# NSF Committee of Visitors Report
# Deep Earth Processes Section
# Division of Earth Sciences
# Directorate for Geosciences
# August 12-14, 2014

## RESPONSE TO SPECIFIC COMMENTS IN THE COMMITTEE OF VISITORS REPORT

James H. Whitcomb
Head
Deep Earth Processes Section
Division of Earth Sciences

On August 12-14, 2014, a Committee of Visitors (COV) met at NSF to review five Programs in the Deep Earth Processes Section (DEP) of the Division of Earth Sciences (EAR). These Programs included: *Tectonics (TE), Petrology and Geochemistry (CH), Geophysics (PH), Continental Dynamics (CD),* and *EarthScope (ES).* The review covered proposal and award actions for the Fiscal Years of 2011, 2012, and 2013. We are very pleased with the overall findings and recommendations across DEP as outlined in the COV report:

- DEP programs are funding essential and cutting-edge science, including potentially transformative research and an appropriate blend of inter-disciplinary and disciplinary projects.
- DEP POs are doing an outstanding job of running their programs. The COV was particularly impressed by the excellence of this management in the face of very high PO workloads and flat or declining program budgets.
- The proposal review process in each program is based on expert information from mail, panel and PO evaluations. It is fair, transparent, and in general clearly documented.
- DEP POs have been pro-active in working with their research communities to define and develop new research directions, and they pay close attention to funding trends and concerns (e.g. large observational projects, experimental and analytical labs) and the health of the research workforce.

While positive and complimentary of NSF's management of the DEP Section, the COV report contains some specific recommendations or concerns on areas that could be improved by the Section.

## GENERAL RECOMMENDATIONS

*Recommendation 1:* The exemplary three-part review process employed in DEP (mail reviews, panels and PO analyses) should be continued, and enough PO and support staff positions should be allocated to make this process sustainable.

Response: We agree and plan to continue the three-part review process that we consider to be the "gold standard" of NSF peer review.

> *Recommendation 2:* The PO review analyses were a revelation and gave us great insight into funding decisions. The depth of thought and information in these review analyses is a very valuable resource for PIs. Some POs shared significant portions of their review analyses (redacted to remove confidential information) with PIs, but this practice was not uniform. We recommend more consistently providing PIs with the content of PO review analyses.

Response: We agree and will make an effort to make the PO Comments sections, which are available to the PI, uniformly complete with emphasis on the review elements that most affected the funding decision.

> *Recommendation 3:* We recommend that POs continue their efforts to educate reviewers, panels and PIs about broader impacts. The range of activities required for high quality broader impacts apparently remains a source of confusion, as was also noted by the past two COV reports. Further clarifying this issue would aid PIs who otherwise may face moving targets of expectation when they submit proposals to different programs. In particular, top-notch work in graduate and/or undergraduate education is one path to excellence in broader impacts. Other types of activities (e.g. K-12 education, public outreach, media work) are also valuable broader impacts, but should not be viewed as necessary to achieving a high ranking.

Response: We agree and in order to address this issue, EAR's Program Director in Education & Human Resources, Lina Patino, hired a PhD-level AAAS Fellow (Justin Lawrence) for the last year and a half to help the entire Division get a handle on what Broader Impacts are included in the proposals submitted, and which are well carried out upon award (and which are not). He has produced program-specific data and analysis of how the broader impacts are used within each discipline, and talked with all PD's about what their communities are doing, and could do better. This has helped clarify in the PD's minds what broader impact activities are working in their program, and given us all data and resources with which to encourage our PIs. Justin has also been using the Division's newsletter, 'EAR to the Ground,' to highlight successful and diverse broader impact activities, in hopes of clarifying what NSF considers "excellent broader impacts," and encouraging other PIs to develop their own activities. The Deep Section PD's in particular have engaged with their panels, with the help of Lina, to remind them during panel discussions about a) the importance of broader impacts, and b) the diversity of activities that could be considered in that category (e.g., not simply student education, but museum outreach, implications for hazard mitigation, development of community-wide tools, etc.) We also continue to remind PI's not to take on broader impact activities that may be outside their expertise (like engaging in elementary education) but to partner with education experts who have the tools to turn their science into something more broadly reaching.

> *Recommendation 4:* DEP should continue to seek solutions for funding large observational projects and for sustaining experimental and analytical labs and the expert personnel they require. Increasing funding to DEP programs is one obvious solution that

should be actively pursued, but coordinated strategies and new support models in DEP and across EAR should also be explored. For example, CH has been investigating joint planning with the EAR Instrumentation and Facilities program.

Response: We agree that better coordination among DEP research programs and IF is needed, and that DEP needs to develop strategies to best meet the needs of the community for both infrastructure and large observational programs. The section will plan and hold a 2-day science retreat in the fall of 2014 to start to tackle these issues. The science retreat will focus on developing ideas for enhanced coordination among programs and facilities to address the above needs in the current reduced funding environment. Future steps may include 1) developing mechanisms to involve the community in discussions of these issues, and 2) documenting strategic needs for the DEP community to advocate for enhanced funding within NSF.

*Recommendation 5:* DEP programs should develop strategies to more accurately measure participation of minority PIs and their success with funding relative to the total pool of PIs. Should a gap in success still be apparent, its causes should be studied and addressed. DEP programs should also continue their wider efforts to enhance diversity in the research community, including attention to this issue in proposal broader impacts.

Response: We agree that it is important to ensure fair treatment of minority PIs and that their success in funding should match or exceed the overall funding rates. However we are limited by the requirement that the NSF data base be used to identify minority PIs. This leads to large uncertainties because minority status in the NSF database is limited to self-identification, and minority PIs are a very small percentage of the community. While we do not have much hope in improving the accuracy of minority success statistics, program officers will continue to use identified minority status as one of the positive factors in the review process decisions.

*Recommendation 6:* Because education and outreach are a major component of CAREER proposals, we recommend that program officers solicit at least one mail review from a geoscience researcher with deeper than usual expertise in education. CAREER proposers should also be encouraged to seek pre-submission advice from experts in geoscience education.

Response: Program officers have tried a number of different combinations of research and education expertise in their review of CAREER proposals. In general, they have found that the best peer review system utilizes experts who have the breadth to evaluate both research and the special broader impact requirements of the CAREER solicitation. If, for example, a review is requested from an education specialist, there is no guarantee of receiving that review. Requests might be made from eight reviewers whereas it is typical that not all return a review; three reviews are required. If no ad hoc reviewer or panelist has appropriate educational expertise, advice is sought from program officers that are expert in the field.

*Recommendation 7:* To eliminate uneven treatment of CAREER proposals, and to encourage sharing of best practices between programs, we recommend that DEP POs jointly develop criteria for funding CAREER proposals. If timing permits, jointly examining all CAREER proposals following panel meetings should also be considered.

Response: We appreciate the COV's encouragement and suggestions to improve our funding of CAREER proposals. The review criteria are of course spelled out in the CAREER solicitation, but we have discussed many times ways to improve CAREER submission and success rates including a joint review process. However, the funding for CAREER proposals comes primarily from the relevant 'core' research program and, as such, it is one of the many things a Program Officer needs to balance in their portfolio. Also, each program receives a widely varying number of CAREER proposals per year and the quality of those proposals may vary significantly from year to year. In some cases, funding for CAREER proposals is balanced against funding of proposals by early-career PIs that are not eligible for CAREER, or early-career PIs have been discouraged by their organizations from applying to this program for a number of reasons. However, we believe that the DEP POs share a very positive attitude towards the support of early-career PIs in this prestigious program and seek to fund these proposals whenever possible. Some CAREER proposals submitted and declined are resubmitted at a later date and funded after the PI has addressed weaknesses in the research and/or education components. The cumulative success rates for CAREER proposals over the past ten years in CH, TE, and PH are all between 44 and 46%. EarthScope has received too few CAREER proposals over this time period to yield a reliable success rate. We suspect that most PIs that could submit to EarthScope end up applying to Geophysics instead.

> *Recommendation 8:* Before committing to any new initiative within NSF, an assessment should be made of the person-hours it requires and the demands that are likely to be made on PO efforts to run their core programs. When a PO's time is allocated to a new initiative, new PO positions should be added to help manage the PO's prior programs.

Response: Each new solicitation or program at NSF must have a management plan that outlines the resulting financial and personnel impact on the division budget and workload. In such cases the impact can be anticipated and accommodated if known far enough in advance and additional resources brought to bear or cuts can be made elsewhere to make up for the additional needs. However, this is sometimes more difficult for programs outside of the division where a program officer is approached to work on a new initiative without consulting in advance with the division management structure. The end result is often over-commitment by the program officer and/or a scramble to fill in behind them in ways that are not as effective. We will continue to work with the EAR and GEO management to improve problems of over-commitment.

> *Recommendation 9:* Improved information systems should be aggressively pursued. Great potential exists to save time spent on routine tasks, thus better enabling POs to manage their extensive responsibilities within and beyond their home programs.

Response: In the past two years, NSF has strengthened its governance of IT modernization at the Foundation. These governance bodies meet regularly to oversee NSF IT modernization initiatives. Currently, modernization activities range from modernization of the proposal submission process to internal proposal, review, and reviewer management (including all aspects of merit review). The efforts will be deliberate and incremental in order to avoid significant disruption and to ensure appropriate system integration.

> *Recommendation 10:* We recommend that DEP program budgets grow. Improved funding will prevent loss of U.S. capabilities in observational, experimental and analytical science, enable transformative research, address key national priorities, and develop the careers of the next generation of the geoscience workforce.

Response: We agree. With the community's help, we must continue to make the case of the importance of DEP science to the mission of NSF and the country in the face of substantial budget cuts of the past few years.

**Program-specific Recommendations**

In addition to the general recommendations for the DEP section, there are program-specific recommendations that are not covered in the "Findings and Recommendations across DEP" discussed above.

> Petrology and Geochemistry (CH)… The POs have identified sustaining labs and technical staff as a particular challenge for CH. Labs need long term support, i.e. greater than the 2-3 years currently typical for science proposals. As funding gets tighter, funding of technical staff becomes more precarious, and key lab staff are being lost. CH POs have been pursuing better coordination with the EAR Instrumentation and Facilities program. DEP-wide planning would likely great aid in managing/funding this critical support in the coming years.

Response: CH will engage with IF, hopefully as part of a Section-wide (or even Division-wide) effort to better coordinate research and lab funding. At times like this, when budgets are exceptionally tight, thoughtfulness and coordination is required to ensure that productive labs stay afloat and staffed, and new instruments are distributed carefully to those PIs and institutions that will be able to support them. It is in the best interest of not only CH, but the entire Division, that instrument-related funds either from IF or from the research program in the form of staff support and supplies is well spent.

> EarthScope (ES)…The panel decision was supported in the panel summaries although it is noteworthy that the average panel scores were typically lower than the average mail review scores (the average difference is 0.7 lower). The COV raised the possibility that the composition of the panel for the round of proposals we reviewed may have been uncharacteristically hard on the proposals. This emphasizes the importance of the PO continuing to strive to populate the panel with fair-minded scientists.

Response: We agree that a "fair-minded" panel is key, and we believe the ES panels have been fair-minded. It is important to note that the panel views all (or nearly all) proposals submitted to a given round, and thus provides a synoptic perspective that is reflected in the scores that it assigns to a given project, whereas a ad hoc reviewer only assigns a score to a single proposal. Typically, panel scores tend to have a wider spread than *ad hoc* review scores, resulting in the average panel scores within EAR trending lower than the average *ad hoc* review scores. This should not necessarily be construed as the panel being 'harder' on the proposals, but merely

reflects the panel's calibration of their merit review scores as they assess the entire round of proposals. The program POs will continue to strive for a fair, diverse, and balanced panel for the program.

> EarthScope (ES)… The documentation was clear for purposes of determining the rationale for the funding decision. However, the COV struggled with understanding the justification for some fund/decline decisions relative to each other. From the information provided in the jacket, we could not completely extract the justification for some decisions over others since the mail scores were often very high, but then the panel gave a low score. It was not straightforward to extract a consistent criterion. The PO made clear that in some cases the mail reviews provided high scores, but interpretation of the review text indicated that a lower score would have been more appropriate, and the panel went with the latter. Also, the panel appeared to take broader impacts more seriously than the ad hoc reviews. This may explain some of the reduced panel scores relative to the ad hoc scores. One particular case was a CAREER proposal that was ranked highly by the ad hoc reviews. The COV felt that the information provided did not provide sufficient (consistent) reasoning for the rejection. We encourage the POs to log all the information that gives context for the decisions, especially relative to each other. We reiterate that we are not questioning the fund/decline decisions, but advocate greater and more consistent documentation. It is quite clear that the POs have worked very hard in the review process.

Response: We agree with the need for more clarity, and will ensure that relevant factors for a given recommendation are presented in the proposal jacket, especially when the recommendation is influenced more than average by factors not apparent in the reviews themselves. Information on relative rankings is currently provided in general terms -- upper/middle/lower third, for example -- but we will examine ways to provide further information while ensuring proper attention to confidentiality.

> EarthScope (ES)… The system of communicating decision information to the PI is very important for the PI, and many of the letters were thorough and effective in communicating the decision and the rationale behind it. However, the PO decision letters to the PIs were quite varied, from exemplary in their clarity and detail, to terse. For declines, several PO letters to PIs simply recommended that the(y) view the panel and external reviews and consider resubmitting the proposal. But for some of these cases the external ad hoc letters were quite strong. This opens the door for PI confusion: great external reviews but a rejection decision and no information from the PO for how to improve in resubmission. A more even treatment of the summary analysis of the proposal in the PO letter to the PI across proposals is desirable.

Response: We agree. The current program POs have begun using a common template for review analyses and PO comments, which is intended to provide more uniformity and improve clarity, and have made other changes to the review process. More generally, the program POs will continue to strive to provide useful feedback and guidance to PI(s) about significant highlights or concerns for a given proposal, so that the PI(s) understand the recommendation we made and why we made it.

EarthScope (ES)… Regarding the use of the merit system of review, the COV had a suggestion for the ES POs. We learned in discussion with the POs that the highest ad hoc rankings of proposals defined a list that would not need to be discussed further unless any panel member expressed the desire to bring any of them into review by the panel. This resulted in several top-ranking proposals being reviewed by the panel, and ultimately rejected. The COV was concerned that this is an uneven process and recommends that a different protocol be considered. For example, the top-rated proposals can either all be reviewed, or all be excluded from review.

Response: We understand the concern raised here, and will consider this recommendation. We would like to note that even if all proposals were to go forward for panel discussion, in cases when the ***ad hoc*** reviews provide sufficient feedback to the POs and PI(s), the panel may concur with the *ad hoc* reviews, and choose not to discuss a proposal or only to discuss it briefly.

Continental Dynamics (CD)… In several cases, documentation of the funding decision was not clearly documented, and/or did not appear to reflect some concerns raised by the reviewers. The subcommittee discussed one case with PO, and the funding rationale in this instance was clarified.

Response: We will increase our efforts to ensure that the funding decision is well-documented in the Review Analysis

Continental Dynamics (CD)… In a few cases, no detailed explanation of the funding decision was communicated to the PIs beyond the panel summary and reviews.

Response: We will increase our efforts to ensure that the major factors influencing the funding decision are communicated to the PI in the PO Comments section.

Continental Dynamics (CD)… Much of the discussion that led to the phase-out of CD and the creation of IES appears to have been internal to NSF. A workshop that involves the research community in discussions of IES directions would be a good idea.

Response: EAR plans to hold a workshop discussing the IES program directions in the near future.

Other Topics… DEP programs are producing amazing science, and while DEP POs make efforts to publicize this work within and beyond NSF, better help from the press and public affairs staff at NSF would be beneficial. In addition, we suggest allocating non-PO staff time (perhaps an intern) to collecting data on high profile publications and others measures of program success.

Response: A system is in place to identify and publish highlights of NSF research. This function is normally within the responsibilities of the Section-Wide position. These highlights are publicized through the NSF web page. OLPA, the NSF group responsible for the press and public affairs, assigns a single person to GEO and other directorates to handle publicity of

science highlights and major papers to the external press. We will consider the suggestion of devoting staff time, perhaps an intern, to collecting more complete DEP publication data.

We would like to thank Dr. Fischer and the members of the COV for their time and efforts in making these excellent recommendations that will improve the Programs of the Deep Earth Processes Section.

James H. Whitcomb
Head, Deep Earth Processes Section

Concurrence by:

Dr. Sonia Esperanca
Acting Director, Division of Earth Sciences