NATIONAL SCIENCE FOUNDATION

Advisory Committee for Geosciences Directorate

(AC-GEO)

October 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, Washington, D.C.

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. 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. Steven D. Gaines, Dean, Bren School of Environmental Science & Management, UC-Santa Barbara

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

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

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

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

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

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

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

\* Present Thursday, October 13 only

\*\* Present Friday, October 14 only

Members Not Present:

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

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

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

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. 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. Leonard Johnson, EAR

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

Mr. William Smith, Staff Associate for Budget

Ms. Melissa Lane, Executive Secretary, AC-GEO

Dr. Cliff Jacobs, OAD/GEO

Dr. Eva Zanzerkia, EAR

Mr. Alan Blatecky [via telephone], Director, OCI

Dr. Jennifer Schopf, AD/GEO

Capt. Bob Houtman, OCE

Ms. Candace Major, OCE

Dr. Stephen Meacham, OIA

Dr. Rich Behnke, AGS

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

**Thursday, October 13, 2011**

**Welcome and Introductory Remarks**

The meeting was called to order at 8:18 a.m., by Dr. Louise Kellogg, Chair, AC-GEO. Dr. Kellogg welcomed all those present and invited AC GEO members, NSF staff, and visitors to make brief self-introductions. In her introductory remarks, the Chair gave a brief overview of the meeting agenda and noted that it had been designed to reflect the Committee’s charter, noting that is to provide NSF advice on matters pertaining to GEO, particularly research programs, program balance, program management, and the impact on the geoscience community at large.

**Preparation for Meeting with the Director**

The first order of business was to prepare for the visit with the Director. Members enumerated and discussed the following as possible topics for discussion and questions for the Director: 1) **What is the state of the NSF Budget for Fiscal Year 2012 and how is the NSB addressing it?** (2) **Diversity**. Underrepresented minorities are still underrepresented in STEM at all levels. Dr. Killeen suggested reframing this from the engagement point of view: how do we better engage and bring people into the learning environments? (3) **International collaboration**, specifically with regards to China and space program opportunities. (4) **Balancing funding for large facilities versus support for core research** **programs and individual grants to PIs.** How does the Director view the role of NSF in building, sustaining and creating facilities in critical scientific fields? (5) **Interdisciplinary, balancing priorities**; what is the role of GEO in cross-cutting NSF initiatives? (6) **Future of GEO leadership**; process for succession planning; how are applicants recruited for AD GEO? (7) **Role of science in policymaking**; the importance of an informed electoral body and informed general population.

Following the discussion, the Committee took a short recess and then reconvened to meet with the Director.

**Meeting with the Director**

Dr. Kellogg welcomed Dr. Suresh to the Committee and invited him to make introductory comments.

Highlights of Dr. Suresh’s introductory remarks were as follows:

* Re budget, NSF planning will reflect: (1) principles/core values that will be supported regardless of budget, such as human capital development and support for GRFs and postdoctoral and CAREER awards; (2) collaboration with the broader interested community to achieve a unified voice in speaking with Congress; (3) identification of activities that can be moved ahead regardless of budget; and (4) identification of internal organizational activities that can be improved. Dr. Suresh stated that a financial crisis can provide a unique opportunity for introspection and improvement.
* Re leadership transitions, noting that Dr. Killeen’s four-year tenure will expire in July 2012, **Dr. Suresh requested that the AC provide recommendations for the search committee, preferably within the next ten days. Nominations for the position and other comments will be welcomed as well.** He noted ideally there will be overlap before Dr. Killeen leaves the agency.

Questions by AC members and Dr. Suresh’s responses follow:

* Re diversity, Ms. Arroyo and Dr. Rudnick inquired as to strategy and new initiatives within NSF to address issues. Dr. Suresh responded that a Family Friendly Policy Working Group with members from across the Foundation was formed in February 2011. The work of this group has resulted in the Career Life Balance Initiative which will address particularly the issues of marriage and childbirth as barriers for women and how women with Ph.D.s in science and engineering can be retained. He noted diversity is a complex issue. An area of focus for OneNSF is on retention of minority women in STEM fields. More data will be gathered to help determine both pipeline and retention issues.
* Dr. Noonan commented on the lack of understanding of basic science research by both Congress and the public. She asked how can the Advisory Committee help the Director to advance the best agenda for the country? Dr. Suresh stated NSF is not a lobbying agency. Accepting that differences do exist within the various disciplines as to what should be supported, expectations within the scientific community must be reasonable and realistic, and resources must be leveraged nationally and internationally. **He asked the Advisory Committee for help on how to leverage infrastructure experiences globally.**
* Dr. Baker asked whether, given the present political climate, NSF can play a role in fostering greater cooperation and scientific collaboration between the U.S. and China? Dr. Suresh responded that the greatest barrier to international collaboration generally is the lack of a common understanding of mutually agreed upon, minimally acceptable standards of merit review, professional ethics, and scientific integrity. Specifically, with reference to China, the Director stated issues related to currency and openness of access are complicated and beyond the control or reach of NSF; however, NSF is attempting to broaden conversation with the “right folks.”

Dr. Suresh also stated that NSF has taken a leadership role in the Global Summit meeting, planned for May 2012, in Washington, which will be attended by all G20 and OECD countries. An anticipated outcome of this meeting and others is the creation of a set of agreed principles that may reduce impediments to increased international scientific collaboration.

* Dr. Delaney asked about the balance between funding facilities and research at NSF; have there been changes relating to MREFCs; what are the challenges; where is NSF headed? Dr. Suresh responded these are questions being posed in conversations with Congress as part of ongoing budget discussions. He stated the NSF needs flexibility both to balance cost implications of lost resources, lost time, and lost leadership when prior commitments are not honored, and to achieve balance between support for individual scholarship and human capital development and support for large facilities.

**He asked the Advisory Committee to consider new and interesting ways for advisory groups to engage with NSF using the latest tools and technologies, particularly the use of virtual meetings, to improve efficiency in the way NSF operates.** Dr. Brian Taylor noted the difficulty/challenges presented by day-long meetings when attendees are in multiple time zones. Dr. Suresh agreed and responded meetings could be shorter and more frequent. **Dr. Kellogg stated the Advisory Committee will discuss this issue and provide input to the NSF.**

Dr. Kellogg thanked Dr. Suresh for meeting with the Committee, and following a short break, the Committee reconvened to consider the next agenda item.

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

Dr. Killeen stated that GEO is the only directorate with a written strategic vision, GEO Vision, which was signed by members of the Advisory Committee in October 2009. The strategic vision positions GEO to be exploratory, look at linkages, look across boundaries, look at complex systems approaches to problems, keeping in mind fundamental basic disciplines as major strengths. He noted that strategic planning at all levels of GEO is emphasized regardless of budget constraints.

Additional highlights of Dr. Killeen’s presentation and comments/questions from Advisory Committee members were as follows:

* FY12 Budget Request has 10.1 percent increment for GEO, and this is spread across all GEO divisions. Major investments are planned for SEES, EarthCube, CaMRA (Creating a More Disaster Resilient America), and continuing investments in basic research, education and diversity.
* FY12 GEO priorities, which reflect Administration priorities, include: (1) clean energy future; (2) understanding and adapting to global climate change, and (3) managing competing demands on land, freshwater, and oceans for production of food, fiber, and biofuels.
* Geosciences has a diversity “crisis.” Support for education and outreach to address this diversity challenge is ongoing in GEO and throughout the Foundation. Investments in CAREER, an NSF flagship program that supports early career investigators, are greater than investments in all the MREFCs combined.

Dr. De Paolo asked if Congress understands and “buys into” the notion of education and outreach as a major role for NSF? Dr. Killeen responded that they do, but that the commitment to using NSF as a tool for transforming education nationally needs strengthening.

* Expeditions in Education (E2) is one way GEO participates in the NSF-wide education enterprise, strategically and aggressively attempting to “move the dial forward” to first engage learners and then empower them once engaged through research experiences, resulting in an energized workforce.
* Two new facilities for GEO include NCAR-Wyoming Supercomputing Center and EarthCube. EarthCube is GEO’s attempt at transformative cyberinfrastructure. EarthCube leverages both GEO and Office of Cyberinfrastructure dollars, and it is envisioned as a persistent, long-lived, decadal cyberinfrastructure, to include some type of rapid prototyping or versioning activity as part of providing interworkability.
* Some continued ongoing major facility investments, which are either operational or under construction, include such projects as HIAPER, EarthScope, R/V Sikuliaq, and Ocean Observatories Investment. Dr. Killeen noted that OOI is the leading cyberinfrastructure activity in the Foundation with 26 FTEs involved. He stated that “GEO gets things done on time and on budget.”
* Re international activities, GEO is working closely with international partners through IGFA (International Group of Funding Agencies) and the Belmont Forum. The Web Site for the Belmont Forum is operational, and the fifth meeting of the Forum is scheduled in Kyoto in January 2012.
  + “The Alliance,” a new entity created as a result of the revisioning of ICSU (International Council for Science) and the Belmont Challenge, will roll out a ten-year initiative on global earth system research at the Rio Plus 20 conference.
  + Two international workshops are planned for October 2011, in Europe, one on coastal vulnerability and one on freshwater security. Dr. Orlando Taylor asked if the Belmont group, as part of its research mandate, is “interested in” the psychosocial aspects of persons living in vulnerable communities or societies? Dr. Killeen responded that the Belmont Forum has funded a workshop with a proposed agenda that will address how to bring in the international social sciences, including risk analysis, decision-making under uncertainty, perceptions, and use of technologies.
* **Dr. Killeen requested input from the Advisory Committee on the draft USGCRP (U.S. Global Change Research Program) Decadal Strategic Plan, which is accepting public comment through December.** He noted it is appropriate to respond both as a Committee as well as individually.
* Dr. Brian Taylor noted that words are important in getting the message accepted. He cautioned against the use of “climate change” and recommended that “strategic security” and “resiliency” be used in an effort to gain bipartisan support. Dr. Killeen stated this is why the environment-economy-energy nexus is important.

Dr. Killeen concluded his remarks by introducing new members of the GEO Directorate and also noting that in honor of Dr. Jarvis Moyers’ contributions to the field, the American Meteorological Society is establishing the Jarvis Moyers Travel Fund to support students who want to attend the annual AMS meetings.

Further comments/questions from the Advisory Committee members and responses included:

* Dr. Baker observed that re international leadership, there appears to be a lot of emphasis on “process” and “how” but not enough focus on “what.” Dr. Killeen responded that the Director has created space to fill the “what” and has established directions with the expectation that the directorates will provide the substance. Ideas must come from the community.
* Dr. Brian Taylor asked whether there has been new thinking on the traditional role of the program manager as so many programs are now cross-directorate. **Dr. Killeen acknowledged stresses have accumulated and asked the Advisory Committee for input on how to lessen the burdens, perhaps through the use of technologies.** In response to a member comment whether gender diversity has been a “fallout” of that stress, Dr. Killeen commented that GEO is thinking a lot about gender diversity and that a committee headed by Dr. Conover has been established to explore how to intervene in the recruitment process to ensure that applicant pools are more diverse, with greater gender diversity, and greater diversity in outlook, in experience and in approach**. Dr. Conover added that the Advisory Committee could help by sending names of potential nominees when positions are announced.** Further, he stated there is an OCE section head position presently open.
* Dr. Spence noted there are challenges presented by interagency cooperation and asked are there opportunities for leveraging and shifting priorities that GEO could advocate across agencies? Dr. Killeen responded that GEO could use some assistance with NOAA and NASA.
* Dr. Schimel noted that some universities do not “reward” “stints” at NSF and asked whether the Director could speak out in his interactions with high-level administrators to reestablish the importance and value of serving as an NSF rotator? Dr. Killeen stated Dr. Suresh shares that concern.
* Noting that people/Congress will be looking for overlaps in funding of certain activities, Dr. De Paolo stated that NSF and GEO need to explain their unique contributions that are different from those of other funded science agencies. Dr. Killeen responded that NSF has a capacity issue: there are too many interfaces and not enough NSF people to work them. But he agreed it is important to understand the overlaps and opportunities and gaps in research funding. Additionally, he stated it is important to lay out the longer-term strategies that can show up in OMB memos to get alignment with other agencies; however, he also observed there are some legal constraints to planning across agencies.

Following Dr. Killeen’s presentation and discussion, the Committee moved immediately to consider the next item on the agenda.

**GEO Vision Update: Topical Strategic Plans, Dr. Marge Cavanaugh, DAD GEO**

Dr. Cavanaugh gave a brief update of GEO Vision activities as related to the topical subcommittee plans. She stated each of the four topical subcommittees of the Advisory Committee (Education and Diversity; Facilities and Instrumentation; International; and Data/Informatics) working together with GEO staff have put together specific plans, ideas, and high-level strategies. These plans are now available on the Committee SharePoint site for review.

**Dr. Cavanaugh requested that if time permits during the subcommittee breakouts that subcommittee strategic plans be discussed and hopefully approved.** Dr. Kellogg suggested since the slides and reports are online, this can also be done electronically over the next few weeks. **Dr. Killeen reiterated that it would be helpful if the Advisory Committee could review and approve or recommend changes so that these plans could then be distributed to the wider community.**

Upon completion of the discussion, at 11:59 a.m., the Committee took a short recess to get lunch and return for a working lunch presentation.

**Working Lunch: Report from the NSF Merit Review Working Group, Candace Major, GEO; and Dr. Steve Meacham, OIA**

Dr. Kellogg welcomed Ms. Major and Dr. Steve Meacham, co-chairs of the Merit Review Working Group, to the Committee and invited them to make their presentation.

Ms. Major noted that the Merit Review Working Group was established by the Director to review the merit review process, as distinguished from the NSB Merit Review Task Force, whose focus is the merit review criteria.

Highlights of the presentation included:

* Recognition that there are stresses on the merit review process caused by workload burdens and other factors. Both the number of proposals received and the number of review requests have continued to trend up.
* Working Group is looking for potential enhancements to process, including use of new tools to reduce those burdens on both the reviewers and the people submitting proposals, while at the same time stimulating submission of high risk/reward/game-changing types of proposals, as well as ensuring these types of proposals will be reviewed appropriately through the process.
* Paramount consideration is maintenance of NSF “gold standard” merit review process.
* Working group is designing a program of pilot activities and a framework for evaluating these activities with an emphasis on engaging all stakeholders.
* Potential new experiments are: (1) PI response to reviews prior to decision; (2) return of noncompetitive proposals based on Program Officer review; (3) Wiki-based reviews; and (4) increased use of virtual panels.

After Ms. Major briefly reviewed some of the potential benefits, drawbacks and mitigation steps for the four above experimental ideas, she requested Committee comments, reactions. They included the following:

* Communicate with others who have employed these methods to get the benefit of their experiences.
* Face-to-face interactions have value in allowing observance of facial expressions.
* Recognition that “younger” scientists have the ability to communicate more comfortably without being physically present.
* Wikis can save time, get more people involved that are not able to travel easily, may have the benefit of having anonymous reviewers, can inject more fairness into the process, increase participation generally in process.
* Experienced Program Managers have ability to recognize and send back proposals that will not be reviewed favorably.
* Allowing PIs to respond to reviews seems to be good idea.
* Recognition that if risky proposals are funded, a large percentage will “fail” because they are risky. Question of what percentage of return is worthwhile? When do you evaluate?
* Drawback in both returning noncompetitive proposals and allowing PI response to reviews prior to decision is the potential for disproportionate effects on first-time investigators and/or young investigators and/or underrepresented minorities. Use of benchmarks may alleviate.
* Use of virtual panels may increase efficiency and effectiveness and save money.
* Virtual panels may work best for routine kinds of reviews with lower money threshold, but for larger programs with more at stake, it is beneficial to have face-to-face meetings.
* Logistical challenges can be associated with use of virtual panels. Flexibility required.
* Scientific journals are faced with similar problem of rejecting some percentage of submissions without review.
* Wikis provide opportunities for sharing information.
* Restrict PI response to review for proposals that are on the “bubble” of getting funded.
* On returning proposals without review, create an exception for first time PIs who may have been unsuccessful because they didn’t fully understand the process or who may benefit from reviews in ways that more experienced PIs do not.
* Recognition that a first-time PI may become discouraged by negative comments received. New PIs need feedback that will help them be better PIs.
* Recognition that the community may react “negatively” by choosing not to submit if they know that, for example, 30 percent of proposals will be returned without review.
* Consider offering on a volunteer basis some training for individuals, maybe department chairs, deans, etc., at institutions, who would take on the responsibility of reviewing first-time PIs’ proposed submissions.
* Allow a reviewer on a panel the opportunity to at least take a look at the proposals that are rejected by the Program Managers.
* Consider use of triage system presently being used by universities that are dealing with increased numbers of applications.

Dr. Kellogg thanked Ms. Major and Dr. Meacham for their participation and presentation.

At 12:51 p.m., following the working lunch session, the Committee took a brief recess before reconvening in a breakout session for the purpose of meeting as division subcommittees.

**Afternoon Session**

**Division Subcommittee Meetings**

The three division subcommittees, Atmospheric and Geospace Sciences, Earth Sciences, and Ocean Sciences, met individually during the breakout session.

At 4:00 p.m., after the breakout session, the full Advisory Committee reconvened to proceed with the agenda.

**Topical Subcommittee: Facilities, Dr. Don De Paolo, AC GEO; and Dr. Will Smith, GEO**

Dr. De Paolo asked Mr. Will Smith, co-chair of the GEO Facilities Team, to present. Highlights from Dr. Smith’s presentation follow:

* Charge to the committee included: develop and assist in implementation of a strategic framework for facilities activities in GEO; coordinate within GEO and other directorates; provide catalog of GEO facilities; provide advice for the setting of priorities related to facilities activities; gather and disseminate information/knowledge of facilities activities; and collect information on best practices.
* Major accomplishment is development of a draft Facilities Plan, which is available on the AC/GEO Web site.
* Two models have been considered for producing a catalog of GEO facilities available to the community: (1) online catalog of GEO-supported facilities; and (2) a broader catalog like that run out of NCAR, which would be an external NSF Web site. **Mr. Smith requested AC input on what would be valuable in terms of a catalog of infrastructure available for geoscience.**
* GEO is a large player in infrastructure at the Foundation. Percentage of GEO budget spent on facilities is larger than any other NSF organization, including MPS.
* Re mid-scale infrastructure, GEO is largest contributor ($450 million) in the Foundation.
* An NSB Subcommittee on Facilities was formed two years ago and tasked with (1) performing an annual portfolio review of NSF-supported facilities; and (2) reporting to Congress on mid-scale facilities. The report is planned for release in January 2012.
* The NSB review noted a data set of 103 current NSF projects which fall into two categories: (1) physical instrumentation; and (2) cyber and data instrumentation.

Discussion followed the presentation and included the following points:

* All four topical subcommittees need to be reconstituted, or “refreshed.” Volunteers are requested. Dr. Brian Taylor volunteered to serve on Facilities Committee. He will join Dr. De Paolo and Dr. Delaney.
* Should a catalog of facilities include facilities that are not NSF supported but key facilities for the type of research that NSF supports? Is there value in recognizing that certain agencies can be relied upon to provide infrastructure that would make no sense for NSF to replicate?
* In a budget flattening scenario, challenges exist. Presently, facilities consume 40 percent of GEO’s budget. A strategic plan, perhaps a set of guiding principles, and discussions on “what ifs” are needed that could illuminate the decision process.
* The balance between budget scale and facilities is a moving target depending on each new year’s demands.
* Remember that facilities play an important role in developing early career scientists. They enable them to address questions without maintaining large establishments, to participate in large field campaigns that GEO supports, to engage in collaborative activities with leading people in the field, and to form groups and experience collegial interactions. Also facilities allow faculty from universities which do not have major facilities and laboratories to participate in world-class science. **Dr. Killeen stated it would be helpful if the AC could clearly articulate those points, which have broad implications for science and are often lost in the debate.**
* It is important to understand why Congress has proposed reducing the MREFC budget more than the NSF budget as a whole. **Dr. Conover asked that the community educate Congress on the impacts.**
* It is naive to think that, at some level, this isn’t going to be a tradeoff between facilities and research. Facilities and research are intimately tied together and finding the balance is key.
* Because difficult decisions will be faced, and it is a significant issue for GEO, **Dr. Killeen reiterated the need to have the AC “up to speed” on what’s going on so that the Committee can speak authoritatively about the “what ifs” regarding funding flows to large facilities.**
* Some relief for facilities has come from contingency funding as well as ARRA funds.

The discussion was concluded because of time constraints, but Dr. Kellogg stated there is need for further discussion at a later time. The Committee moved immediately to consider the next agenda item.

**Division Subcommittee Reports**

**1) Ocean Sciences, Dr. Peggy Delaney AC GEO, and Dr. David Conover, OCE/GEO**

Dr. Delaney reviewed the discussions of the Ocean Sciences Subcommittee. Highlights included:

* Subcommittee believed its feedback to GEO/OCE had been thoughtfully listened to and acted upon.
* No consensus reached whether a decadal survey is appropriate for Ocean Sciences. It is a large division and not a unitary community. Subcommittee believed, however, this idea should be explored further.
* It is critical to understand operational plans for infrastructure projects and core funding. Are there steps that can be taken incrementally with reduced resources?
* It is critical to manage community expectations. “Flat is the new doubling.” This conversation needs to take place; it has not really been fully absorbed by the community.
* Efforts to increase participation and diversity need to be integrated into the mainstream of all activities.
* COSEE (Centers for Ocean Sciences Education Excellence) decadal report was useful, but growth areas for COSEE exist re measuring impact and outcomes, not just reporting numbers.
* Good discussion on OCE Strategic Plan. Subcommittee is looking forward to seeing the document.

Following the report, Dr. Killeen observed that NSF and GEO have not digested or absorbed the “new normal” either. **He requested that the Advisory Committee help encourage bidirectional communication so that opportunities that come forward are appropriate and realizable.** Dr. Delaney asked does the community lead? Does NSF pull? She agreed that the community must step up and let go of the past and recognize the present opportunities.

**2) Atmospheric and Geospace Sciences, Dr. David Schimel, AC GEO; and Dr. Michael Morgan, AGS/GEO**

Dr. Schimel reported there was both good attendance and enthusiastic participation at the subcommittee meeting. Highlights of the meeting were as follows:

* Dr. Michael Morgan, Division Director, gave a good overview of the Division’s activities, including state of field projects, modeling activities, and the role of facilities in enabling the division’s work.
* Several “thorny” issues were discussed:
  + COV recommendation to split the division into two divisions. There was vigorous discussion of this recommendation. As this was not the first COV to make this recommendation, the subcommittee felt it needs to be resolved, keeping in mind the context of the overall intellectual fabric of the directorate as a whole.
  + Gender issue remains very difficult both within the division and the GEO Directorate as a whole. Subcommittee felt the issue needs to be addressed seriously by management with the same care and creativity and perhaps same mechanisms that NSF “forces” on the external community.
  + Increasing difficulty of recruiting the best and brightest as rotators. There is eroding prestige and importance attached to the notion of serving as a rotator. This needs to be addressed at the Director and AD level.
* NEON update provided by Dr. Schmiel.
* Atmospheric Chemistry update provided by Dr. Alex Pszenny included status of field campaigns, collaborative activities, and report on upgrading of NCAR facilities.
* Discussion of idea of holding virtual meetings as part of the Advisory’s Committee’s activities. Subcommittee members noted virtual meetings may not replace face-to-face, but may enable the Committee to do more. Subcommittee meetings seem most likely to benefit from using virtual meetings to address issues that may require more timely input for decision-making.
* Discussion of extreme weather events and importance of CaMRA. Concern was expressed over possible delay or descope of that activity. The Subcommttee reiterated there is real need for not only improved understanding of the physical processes that lead to these events, but how they impact communities and infrastructure, and how that information can best be communicated.

Following Dr. Schimel’s report, Dr. Killeen responded as follows:

* Re splitting the division, this is being looked at internally and will continue to be studied.
* Re gender diversity, close attention is being paid to these issues, and an action agenda has been released which includes training and a special committee looking at related issues. NSF/GEO has to lead by example.
* Re erosion of stature of the rotator, this is worrisome and needs to be addressed. Rotators hold key national leadership positions. The Foundation wants to recruit people who are supported and rewarded by their institutions for their service in these positions. Dr. Killeen noted it’s a collective responsibility, and the community must do its part. **He requested any advice the Committee has to offer on this issue.**

**3) Earth Sciences, Dr. George Hornberger, AC GEO; and Dr. Robert Detrick, EAR/GEO**

Dr. Hornberger reported on the activities of the Subcommittee meeting as follows:

* Dr. Detrick reviewed the current status of EAR, and this overview laid the groundwork for the subcommittee’s discussion.
* Re Foundation-wide initiatives, EarthCube, SEES, and SAVI (Science Across Virtual Institutes):
  + Advertising for SEES not as effective as it needs to be.
  + Dear Colleague letters not as effective as solicitations
  + Newsletter is read and is an important vehicle for communication.
  + Leadership role played by GEO in EarthCube was acknowledged.
  + EAR community needs to be better alerted to SAVI.
* Re issue of setting priorities: recognition that the new “doubling” environment creates tension between broad new initiatives and paying bills for core programs. What is the balance? What message is NSF sending both to community and Congress if new initiatives are started and funding is not increased? Communication with community and OMB critical.
* Re issue of recruitment and new appointments: AC should give names when asked and reminded when openings exist. The subcommittee expressed surprise by the process used to appoint ADs. Vision of OneNSF seems to demand more transparency in the entire process. With regard to recruitment of division directors, in order to get a more diverse pool of applicants, the Advisory Committee would urge Dr. Killeen to consider appointing a committee from outside NSF, who are members of the Earth Sciences community, to help stimulate interest in getting potential nominees to apply.

After Dr. Hornberger’s presentation, additional comments were made by members of both the subcommittee and the whole Committee. Dr. Killeen also responded. Comments and responses as follows:

* **Dr. Killeen introduced Dr. Bob Hautman who is chairing the EAR Division Director Search committee and invited members to give input to Dr. Hautman.** Dr. Cavanaugh reiterated there is transparency in this process and suggested the AC get involved and take an active approach in division director searches.
* **Re the AD search process, Dr. Killeen requested that the Advisory Committee put its recommendations in writing, and they will be taken forward to the Director level.**
* In response to Dr. Baker’s question as to whether these positions for which input is requested are permanent or rotator, Dr. Killeen responded they can be either.
* Dr. Noonan reiterated the community’s concern with how investments in infrastructure and research are balanced. She noted the importance of “sticking together” as a whole community, particularly in this type of budget climate.
* Dr. Brian Taylor stated if NSF wants diversity, there must be enough time in the recruitment process to get the message out and allow people to consider the opportunity.

As a final comment, Dr. Kellogg stated the message is **use this Committee to get names for these positions.**

**Wrap Up**

Before adjourning for the day, Dr. Kellogg listed four action items for members to think about overnight: (1) Nominations for the AD pool and suggested names for the search committee. These are requested within the next week or two. (2) Response to the USGCRP Decadal Strategic Plan. Ad hoc subcommittee could be appointed to write something on behalf of AC for submission by end of November. (3) Reconstitution of Facilities and other topical subcommittees; and (4) read, review and weigh in on draft strategic plans of the topical subcommittees. Do within next couple of weeks so plans can be finalized and distributed in December.

There being no further discussion, the Advisory Committee recessed at 5:55 p.m., to reconvene at 8:15 a.m., Friday, October 14.

**Friday, October 14, 2011**

At 8:15 a.m., Dr. Kellogg welcomed everyone back to the second day of the Committee’s meeting, and moved immediately to consider the first item on the agenda.

**Report of Critical Zone Review Committee, Dr. David Schimel, AC GEO**

Dr. Schimel noted that he was the AC GEO member on the review committee. The committee, which was quite similar to a COV committee, produced a report that is available on the AC GEO Web site. It contains an overview of the CZO program, the main findings of the review committee, and the recommendations of the review committee.

In his presentation, Dr. Schimel stated:

* There are presently seven CZO sites.
* The committee heard presentations from the CZO team.
* The program is young but extraordinarily energetic.
* All sites involve large teams of investigators and include substantial numbers of “un” cohorts (undergraduates to untenured faculty), and have important cross-cutting activities.
* There is much volunteer participation but with close attention to best practices in science data management.
* There is significant effort underway to develop common conceptual framework and modeling framework for CZ science.
* Although this is an observation and field-oriented program, a strong component of integration and synthesis exists within it.
* Most sites are located near the tops of the watersheds. No sites are located in transport of depositional landscapes, which means they are in relatively lightly-impacted ecosystems by humans.
* CZO scientists view these sites as platforms for additional research by other PIs.
* There are strong international connections, particularly to the European equivalent program.

Comments and responses to the presentation were as follows:

* Dr. Brian Taylor asked is there rationale for avoidance of lowlands and human-modified environs? Dr. Schimel responded the review committee raised this issue, and noted that although the emphasis is not on human dominated, certainly none of the systems are pristine.
* Dr. Schimel also noted the committee had concern that there was lack of a formal deep-time perspective. There was no deep drilling and no consideration of trying to understand CZ processes over long spans of time; should these be incorporated? The review team agreed it was important, but believed it did not seem to fit well and that linkages would be difficult.
* Dr. Hornberger noted three of the sites were funded by ARRA and asked how does this fit in the new “doubling is flat” scenario? Dr. Killeen responded that the positive review of this program would be influential in GEO’s thinking in terms of outyear planning.
* Dr. Rudnick noted the recommendations contained in the report ask for additional sites. Is this still the recommendation in light of the “new doubling” and the stimulus funding going away? Dr. Schimel responded this was discussed. There is uncertainty in light of budget considerations. The only way to evolve the program would be to focus on a brutal merit review and frame it within a strategic realignment of the program. The conversation, but not a recommendation per se, indicated a desire to hold on to what is good and look for new opportunities as they arise.
* Dr. Allison noted the issues and approaches in this program are almost identical to other network operations funded by NSF. There are tremendous opportunities to leveraging, to network the networks together, and to look for resultant synergies.

Dr. Kellogg thanked Dr. Schimel and the review committee for doing such a great job and providing such a thorough report.

**Update on EarthCube, Dr. Cliff Jacobs, GEO; Dr. Eva Zanzerkia, GEO; Mr. Alan Blatecky, OCI [via telecon]; and Dr. Jennifer Schopf**

Points from the jointly presented update by Dr. Jacobs, Mr. Blatecky, Dr. Zanzerkia and Dr. Schopf included:

* EarthCube is a major initiative for CIF21 this year. It is a joint project between GEO and OCI, but there is interest from other directorates as well.
* Science has become data intensive. The “sea of data” needs to be managed. EarthCube can assist.
* EarthCube is a vehicle for the community to come together to collaboratively decide what outcomes it would like a decade from now and then to develop a process to get there.
* The broad goal is to transform the conduct of research in geosciences by supporting a kind of community-guided knowledge management system which will increase the community’s productivity and capability.
* An EarthCube charrette will be held November 1-4, 2011. Its purpose is to present, refine, and integrate the best ideas, technologies, and approaches to meet the science needs of the community.
* Following the charrette, there will be another event, possibly an Ideas Lab, which is tentatively scheduled for May 2012; next, the development of protypes; and, ultimately, over a decade-long period, the full integration of geosciences. These outcomes are still vague at this point; they depend on what the community is ready to do. **The hope is for a transformational enterprise.**

Discussion followed. Key points included:

* Dr. Killeen commented this is a different approach for NSF; it is not without risk. **He expressed hope that the Advisory Committee would take some ownership of this new approach to developing community designed, community governed, community operated, pervasive, sustained cyberinfrastructure for the geosciences.** There cannot be winners and losers; it is not like a solicitation; it is not prescriptive. He reiterated the reliance will be on community leadership, and it is a tremendous opportunity for the community to be the first to really go from the concept of generic to transformative capabilities.
* Dr. Schimel commented on the excitement within NEON about EarthCube, and he stated this should not be a cyberinfrastructure-only project.
* In response to several comments about expression of interests by other agencies, Dr. Killeen responded the White House has encouraged other agencies to participate. Dr. Lozier commented that NASA, in particular, should be involved in the process.
* Dr. Allison asked about the involvement of industry, particularly technology and energy. He noted people want to be engaged. Dr. Jacobs responded that a connection to industry is clearly desired, but added NSF has certain legal restraints on how they reach out. Dr. Zanzerkia stated mechanisms for engaging industry are being looked at, and Mr. Blatecky stated there is interest specifically from Microsoft, Google and Cisco.
* Dr. Taylor cautioned that multiple time zones can create problems for those who participate virtually.
* Dr. Kellogg asked if there have been any white papers focusing on the educational component of this? Dr. Killeen responded it has been designed for interworkability for the practicing geoscientists, but there is education outreach potential. Dr. Schopf added that at least two white papers have mentioned training and reaching out to GEO CAREER awardees and postdocs.
* Dr. Morgan asked whether EAGER awards were still being planned as a follow-on to the charrette? Dr. Jacobs responded that if there is convergence, EAGER awards will be entertained, and he added there are a variety of activities that could be done if the community actually reaches some level of convergence.
* Dr. Spence asked is there international interest and outreach and are there initiatives to encourage? Both Dr. Killeen and Mr. Blatecky responded positively. Dr. Killeen emphasized there is strong interaction with Europe.

Following the presentation and discussion, Dr. Kellogg thanked the presenters and acknowledged the fantastic job being done. **She asked members of the Advisory Committee to keep in mind that the Cyberinfrastructure Subcommittee needs new members who will help this go forward and advise the process.**

**Expeditions in Education (E2), Dr. Barbara Olds, EHR**

Dr. Olds updated the Committee on activities happening in the Education and Human Resources Directorate. Highlights of the presentation included:

* There are numerous “grand challenges” in education that cut across all the sciences and engineering, which include: training the workforce; teaching and learning science; creating a scientifically-literate citizenry; broadening participation in STEM; and best use of NSF resources in STEM education.
* In general, NSF does not fund large-scale deployment. NSF needs to improve the handoff of its funded research to groups such as Department of Education which have the wherewithal to take things to scale.
* EHR has begun to transform itself from a directorate that is a collection of more than 30 separate programs into a directorate with three specific work areas: (1) **research and development base** as relates to learning; (2) **leadership**, capacity building and human resource development; and (3) **expeditions**, exploratory, short-term work where partnerships are key.
* Expeditions in Education (E2) will engage, empower and energize.
* Concept of OneNSF is all research programs, all science, technology and engineering programs at NSF should and do include education, and all education programs should and do include science and engineering.
* Some successful EHR partnerships (expeditions) are International Polar Year, Climate Change Education Program; and Cyberlearning: Transforming Education.

Dr. Olds concluded her presentation with a series of questions for AC GEO: (1) how can EHR best engage with the geosciences about a transformed EHR; (2) how can the education R&D base be strengthened; (3) how can the partnerships between EHR and R&RA directorates and offices be strengthened; (4) what are the key driving questions; and (5) what key external partnerships are needed?

Dr. Kellogg thanked Dr. Olds for the presentation and invited comment from the Committee. Key points of the discussion included:

* Dr. Noonan asked, as there still continues to be a lack of progress with underrepresented populations, what is the definition for success; what is the impact of EHR programs on student performance or engagement; what is different in these new proposals; why will they work? Dr. Olds responded that more data is being collected on what works for which students under which circumstances, and as EHR moves to more of a research base and away from simply funding programs, there will be more research on the “why” of successes and the components of a successful program. Dr. Killeen added GEO’s exciting and relevant content provide it a unique opportunity to engage with EHR in a deeper, more authentic partnership.
* Dr. Lozier suggested that we need to think more quantitatively about the STEM workforce that is needed and focus more on developing that workforce. Programs need metrics of success to determine if we have the programs that accomplish our goals. Dr. Karsten stated that in terms of future workforce development, many educational activities within the EHR community are focused at the master’s level. Dr. Olds added that there is focus on community colleges, noting that a large number of people, particularly those from underrepresented minorities, who end up in STEM fields start in community colleges.
* Dr. Orlando Taylor noted the need for increased emphasis on looking at diverse styles of learning, the psychosocial aspects of learning.
* Dr. Rudnick commented on the general lack of respect that exists for education in society. She also noted that students are not introduced to earth sciences within the K-12 education system.
* Dr. Schimel stated NSF is uniquely poised to address the public’s lack of understanding and respect for what science actually is. He further noted the challenge for NSF broadly is how to transition from research to operations. Dr. Killeen responded that the new I-Corps (Innovation Corps) program may help address the scaling question. **He also requested that the AC think about specific opportunities for funded projects that could feed into an expedition in education, a hypothesis-driven approach to look at the impact of different types of thinking on national education.**
* Dr. Schimel also stated there are many scientists, especially young scientists, who are interested in making education a stronger part of their portfolio. He suggested that we find a way to inform and educate them about opportunities for taking ideas to scale. Dr. Killeen invited members of the AC who are members of AGU to attend the GEO town meeting in December and meet the 50 CAREER awardees.
* Dr. Delaney stressed it is important to convey to underrepresented communities that there is an employment future for student majors in the STEM disciplines.
* Dr. Lozier stated communication must be improved between those who write proposals for science and those who write proposals for education. Dr. Olds agreed stating we need partnerships made up of cognitive scientists, learning scientists, education researchers and the people who know the research disciplines.
* Dr. Spence commented that the changes and transformations in EHR must be aligned with GEO at all levels.
* There were general comments about the importance of both faculty training and preparation as well as teacher professional development.
* Dr. Conover stated facilities, which are a huge area of investment for GEO, are really exciting “toys” we use to do science and should be thought of as another educational resource.

Following the discussion, the Advisory Committee took a short break and then reconvened to hear the COV reports.

**COV Reports**

**AGS Geospace Section, Dr. Daniel Baker, AC GEO**

Dr. Baker presented the AGS Geospace Section COV report. Highlights were as follows:

* All COV reviews are intended to provide two kinds of input: (1) assessment of quality and integrity of program operations; and (2) comment on how the results generated have really contributed to the overall NSF goals and strategic objectives.
* Findings related to this COV noted:
  + Work of section continues to be of highest quality and efficiency. Much is accomplished with the available resources.
  + Stewardship of resources given to programs was of highest integrity and very satisfactory in all respects.
  + Procedures were fair and transparent in administering programs as well as in handling of ARRA funds.
  + Evidence of outstanding scientific accomplishments from the investment funding.
* Critical issues/findings included:
  + Extensive discussion of why section should be elevated to division level.
  + More strategic planning and more integration with rest of activities in geosciences is advisable. A need exists for both bottom up and top down planning in thinking about how to use resources.
  + Appropriately funded CubeSat program necessary.
  + Expanded space weather leadership role important. Desire to see CaMRA become a fully functioning and fully funded program as quickly as possible.
  + Successful faculty development in space science was noted and recommended that it be continued.
* COV also noted the importance of choosing the “right’ people for NSF staffing and recommended consideration be given to lessening the burdens on staff, possibly by splitting positions or the use of contractors, use of lower level administrators, and greater use of student involvement.

Following Dr. Baker’s presentation, Dr. Morgan, Division Director for AGS, responded to the suggestion of elevating the section to division level. He stated it was viewed at this time as “an unnecessary distraction,” and that he would not advocate for this. He stated further there is no funding available, and it would be inappropriate for consideration presently. However, at some future time when circumstances are different, it might be considered.

There followed a robust discussion by the entire Advisory Committee of the pros and cons of the COV recommendation to elevate the section to division level status**. Dr. Killeen made some concluding remarks following the discussion in which he challenged the AC to think about space physics, and if it is indeed an emerging coherent discipline, then to consider E2 and EarthCube opportunities, and to think about new levels of facilities, perhaps mid-scale instrumentation, going to the next level. He asked that the Committee take on the charge of strategic thinking and planning for space sciences, solar space sciences. Dr. Baker agreed that the Committee will do more on strategic thinking.**

Dr. Kellogg then requested a motion to accept the COV report, a motion was made, and the Committee voted unanimously to accept the report. She clarified that acceptance does not mean endorsing the recommendations.

**OCE Integrative Projects Section, Dr. Peggy DeLaney, AC GEO**

Dr. Delaney presented the COV report on the Oceanographic Centers, Facilities and Equipment of the Integrative Projects Section. Highlights were as follows:

* OCE includes ships in the U.S. fleet, submersibles, shipboard infrastructure, shared use instruments that go to sea, and seagoing technical support.
* Budget pressures exist for this program and include those related to age of fleet.
* Program exemplifies goals of collaboration and communication and strategic thinking and engagement with stakeholders.
* Large assets are well managed by small core of people.
* Maturity of organization noted.
* The strong communication to the community by GEO that we are facing a crisis in ship time availability has led to or may correlate with a drop in proposal pressure at OCE and probably a real-time drop in ship-time requests. There is need to recognize that positive messages get heard very slowly and strong concerns or negative warnings seem to have a longer lifetime.

Following the presentation, there was general discussion of the ship time requests/availability issue. Dr. Killeen noted this area needs follow-up in order to understand the correlation between proposal requests for ship time and actual availability and community perceptions. Dr. Hautman stated there are surveys being conducted. Dr. Delaney noted managing vessels is not intuitive; “fixed price costs don’t go away.” Dr. Kellogg suggested this is a topic for the Facilities Subcommittee to entrain in their conversation. Dr. Hautman also commented that the ARRA funding allowed for an increase in utilization for the 2009 through 2011 period. Presently, the drop in funding is reflected in the number of ship days available.

Dr. Kellogg asked for a vote of acceptance of the COV report by the Advisory Committee. The vote was unanimous to accept.

**EAR Surface Earth Processes Section, Dr. George Hornberger, AC GEO**

Dr. Hornberger presented the final COV report, which was on the Surface Earth Processes Section of the Earth Sciences Division. Highlights included:

* Well-run program; section in good shape.
* Review processes handled very well.
* Program portfolio and program goals are well-balanced and high quality.
* Findings/recommendations as follow:
  + Workload issue exists.
  + Two-tiered system of review works well. Recommend it be continued.
  + Program officers excel in leveraging/cofunding within EAR, within GEO and across the Foundation as well as other agencies.
  + Be aware that a size duration viability threshold exists.
  + EAGER program important in terms of stimulating proposals for high risk research. COV recommends that EAR track the work and identify the successes.
  + Appears to be a bias against the funding of proposals that are interdisciplinary in nature. They have lower success rates than those reviewed by a single disciplinary panel. Use of overlapping panels may be useful.
  + Within core programs, successful proposals have fewer ad hoc reviews than unsuccessful proposals. Why?
  + Participation and funding of minority PIs appears relatively static across recent years. Recommend redoubling efforts.
  + Good balance between permanent POs and rotators exists.
  + COV recommends continued participation in international conferences.
  + COV recommends statistics be provided to future COVs.

Following the presentations, responses from GEO staff included: (1) re data gathering requests, some of this data is available and can and will be provided to next COV; (2) bias question is an interesting finding and will be addressed.

Dr. Kellogg asked for acceptance of the COV by the Advisory Committee. The vote was unanimous to accept.

At 12:13 p.m., the Committee took a short break to get lunch, and then reconvened in a working luncheon session to consider the next item on the agenda.

**Working Lunch – Topical Subcommittee – Education and Diversity, Dr. Orlando Taylor, AC GEO, and Dr. Jill Karsten, GEO**

Dr. Karsten led the presentation and discussion. Key points included:

* Brief updates on the following programs: Geoscience Education; Opportunities for Enhancing Diversity in the Geosciences; Global Learning and Observations to Benefit the Environment (GLOBE); Geoscience Teacher Training; Climate Change Education Partnerships; and GEO-EHR STEM Talent Expansion Program.
* Demographic trends are bad.
* REU (Research Experience for Undergraduate) site data shows good participation with respect to gender. Some subdisciplines are improving with regard to getting undergraduates from diverse populations into those site programs, but there is still room for improvement.
* Targeted efforts include: (1) Increased focus on community colleges. More than 40 percent of students who go into STEM bachelor degree programs start at community college. (2) Leveraging activities within professional societies. (3) OCE early career programs.

After concluding her presentation, Dr. Karsten introduced the OEDG panel participants for the discussion.

**Panel Discussion with Grantees from the Opportunities for Enhancing Diversity in the Geosciences (OEDG) Program:**

**OEDG Panelists: Dr. Emi Ito, U-MN; Holly Pellerin, U-MN; Dr. Alexander Gates, Rutgers; Dr. Lisa White, San Francisco State; Donald Stredney, Ohio State; and Dr. Christopher Atchison, Georgia State**

The panelists made brief presentations describing the work of their individual programs. A broader discussion followed after all four presentations.

Dr. Lisa White presented first. Key points of her presentation included:

* Discussion of two projects that she has directed: (1) SF-ROCKS (Reaching out to Communities and Kids with Science in San Francisco; and (2) METALS (Minority Education through Teaching and Learning in the Sciences). Both are programs which promote science experiences out in the field and highlight importance of collaborations with different regional partners.
* Some lessons and challenges were:
  + Connections with communities, including making visits to local schools and interacting with teachers, are important.
  + Geological settings in local environments provide opportunities.
  + No substitute for field experience.
  + Cultural connections and a culturally significant experience are important.
  + Networking with other OEDG programs or diversity programs focused on summer field experiences is helpful.
  + Teachers need additional learning materials.
  + Field experiences offer students opportunity for experiential learning and ability to interact with faculty and graduate students by working in environments that have direct impact on communities.
  + Can be difficult to find people to lead the research teams during the summer.

Dr. Alexander Gates presented next on the Highlands to Piedmont Project. Highlights included:

* Program located in Newark, New Jersey, a community where minorities comprise 88 percent of the population, there are 45,000 students in school system, a high crime rate with gangs, drugs, and violence exists, and there is cultural pressure on kids.
* Project collaborated with Rutgers University, University of Newark, Kean University, Newark Museum, Newark public schools, local industry and ExxonMobil.
* Program included: integrated/applied hands-on classroom activities; weekend and after-school museum programs; professional development for teachers; summer school institutes; and opportunities for advanced experiences.
* Philosophy was to use a “hook” to get students interested (classroom games) and then build on that hook (Dinosaur Day, Geoscience Day), continue to engage (summer programs), to pique the students’ interests, and educate students and their families about opportunities, including careers in the geosciences.

Dr. Emi Ito was the third presenter. Her presentation noted the following:

* Program name is Manoomin (wild rice).
* Collaborative effort with Fond du Lac Tribal Community College.
* Middle school and high school student researchers participated in original research to study wild rice, investigating the past, present and future conditions of the wild rice lakes.
* Key points of project included:
  + There was existent infrastructure and human capital.
  + The decision to investigate manoomin came from Fond du Lac community, as a result of a “talking circle,” a Native American technique of listening respectfully to all opinions.
  + Because manoomin is a culturally significant plant, students were energetic and committed to studying.
  + Project presented opportunity for original research that could be investigated jointly.
  + 13 of 14 funded individuals were Native Americans.

The final presentation was made by Dr. Chris Atchison. Highlights included:

* Disabled population makes up extremely small percentage of geosciences workforce. Geoscience is least accessible science for disabled students because of need to be in the field to make direct observations and interpretations.
* Knowledge of the aging geosciences workforce who can no longer work in the field should be utilized.
* Need to bring the field to these above populations; thus, the focus of the project.
* Collaborated with Don Stredney from the Ohio Supercomputer Center.
* Objectives of the project were: (1) attain additional data. Six students who were mobility-impaired (in wheelchairs) were taken to Mammoth Cave and actually performed mapping exercises. (2) Virtually recreate that section of Mammoth Cave; take the data and integrate it into a virtual field site for use with students. (3) Assess the efficacy of students using the virtual environment compared to those who were in the actual environment and determine dissonance between the two.
* Geoscientists in industry or academia could be included in project as well.
* Goal is to minimize barriers and make geoscience more accessible to disabled students.
* Six participating students displayed enhanced content knowledge. They were not geoscience students, and yet their interpretations were “phenomenal.” This may be worth exploring in a follow-up study on spatial knowledge abilities of wheelchair-bound individuals.
* One notable finding was the more independent a student is in his daily life, the less adventurous he is.
* In addition to obvious physical barriers, there are psychological and societal barriers as well. Disabled individuals must be included in all phases of program development and planning, including curriculum development.
* Creation of a virtual environment that would enable a student to stand inside and see completely around the cave is anticipated.

General discussion followed the presentations. Questions, comments, responses included:

* How might these activities be scaled up and work inside the school system instead of being extracurricular? Ms. Pellerin responded that teachers involved in the projects do take curriculum back to their classrooms.
* Simulation training is not unique, but the problem is how to get it into the curriculum. There is insufficient time for faculty make necessary changes to the curriculum.
* What motivated this group of presenters to spend their time and energy on developing these creative programs?
* These projects demonstrate ways to connect research and education in research in geosciences. E2 aligns well with this.
* Permanently funded base field camps would allow scalability.
* Summer field programs can be done anyplace.
* Not all programs are scalable. However, examples can be replicated.
* The future of the geosciences workforce is a community-wide concern. We need to think about a reward structure that would get encourage the community to get more involved in these types of programs.
* Think about one or two best practices that might be doable.
* Most reward systems in research universities do not support this kind of work. It would be desirable to have a mechanism whereby a supplement of “x” amount (maybe ten percent) would be given to a grantee to engage in this type of work. Dr. Killeen responded any PI can do that today. NSF should urge and encourage this. Universities need to understand the value of this and actually “weave it into the fabric.”
* Core goal of Director is development of human capital. Allow people to participate in ways that don’t require a “full” effort.
* Science fairs can be “hooks.” Encourage students to participate in science fairs. Give awards in geosciences.
* Contact veterans affairs organizations to reach out to disabled veterans who are returning to college.

Dr. Kellogg thanked Dr. Karsten and all the presenters and participants for their participation in this very valuable and inspiring discussion. The Advisory Committee took a brief recess and reconvened to consider the final agenda item of the meeting.

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

Action items include the following:

* Feedback/input requested as to formation/composition of the search committee for the AD position. Chair requested that members e-mail their suggestions within next few days and she will forward to the AD.
* Committee has been asked to consider candidates for the AD position. Advisory Committee members are asked to respond directly to the letter with their suggestions. Although these suggestions are not needed immediately, they are requested as soon as possible.
* Re repopulation of four topical subcommittees (Facilities, Education and Diversity, International, and Cyberinfrastructure), the chair requests members to e-mail their first two choices for subcommittee assignments.
* NSF staff has requested feedback on the strategic plans for each subcommittee. Members are asked to review and respond within two weeks so staff has sufficient time to make revisions before the upcoming AGU meeting.
* Re Expeditions in Education presentation questions for Advisory Committee response, if members have ideas, please forward these as well.
* Re response to USGCRP, the chair asks for two or three volunteers to be part of a small ad hoc subcommittee chaired by Dr. Delaney to formulate a draft response from the Advisory Committee for circulation and review. Members may respond as individuals as well. These responses are needed by end of November.
* Re Merit Review Working Group, any additional comments that members may have should be sent to the chair. She will consolidate with comments she has already received and forward to Candace Major and Steve Meacham.

Dr. Kellogg concluded the meeting by thanking the members, Ms. Lane, and other NSF staff for their help and support of the meeting. Dr. Killeen thanked Dr. Kellogg and the Committee for its many inputs and reiterated the desire of the Directorate to get feedback promptly on the four strategic “plan-lets.” He also again urged members to attend the AGU Town Hall meeting.

There being no further business to come before the Committee, the meeting was adjourned at 2:20 p.m.