dr. George Hornberger, AC GEO**

Dr. Hornberger reported on the Earth Sciences Subcommittee discussion, as follows:

* Issues were discussed relating to new integrative initiatives similar to ones discussed in AGS Subcommittee, i.e., how could participation by EAR scientists be encouraged to lead to submission of the best proposals?
* The Subcommittee appreciated presentations by program directors and was encouraged by the excellent opportunities these offered.
* Challenges were noted re disciplinary and cultural barriers that exist both internally for NSF, particularly with SRNs, as well as externally in academe.
* “Dear Colleague” letters were discussed and Subcommittee reiterated problems exist.
* Suggestion was made that NSF take advantage of networks that already exist, such as IGERT, to get the word out.
* Implementation issues were acknowledged within interdisciplinary programs, e.g., CaMRA.
* Workload issues were discussed and it was noted EAR has a relatively large proposal per FTE load. Dr. Robinson added there are workload demands at lots of levels, including the work involved for PIs to nucleate teams and put together solicitations. Dr. Banfield asked about the use of preproposals as a way of giving feedback and guiding preparation of proposals? Dr. Killeen stated that is done in some areas and being considered for future solicitations.

**Ocean Sciences, Dr. Andrew Rosenberg, AC GEO**

Dr. Rosenberg, Chair of Ocean Sciences Subcommittee, reviewed the Subcommittee’s discussion as follows:

* Presentation by Dr. David Conover, Division Director, focused on three specific questions all related to OCE strategic planning:
	+ How does the division deal with the challenge of engagement in interagency and government-wide policy initiatives like the National Ocean Council and National Ocean Policy? The Subcommittee agreed this type of engagement has high resource demands that may not come with resources, but believe it is critical for NSF to remain engaged in these initiatives because of the important science needs associated with developing ocean policy. Subcommittee recommends engage but make sure engagement is not a single-purpose engagement.
	+ Is the renewal proposal for the Ocean Drilling Program appropriate? Subcommittee expressed agreement that the approach to renewal was generally on the right path, but expressed concerns about long-term issues with regard to O&M costs versus supporting science programs.
	+ Issues of engagement with the ocean community. Subcommittee stated “Dear Colleague” letters necessary but not sufficient. Program officers need new tools to communicate with broader ocean science community. **Dr. Killeen requests Committee input on what those tools might look like.**
* Strategic planning working groups within the division have discussed the idea of creating a section within the division that deals with coordination needs created by increasing interagency, as well as cross-directorate and cross-division, demands. The Subcommittee stated that is an idea worth considering, but it needs further fleshing out as to how the work would be structured and how staff move in and out of a coordination section.
* Workload issues exist.
* Strong support by the Subcommittee for continued use of senior executive level positions to lead sections.
* Recognition that this is a division with large infrastructure programs. Infrastructure versus science needs are a concern. O&M costs can overwhelm science budget.

**Action Item**: **Following the discussion, Dr. Rosenberg made a motion that a committee be created to review the Ocean Drilling Program. The motion was duly seconded and the Advisory Committee voted unanimously to approve the motion.**

Dr. Conover added that as the above motion had been expected, Dr. Susan Lozier, a new member of AC GEO, has already been contacted and has agreed to serve as chair of the committee.

**Following the meeting, Dr. Conover will make some editorial changes to the draft Terms of Reference for the proposed committee’s charge to reflect suggestions made today. It will then be placed on the AC GEO Committee Web site for electronic discussion and ultimate endorsement by AC GEO members.**

Dr. Killeen thanked all the subcommittees for their great work. He noted no major changes in direction were suggested, but there were recurring cautionary comments with regard to such issues as O&M, workload, and interaction/communication with the community.

**With regard to communication, he stated it would be helpful to have AC GEO grapple with this issue as it is part of the mission of the Committee and GEO needs direction. Dr. Rosenberg suggested before the next meeting, input be solicited from the program officers and division directors about the kinds of things/tools they need that the Committee can then consider and discuss at its next meeting.**

Dr. Cavanaugh asked for a volunteer from the Committee to serve as a sounding board for NSF as this gets put together for the next meeting.

**Re communication with the community, Dr. Robinson suggested that the letter to the Director might include some wording about the general issue of providing resources for program officer support, i.e., funding of travel for program officers to get out into the community and get the word out that there is a new way of doing business at NSF. This could also facilitate engagement with early career scientists and underrepresented groups. He also suggested retooling of NSF Day events to offer program officers more opportunities to engage with PIs.**

Dr. Karsten suggested the use of Webinars as tools to introduce cross-foundation competitions and as a way to engage/communicate to the community. This also might be mentioned in the letter to the Diretor. Dr. Kellogg stated there are multiple programs available that provide guidance on the use of this technology.

Dr. Brian Taylor noted a weak link is ownership at the program officer level of SEES cross-directorate programs. Improvement of that is also critical to effective community engagement.

Following the discussion, Dr. Kellogg thanked the division directors and program officers who helped with the information presentations and thanked the chairs for their clear presentations.

The Advisory Committee moved to consider the next agenda item.

**Summary of Review of Deep Underground Science and Engineering Laboratory (DUSEL), Dr. Louise Kellogg, AC GEO; Dr. Robert Detrick, EAR/GEO; and Dr. David Lambert, EAR/GEO**

The Chair noted she was the AC GEO link for the DUSEL report committee and then invited Dr. Detrick to present an overview of the DUSEL project.

Highlights from Dr. Detrick’s overview were as follows:

* DUSEL, an MREFC project, was a joint project between NSF and Department of Energy. Leadership in NSF was from Physics and MPS.
* In response to initial solicitations, seven experiments were funded in geosciences and engineering, and they are still ongoing.
* In October 2010, DUSEL was in the queue as an MREFC project with PDR (Preliminary Design Review) scheduled for middle of 2011.
* GEO wanted an independent assessment of the sort of science opportunities and merits of the seven experiments that they had funded. GEO approached the AC GEO at its October 2010 meeting about setting up a committee for this purpose.
* In December 2010, the NSB Committee on Programs and Plans declined a bridging proposal to the DUSEL facility, and in the FY 2012 budget released in February 2011, DUSEL was removed from the MREFC queue and NSF decided to withdraw from DUSEL based on the NSB recommendation to the NSF.
* It was decided to proceed with the AC GEO committee review of the experiments anyway, as there was (1) the possibility of DUSEL going forward at a later time; and (2) other similar type facilities might be appropriate for these kinds of experiments.

Following the overview of DUSEL, Dr. Kellogg summarized the results of the Subcommittee’s deliberations, as follows:

* Seven proposals, primarily in geology, that were funded and are still ongoing were reviewed. The Subcommittee had access to the original grant proposals, the interim reports, and the technical reviews and PI responses.
* Charge to the Subcommittee was to review for potential transformative science that could be accomplished in a deep underground science and engineering laboratory with regard to geosciences.
* Review topics included:
	+ Is a deep mine the right place? Is the Homestake mine the right place?
	+ Is anything missing in terms of other transformative geoscience opportunities?
	+ Is the proposed selection process and the on-ramps and off-ramps appropriate?
* Pumping of water out of mine will continue through 2012.
* Subcommittee met for two days, during which it read the proposals, the interim reports, and discussed the projects in great detail. The Subcommittee:
	+ Concurred there are opportunities for transformative science at DUSEL or a DUSEL-like lab. In addition to transformative science experiments, there are other “have-to-do” experiments such as those involved with safety monitoring.
	+ Considered additional geoscience opportunities for experimentation such as detection of geoneutrinos.
	+ Reviewed other underground labs in the world. There may be other places, such as sides of mountains, where this work can be done.
* Comprehensive report was prepared from the discussions which:
	+ Identified concerns: some facilities need more analysis and development; extra attention to safety protocols related to experiments; lack of coordination noted among the experiments.
	+ Strongly recommended careful consideration of safety in the design and careful consideration be given to the impact of experiments on each other.
	+ Recommended a coordinator be appointed with an advisory team that includes PIs of DUSEL experiments and probably should also include broader community oversight as well.
	+ Noted a need for coordination of data streams, and data archiving needs to be addressed.
	+ If possible, gain access to historical information available on the mine.

Discussion followed:

* Dr. Robinson noted solar neutrino experiments had been done in the mine in the past. Dr. Lambert noted that work had resulted in a Nobel Prize being awarded to the scientist and stated the area used for that work has been expanded to house the neutrino detector of the future.
* Dr. Banfield asked whether a case could be made for ongoing microbial research at the site or was it more the sense of this is an “opportunity looking for a problem”? Dr. Kellogg agreed there was some element of “because the site is available, because it’s very deep, that’s where the study ought to be done.” However, she also noted that in different tectonic settings, you might get different microbes.
* Dr. Killeen asked if as a result of the analysis of the geoscience proposals by the Subcommittee, it was determined any new design requirements were necessary to be placed on DUSEL? Dr. Kellogg reiterated the need for coordination of experiments. Interference between experiments could potentially be a problem.
* Dr. Brian Taylor asked from the geoscience perspective, is there anything the nation really ought to do here? Dr. Kellogg stated she could not speak for the Committee, but did note there are distinctive things about a mine environment that make it appropriate for seismic instruments.

Following the discussion, Dr. Killeen thanked the Subcommittee for its hard work, and Dr. Detrick thanked Dr. Kellogg in particular for her role in the Subcommittee.

At 12:25 p.m., the Committee took a short recess to get lunch and then returned for the working lunch presentation.

**Working Lunch: MREFC Presentation: Regional Class Research Vessels (RCRV), Dr. David Conover, OCE/GEO, and Captain Bob Houtman, OCE/GEO**

The Committee reconvened at 12:37 p.m., for the luncheon presentation on the status of the proposed MREFC project known as the Regional Class Research Vessels Project.

Dr. Conover, Division Director, Ocean Sciences, highlighted the following:

* The Academic Research Vessel Fleet, which provides support for oceanographic research and scientific access to the sea, is aging, and over the next several years, vessels will be retiring. Eight ships will retire in 2016, and without additional federal investment in replacing the fleet, it will go from 21 vessels down to nine by 2020.
* There are some activities presently underway as partial solution.
* The Division of Ocean Sciences believes some rebuilding of the fleet is necessary and has proposed construction of three new Regional Class Research Vessels as an MREFC project.
* OCE represents 75 percent of all basic research in ocean sciences.
* All MREFC projects must identify the scientific drivers that demand the new equipment. In the case of RCRVs, there are numerous critical areas of scientific research that necessitate the need for these ships, e.g., understanding climate change and its impacts in the oceans; the need for increasing our stewardship of the oceans, coasts, and Great Lakes; as well as many others.
* Tools used for oceanographic research have changed since 1970s. Greater technological capabilities exist.
* Ships are still needed to deploy the technologies and to monitor and maintain them. Geographic imperative for ships exists also.
* Coastal science, in particular, is an important area of focus.
* The academic research vessel fleet (21 ships) is divided into four classes: global; ocean; regional; and local. These vessels are distributed in 15 academic institutions, which operate the vessels, and NSF supplies funds to the institutions to cover the operation costs.
* Vessel time for scientists is scheduled by UNOLS (University National Oceanographic Laboratory System).
* Presently, the Navy is building two vessels to support the oceanographic fleet of the ocean class size. NSF is building the SIKULIAQ, a global class vessel, mostly used for Arctic research.
* There is a decline in vessel usage partly because there are other approaches available now to measure oceanographic variables.
* To ”right-size” the fleet, OCE is proposing to build three regional class vessels which by 2020 would result in a fleet of 15 vessels rather than the reduction to nine. Six new vessels by 2020 would be in the fleet, three of which we would be building through a Regional Class Research Vessel Initiative.
* This need has been documented extensively by government studies and reports.

Captain Bob Houtman, Section Head, Integrative Programs Section, continued the presentation with details about the design of the vessels themselves. Some highlights of his presentation were as follows:

* Because of increased cost for each of the RCRVs, GEO has had to reconsider how to proceed with the renewal effort, which has resulted in the proposal for three Regional Class Research Vessels as an MREFC project.
* This proposal supports NSF’s inter-agency agreement to the fleet renewal.
* The proposal capitalizes on both the Navy RCRV design efforts and the MREFC design process for the SIKULIAQ.
* RCRV solicitation package would go forward, following the Large Facilities Manual requirements. A phased award approach would be used in order to review achievement of milestones before continuation to the next phases.
* **The proposal reflects change in requirements that can be met with fewer vessels with greater capabilities for roughly equivalent current operating costs**.
* Some new capabilities will include: dynamic positioning; low environmental impact; compliance to the maximum extent possible with Americans with Disabilities Act; and increasing regional interface between science research and the education outreach. The somewhat larger size of these vessels will allow for increased number of science berths that will also increase the ability to work in interdisciplinary teams.
* The technical design package process has begun and is well advanced.

Questions/responses and discussion followed the presentations:

* **Committee members noted the importance of support for atmospheric research and suggested it would be advisable to include someone from AGS into the process as early as possible.** Dr. Conover agreed.
* Re workforce issues associated with the change in fleet size, Dr. Kellogg asked will both the technical and scientific workforce be sustained? Dr. Conover responded the same workforce cannot be maintained and operating expenses simultaneously reduced, but the goal is to maintain field capacity.
* Dr. Brian Taylor stated the community has been watching very closely the evolution of this ship class, which is a larger small ship with greater technological capabilities. He noted the expansion of virtual capabilities as well which will allow for more interaction between what’s happening at sea and the research being done on the land. Dr. Conover noted, as well, there has been a shift in the kinds of science that institutions are doing with more focus on problems of regional significance, and this too has increased the need for more vessels in the regional category.

Following the discussion, Dr. Kellogg thanked both Dr. Conover and Captain Houtman for their very thorough and interesting presentations. The Committee proceeded immediately to the wrap-up portion of the meeting.

**Meeting Wrap-Up: Action Items, Dr. Louise Kellogg, Chair, and AC GEO Members**

Dr. Kellogg invited members to make final comments, particularly addressing items for the Committee to address in the near term. Close-out discussion and action items included the following:

* Establish a committee to review the Ocean Drilling Program.
* Chair will draft a letter to the Director summarizing what the Committee has learned and responding to Dr. Suresh’s visit and his requests for input. She will seek input from other members if necessary and circulate the letter to the entire Committee for comment. This will be done quickly as a main item of business.
* Discussion of date and location of next meeting. Interest was “mixed” regarding the idea of the Committee taking a “field trip” to Wisconsin to see the SIKULIAQ being built. The AC GEO fall meeting, which is presently scheduled for October 12-13, 2011, may be moved to October 13-14, 2011, to avoid conflicting with some other meetings. Ms. Lane will check and advise members if the change can be made.
* As this is Dr. Doug Erwin’s last opportunity as a member of AC GEO to participate in a meeting, the Chair thanked Dr. Doug Erwin for his service on the Committee.
* Dr. Jill Karsten inquired whether the Committee had any interest in holding a half-day session before the next meeting to meet with PIs or students involved in the Opportunities for Enhancing Diversity in the Geoscience Program (OEDG). She noted an OEDG PI meeting is planned for the same time as the fall AC-GEO meeting and arrangements could be made for some interaction with this group. The Committee expressed interest in this.
* New Advisory Committee members will be assigned to at least one of the four topical subcommittees before the next meeting.
* Committee requested that the NROES (New Research Opportunities in Earth Sciences) report, which is being written by a committee of the National Research Council, be distributed to members when it becomes available.
* A request was made to have presentations and discussion of the strategic plans and research opportunities of all three divisions at the fall AC-GEO meeting.

Dr. Killeen thanked Dr. Kellogg for running such a smooth meeting. Dr. Kellogg thanked the Committee, staff and all the attendees, and again especially thanked Ms. Lane for her work in handling all the meeting logistics. There being no further business, the Advisory Committee meeting was adjourned at 1:30 p.m.