

**Report of the Committee of Visitors,
Deep Earth Processes Section,
NSF Division of Earth Sciences,
2005-2007**

Introduction

The 2008 Committee of Visitors (COV) to the Deep Earth Processes (DEP) Section, Division of Earth Sciences, met on 9-11 June at National Science Foundation (NSF) Headquarters in Arlington, Virginia. The purpose of the meeting was to conduct an external review of the five research programs that make up this Section, which include Geophysics, Petrology and Geochemistry, Tectonics, EarthScope, and Continental Dynamics. The report of this review, carried out under the auspices of the Advisory Committee for Geosciences, is hereby transmitted to the NSF Directorate for Geosciences, for internal use and for preparation of the annual NSF report produced in compliance with the Government Performance and Results Act (GPRA).

The members of the 2008 COV for DEP are as follows: Sean Solomon, Chair (Carnegie Institution of Washington), Chris Andronicos (Cornell University), Catherine Constable (University of California, San Diego), Michael Garcia (University of Hawaii), Hans Keppler (Bayerisches Geoinstitut), Simon Peacock (University of British Columbia), Peter Reiners (University of Arizona), Susan Schwartz (University of California, Santa Cruz), Jane Selverstone (University of New Mexico), and Carl Sondergeld (University of Oklahoma).

The charge to the COV was to review the actions taken by the five research programs during the last three fiscal years (2005-2007) and to evaluate the products and contributions supported and overseen by the programs over that period. For the review of program actions, the COV was asked to examine the integrity and efficiency of the processes used to solicit, review, recommend, and document proposal evaluation and actions, including the effectiveness of the program's use of NSF's two merit review criteria, and the relationship between decisions and program goals.

The COV formed subcommittees to evaluate each program in detail, and a chair and deputy chair were named for each subcommittee. The subcommittees were:

Geophysics: Constable (chair), Keppler (deputy chair), Schwartz, Solomon, Sondergeld

Tectonics: Andronicos (chair), Reiners (deputy chair), Garcia, Peacock, Selverstone

Petrology and Geochemistry: Garcia (chair), Selverstone (deputy chair), Keppler, Peacock, Reiners

EarthScope: Schwartz (chair), Sondergeld (deputy chair), Andronicos, Constable, Solomon

Continental Dynamics: Peacock (chair), plus all other COV members.

Prior to the review, the COV was sent a broad variety of statistical and background information on proposals, mail and panel reviews, and outcomes for the five programs over the three most recently completed fiscal years under evaluation, as well as a copy of the previous (2005) COV report (chaired by Sharon Mosher). At our meeting, Program Officers presented highlights of each program, and COV members were given electronic access to all proposal jackets for at least one panel for each program. The COV is grateful to the NSF staff for their considerable efforts at assembling the information needed for the committee to complete its charge.

For all programs except EarthScope and Continental Dynamics, the COV reviewed actions from the Spring 2007 panels; the review for EarthScope was of actions from the Fall 2007 panel; because of the small number of proposals per year in Continental Dynamics, we reviewed actions within that program for the three years 2005, 2006, and 2007. For each of the five programs we reviewed, we selected a range of proposals. We generally examined a few that were highly rated and resulted in awards, we reviewed the lowest-ranked proposals that resulted in awards and the highest-ranked proposals that were declined, and we looked at proposals for which the mail rankings were either substantially higher or substantially lower than the panel rankings. For some programs we looked at proposals selected essentially at random from the “Must fund,” “Fund if possible,” and “Do not fund” categories. We also reviewed most of the CAREER (Faculty Early Career Development) award proposals, and we examined several proposals for which there was a sufficient panel conflict of interest that the decision was based entirely on mail reviews. For the Continental Dynamics Program, the three-year perspective gave us an opportunity to assess how proposed project scope and program decisions evolved over multiple proposal submissions.

General Findings

The most important general finding of the COV is that the overall management of the five programs we evaluated appears to be excellent. The review process, including both mail reviews from experts in the area of the proposal and review by the broadly knowledgeable panels, is thorough and fair. The outcomes of the reviews are well documented by Program Officers, and sufficient information on the basis for award decisions is typically provided to the proposers. The Section meets NSF guidelines for proposal dwell time – the time between proposal submission and transmission of a decision to the proposer – for four of the five programs evaluated. The Program Officers communicate well within the Section and with their counterparts in the rest of the Earth Sciences (EAR) Division and the Geosciences (GEO) Directorate, as well as the rest of the Foundation. That communication has enabled balanced reviews of interdisciplinary proposals and has resulted in a variety of teaming arrangements across programs that have permitted the leveraging of Section resources to support a range of attractive projects. The Section generally pays appropriate continuing attention to the diversity of its proposers, awardees, reviewers, and panelists. Most fundamentally, the scientific projects supported by the programs evaluated are all of high scientific merit and often of broad scientific impact.

The DEP Section has been laudably responsive to the recommendations of the last COV. The recommendation of the 2005 COV that programs endeavor to reduce proposal dwell times has been achieved. Program Officer staffing has increased in several programs, with the result that the proposal load per officer in those programs has been reduced. Proposal load is still high relative to other organizational units within the Foundation, but no longer unduly so. Several programs have expanded the size of their panels, as recommended, and the suggestion that early-career scientists be invited to serve as ad hoc members of a panel have been adopted in several instances. Several programs have responded to the recommendation to encourage an increased number of CAREER proposals from young investigators, with the result that a greater number of CAREER awards are being made by the Section per year. Such awards not only encourage the research and educational programs of our most accomplished younger scientists, they are a prerequisite to NSF’s prestigious Presidential Early Career Award for Scientists and Engineers (PECASE). In the area of education and outreach, the last COV had recommended the involvement of local schools and students in the EarthScope Program’s siting of USArray stations, and we were pleased to see that this suggestion has been broadly implemented.

NSF has announced the broad goal of seeking projects that will be “transformative” to the sciences (e.g., Important Notice No. 130 in September 2007). The COV discussed this concept at length, and we endorse the goal of counterbalancing the natural conservatism of peer review with a willingness to solicit and support riskier efforts that depart from the central currents of the scientific mainstream. That said, we are unable to offer much guidance on how to recognize transformative research at the time of proposal submission or how to document success at meeting this Foundation-wide goal. The committee deemed that we could recognize exciting science likely to be of high impact, and we felt able to judge some categories of high-risk projects that, if successful, would be of great importance. Nonetheless, the COV recognizes that many scientific transformations are unanticipated and cannot be proposed in advance but rather follow from serendipitous outcomes of experiments by an investigator or investigators able to recognize the importance of an unexpected result. Even if a proposal can be identified as potentially transformative, that potential is not likely to be realized immediately, so it is difficult to assess the success at stimulating transformative research by evaluating the outcomes of proposal reviews from the immediate prior year. One step that might be helpful would be to encourage community discussion of conservatism versus risk taking in proposal writing and peer review in the hope that a broader understanding of the appropriate balance for the foundation’s research portfolio might encourage additional bold proposals and discourage reviewer reticence to consider such ideas thoughtfully. Another is that the DEP section might consider pooling a few percent of their funds to create a new initiative to promote innovative proposals that are high in risk but also high in potential payoff.

The DEP Section has made an appropriately broad mix of multi-investigator and single-investigator awards. There are some important research topics where cross-disciplinary collaborations are required for progress. Within the Section, the Continental Dynamics Program is specifically tailored for such projects, but each of the other four programs has also made recent multi-investigator awards for projects that could not be readily tackled by lone investigators. The committee recognizes that cross-disciplinary research offers exciting opportunities for new and even “transformative” advances. At the same time, some of the most important scientific achievements have come from bright individuals, a situation likely to continue for the foreseeable future. The COV recommends that the DEP programs preserve a healthy fraction of awards to individual-PI projects.

Of the two merit review criteria applied to the evaluation of proposals to the Foundation, the “intellectual merit” criterion – with the exception of the new goal of fostering “transformative” research discussed above – is well understood by reviewers, panelists, and this COV. Less well understood is the “broader impacts” criterion. Our evaluation of mail reviews and panel summaries for individual proposals revealed a wide spectrum of views on the range of activities encompassed within this criterion and on the relative importance of the two criteria in overall proposal evaluation. We recommend that Program Officers take steps to communicate to their constituent communities the means by which proposers can satisfy the “broader impacts” criterion in their proposals as well as the importance that this criterion will play in proposal evaluation and award decisions.

The typical reliance within the DEP Section on both mail reviews and panels of experts to evaluate and rank proposals leads generally to a robust and balanced review process. No panel can have a sufficient breadth of expertise to be knowledgeable on the topic of every proposal they are asked to assess, but the discussions enabled by face-to-face panel meetings can uncover important issues regarding the feasibility of a given

project and the merit of the proposed approach. In contrast, mail reviews can be sought from those individuals most knowledgeable about the topic of each proposal, and it is often such individuals who are best able to assess most fully the strengths and weaknesses of a given project. We recommend that this combined use of external mail and panel reviews be continued.

The COV was disappointed to learn that the rate of return on requested mail reviews can be as low as 50-60% for some programs. Equally distressing was the discovery that many mail reviews, even from individuals particularly expert in the scientific area of the proposal, do not contain a sufficiently substantive evaluation for the grading score to be meaningfully evaluated by a panel or Program Officer. Both outcomes suggest that many members of the reviewer pool are being asked to evaluate more proposals than can be thoughtfully accomplished and that the importance of critical commentary in mail reviews is not adequately appreciated. The COV was impressed with the attention that individual Program Officers pay to the detailed comments of mail reviewers, but this aspect of the review process may be underappreciated in the community. The COV was encouraged to hear that the Petrology and Geochemistry Program has recently reduced the number of requested mail reviews and at the same time increased the rate of return on those requests (to approximately 70%), in large part by means of follow-on requests from the Program Officer that stress the importance of each particular review. The COV recommends that this practice be emulated by the other programs, and that all programs continue to stress the importance of substantive commentary as a critically needed component of all mail reviews.

Notwithstanding our comments above on the value to a balanced review process of utilizing both mail and panel reviews, the COV noted a small number of instances where a panel did not appear to take sufficiently seriously the critical comments of an expert mail reviewer on a proposal in a narrow field not well represented among panel members. The DEP programs encompass a broad range of scientific topics and disciplines, and there will always be a small segment of proposals for which no member of a given panel is expert. The panel and Program Officer should pay particular attention to the substantive comments, both positive and negative, of the most expert mail reviewers in such situations and should seek additional advice if expert reviews are mixed.

Another fairly general finding of our evaluation of multi-investigator proposals – notably excluding those to the Continental Dynamics Program – was the typical lack of a detailed management plan in those proposals, even those that resulted in awards. There are additional burdens on a multi-investigator project compared with single-PI projects, including a clear division of responsibilities as well as a well-conceived plan for integrating the results of the individual investigators. The Program Officers should take steps to inform potential multi-investigator proposers that the thoughtful development of a management plan would not only improve their chances for an award but would also improve the expected outcomes of their project if funded.

As a general rule, all of the programs in the DEP Section have sensible procedures for dealing with a conflict of interest (COI) for a panel member, e.g., proposals from the panel member herself or himself or from an institutional colleague or frequent collaborator. That said, the programs have different mechanisms for dealing with COI situations, ranging from asking the conflicted panelist to be absent for discussion of that proposal to evaluating panelist proposals entirely by mail reviews seen only by the Program Officer. The COV regards the procedure now in place in the Continental Dynamics Program as one that treats COI situations most fairly yet retains the full balance that is possible only with a mix of mail and panel reviews. By that procedure, a panelist who is submitting a proposal to the program is excused from the panel meeting at

which her or his proposal will be evaluated. Such a procedure not only avoids even the perception that COI may have influenced an outcome, it also affords more opportunities for the one-time appointment of early-career scientists to a panel.

The COV cannot refrain from noting that the phase of the EarthScope Program that has been supported through NSF's MREFC (Major Research Equipment and Facilities Construction) account will end on 30 September, and that thereafter the Operations and Management (O&M) costs will be borne entirely by the DEP Section budget. These O&M costs for the fully configured EarthScope elements come ahead of the infusion of new funds for their support, as well as for the new scientific endeavors that they enable. The result is a squeeze on the budgets of other programs. The maturation of the EarthScope Program introduces other pressures as well, including the pressure to focus studies in North America and the pressure to take advantage of EarthScope assets in geophysical networks by supporting projects that utilize those assets. These pressures, likely to be most keenly felt in the Geophysics, Tectonics, and Continental Dynamics Programs, should be acknowledged in budget formulation decisions within EAR and GEO. At the same time, Program Officers in the affected programs should take steps to ensure that the most compelling scientific projects unrelated to EarthScope continue to be supported.

On a procedural matter, the COV wishes to raise the question of the timing of the committee meeting. Although the choice of meeting date was agreeable to the COV members, the selection of a meeting date in the first half of June meant that Program Officers had to collect background information for the committee at a busy time in the proposal review cycle. A meeting time in August for the next COV for this Section would permit the Program Officers to devote more time to the COV process.

A short summary from each subcommittee review of individual programs is given below to highlight observations that are most pertinent to each program.

Geophysics Program

The Geophysics Program (PH) supports a broad range of theoretical, observational, and experimental geophysics spanning subjects from the shallow crust to Earth's deep interior. The program is distinguished by important cross-program initiatives within EAR, across GEO, and more broadly across NSF. There is strong outreach to the scientific community, and the opportunity for grass-roots development has led to community research plans such as those for CSEDI (Cooperative Studies of the Earth's Deep Interior), CIG (Computational Infrastructure for Geodynamics), and CIDER (Center for Interdisciplinary Deep Earth Research), as well as negotiations for establishing interagency international consortia to meet community needs for acquiring InSAR (interferometric synthetic aperture radar) data. The program has supported geophysical center activities such as SCEC (Southern California Earthquake Center), COMPRES (CONsortium for Material Properties Research in Earth Sciences), and coordination with IRIS (Incorporated Research Institutions for Seismology), UNAVCO, and EarthScope. NSF is the only agency funding such a diversity of deep Earth studies.

The COV is impressed by the manner by which the Geophysics Program has been managed. There are two permanent Program Officers, Robin Reichlin (since 1995) and Eva Zanzerkia (since 2004), and one rotator, Derek Schutt (2005-2008). It is evident that Robin Reichlin has set a high standard in her training of program managers in geophysics and for other programs in the DEP Section, and she maintains a transparent and well-defined process for thorough and thoughtful evaluation of proposals. The program processed around 300 new full proposals each year during 2005-2007 and maintained an

active portfolio of about 400 awards. About 20 uncompleted awards were acted on, and the program is also responsible for managing the portfolio of Geoinformatics awards related to the Geophysics Program.

The research supported engages investigators in the disciplines of seismology, mineral physics, magnetism, potential fields, geodynamics, geodesy, neotectonics, heat flow, and rock mechanics. This diversity is a huge strength and also a challenge to the program, as it requires an enormous range of expertise in the pool of reviewers and panelists. The previous COV suggested modifications to the panel composition to provide additional members and ad hoc flexibility to cover the proposal mix. This recommendation has been implemented, along with joint review and panel discussion with Tectonics and with Petrology and Geochemistry for appropriate flavors of proposals, and the procedures seem to work well. However, a given panel cannot cover all areas of expertise necessary and must still rely on high-quality mail reviews for evaluation of many proposals. The 60% response rate for mail reviews and a lack of substantive comments from some reviewers are causes for concern, although overall it seems that the evaluation process works extremely well.

Since the last COV there has also been encouragement for the submission of CAREER proposals (17 received) and an associated increase in the number of CAREER awards made (8). This is seen as an important initiative, responding to the need for supporting young faculty both to do excellent research and to develop the educational aspects of their work. SGER (Small Grants for Exploratory Research) grants have been used to provide rapid response to scientific opportunities (e.g., 2004 Andaman-Sumatra tsunami) and to explore new frontiers (magnetic inclusions in diamonds). Good community relations mean that emerging science is often discussed directly with the Program Officers.

The COV was impressed by the quality of the supported research, which has led to results of high impact, award-winning community tools, and cutting-edge educational opportunities for the development of a talented workforce. It is, however, a major concern that a large fraction of high-quality proposals go unfunded (60% are fundable, but the success rate was around 30%), so that interesting ideas and a diversity of research approaches may be missed because of proposal pressure. Although all of the must-fund proposals express innovative directions for science, it seems that the peer review process discriminates against high-risk proposals under fierce competition for available funds. This leaves the SGER grants as the main source for funding high-risk activities with the potential for high payoff. Additional funds to the program are necessary to relieve this pressure.

Petrology and Geochemistry Program

The Petrology and Geochemistry Program (CH) supports a broad range of observational, experimental, and theoretical projects extending from the atmosphere (volcanology) to the Earth's deep interior (physical properties) and covering modern to ancient processes. The program has good collaboration within EAR, across GEO (mainly with the Ocean Science Division), and more broadly across NSF (including Office of Polar Programs, Office of International Science and Engineering, and Office of Integrative Activities). There is strong outreach to the scientific community through meetings that the program helps to sponsor. The program promotes developmental research initiatives and cooperatives such as CSEDI, CIDER, ISES (Integrated Solid Earth Sciences) with the Tectonics Program, NAVDAT (North American Volcanic and Intrusive Rock Database), GERM (Geochemical Earth Reference Model) and EarthChem with Geoinformatics, and MYRES (Meeting of Young Researchers in the Earth Sciences)

and CRONUS (Cosmic-Ray Produced Nuclide Systematics on Earth Project) in coordination with other groups.

The COV is impressed with the management of the Petrology and Geochemistry Program, especially by Sonia Esperança, who has led the program with support from IPA rotators until 2005, when William Leeman became a permanent Program Officer. Together Esperança and Leeman have made many notable improvements in the program, including significantly increasing the fraction of proposals having dwell times of 6 months or less (which changed from only 52% for the previous COV review period to 84% for 2005-2007). They also reduced the number of mail review requests and increased the return rate, at the same time insuring at least 5 mail reviews per proposal. This program's managers have excellent interaction within the DEP Section and GEO and across the Foundation. They do a thorough and thoughtful job of documenting the evaluation of new proposals and maintaining good interaction with PIs. The program processed about 250 proposals each year during 2005-2007 and made 231 awards (39 collaborative) during this period and 3-4/year with the MARGINS program.

The Petrology and Geochemistry Program supported investigators in a wide range of research topics from explosive volcanology to ancient climates and deep Earth processes. The program encompasses the myriad disciplines of experimental, metamorphic, and igneous petrology, ore deposits, and geodynamics. This diversity presents a challenge for the Program Officers in selecting appropriate mail reviewers and panel members. In general, we found that selected mail reviewers provided the depth and breadth of discipline coverage to provide ample guidance to the Program Officers. The previous COV suggested modifications to the panel composition to provide additional members and ad hoc flexibility to cover the proposal mix. This recommendation has been implemented, as has joint review and panel discussion with Geophysics and Tectonics for appropriate proposals, and both seem to work well. However, it appeared that the Spring 2007 panel did not have sufficient expertise to handle a few of the proposals considered.

New and young investigators are encouraged and funded by the Petrology and Geochemistry Program, with nine funded proposals and one CAREER award made following the Spring 2007 panel review. SGER grants are used to provide a rapid response to scientific opportunities (e.g., volcanic eruptions) and to explore new frontiers (e.g., water diffusion in mantle minerals). The program managers maintain excellent communication with their community of PIs.

Evidence of the quality of research supported by the Petrology and Geochemistry Program are the numerous medals and awards to PIs funded by this program, including a Presidential Medal of Science Award and numerous medals to young scientists (AGU's Macelwane Medal and the Geochemical Society's Clarke Medals). This program is supporting research that has led to high-impact results in a broad range of topics (early Earth, whole-Earth dynamics, and volcanic eruption processes), new technology and databases (e.g., GERM, NAVDAT), and cutting-edge educational opportunities (MYRES).

Tectonics Program

The Tectonics Program (TE) supports a broad range of field-based and laboratory studies focused on the evolution of the continental crust. The program supports a portfolio of broad interdisciplinary projects that integrate structural geology, petrology, geochronology, and geomorphology and that focus on both long-term geological and active tectonic processes. The program also works across EAR and NSF to fund cross-disciplinary research and pursue unique scientific opportunities.

The management of the Tectonics Program impressed the COV. The program is currently managed by David Fountain, a permanent Program Officer, and James Dunlap, a newly appointed rotator to the program. During the period examined by this COV, Steve Harlan also served as a rotator. David Fountain has done an excellent job of program management, despite the program being occasionally understaffed because of unfilled rotator positions. The program maintains a transparent, well-defined process for thorough and thoughtful evaluation of proposals based on both ad hoc mail review and panel discussion and gives excellent feedback to investigators on their proposals. The program handled 691 new full proposals in the time period 2005-2007, with an average of 230 per year. The program maintained a portfolio of 174 funded awards. The program also funded 11 workshops and participates in a range of NSF-wide activities, including eJacket and E-Business, the Geo Education & Diversity Program, and Regional Grants Conferences. The Tectonics Program also supports several cross-program projects, including NAVDAT, UNAVCO, and GeoEarthScope.

We focused our evaluation of the review process on the Spring 2007 cycle. We examined 20 proposals in detail, including 7 awards and 13 declinations. We selected proposals so as to be representative of the range of reviews, including proposals that were highly ranked, in the “gray area,” and poorly ranked. The majority of proposals selected (14) were from the “gray area,” as these were thought to present the most difficult funding decisions. In each case examined, the COV subcommittee concurred with the decisions made on funding. It is clear that both ad hoc mail reviews and panel review are needed to maintain the high quality of the decision process. Moreover, the pool of reviewers for proposals is well balanced in terms of scientific expertise, gender, and geographic distribution. The program clearly receives more high-quality proposals than it can fund.

Despite the overall high quality of the Tectonics Program, the COV identified the small number of CAREER proposals as a potential problem. During the time frame of this review, only 7 CAREER proposals were received, and none was funded. When compared with other programs in EAR, Tectonics is well below the average for these important and prestigious awards. This is particularly problematic given that a CAREER grant is the only pathway to the PECASE Award. We recommended that the program identify methods for increasing the number of CAREER proposals submitted as a route to increasing the likelihood that one or more such proposals can be funded over the next three-year period. Notwithstanding that this program made no CAREER awards over the past three years, three recent recipients of the Geological Society of America’s Donath Medal (young scientist award) had been funded by the Tectonics Program by the times of their awards, indicating strong support for promising early-career scientists.

The Program Officer review analyses in Tectonics meticulously outline the rationale behind each funding decision. Although the feedback provided to proposers is already exceptionally strong in the Tectonics Program, the COV recommends that the non-confidential information contained in the PO review analysis be shared with the PIs to the greatest extent possible.

Overall, the Tectonics Program is well managed and healthy. Its strength is highlighted by the outcomes of its funded research, which are published in high-profile international journals and are well cited.

EarthScope Program

The EarthScope Program (ES) supports research on the structure, evolution, and dynamics of the North American continent and the underlying reaches of the deep Earth as well as on the physical processes responsible for earthquakes and volcanic eruptions. Research proposed to this program is expected to make use of EarthScope facilities and/or further the scientific or educational goals of EarthScope. EarthScope facilities consist of the following observing systems: (1) the Plate Boundary Observatory (PBO), consisting of GPS and borehole strain and seismic stations; (2) the USArray of seismic and magnetotelluric stations; and (3) the San Andreas Fault Observatory at Depth (SAFOD), a 3.1-km-deep instrumented borehole into the San Andreas Fault. The 2005-2007 portfolio of awards met these expectations and represented a good mix of exciting forefront science using all three facilities along with a few “service-oriented” projects to enhance facility capabilities and innovative educational projects designed to expand the public’s scientific literacy. In addition, the EarthScope program awarded three CAREER grants to talented young investigators. On the basis of an examination of only a single proposal round, the last COV expressed concern over the large number of service-oriented awards granted by the EarthScope Program and recommended that future funding decisions focus more on proposals that solve significant scientific problems. This year’s COV commends the EarthScope Program for successfully moving in this direction.

During the 2005-2007 period reviewed by this COV, the EarthScope Program was managed by one full-time Program Officer, Kaye Shedlock, and one rotating Program Officer was added in 2006 (Lina Patino from 2006 to mid-2007 and Katie Cooper from mid-2007 to the time of our review). This increase in personnel was warranted given the workload involved. Kaye Shedlock’s enthusiasm for EarthScope science is infectious, and her advocacy and management of the program have been outstanding. This program’s proposal review procedures are thorough, effective, and transparent; the review analyses transmitted to the PIs clearly articulate the proposal decision process. Program Officers have been very effective at working with other EAR programs and with other directorates within NSF to leverage funds to support the best science. Moreover, they have very appropriately negotiated reductions in the scope and budgets of specific projects. We also commend the Program Officers for promoting open data-exchange policies and for encouraging this attitude to spread across the community.

The COV notes that the 2005-2007 EarthScope PI pool included a large fraction of researchers who have a long history of involvement in EarthScope Program development. We believe that the program would benefit from a greater diversity of prior program involvement within the PI pool. We suggest that a broadly advertised or clearly articulated statement of the EarthScope Program’s goal of engaging a broader spectrum of Earth Scientists would be helpful in such an expansion of the PI pool.

There is also a limited utilization of geological information by the EarthScope Program. At present, there is some integration of work on recent geological processes and neotectonics with geophysical studies, but studies emphasizing deeper geological time are scarce. The COV anticipates a natural progression to problems having deeper geological time perspectives as the facilities (USArray) move eastward.

Finally, the COV noticed some confusion among both mail reviewers and panelists as to what constitutes an appropriate EarthScope proposal. This confusion is a bit baffling to us since the criteria seem well articulated in the program announcement. Because the EarthScope Program is still relatively young, renewed efforts to heighten the

understanding of EarthScope's scientific and educational goals among prospective mail reviewers and panel members would be worthwhile.

Continental Dynamics Program

The Continental Dynamics Program (CD) supports large-scale, multi-disciplinary investigations of the continental lithosphere that integrate seismology, geophysics, geomorphology, isotope geochemistry, petrology, tectonics, and drilling projects. This program has advanced our understanding of the deep Earth and has helped establish the U.S. as a global leader in the geosciences and scientific drilling. The Continental Dynamics Program promotes scientific learning through the training of graduate students and postdoctoral scholars, educational supplements to research grants, educational films, and special sessions at geosciences conferences. The projects supported by Continental Dynamics are complex and require that the Program Officer communicate and negotiate effectively with multiple PIs and multiple institutions. We commend Program Officer Leonard Johnson for his efficient and effective management of the challenging Continental Dynamics Program; he has been an active listener and supporter of the deep-Earth scientific community.

Continental Dynamics proposals undergo a thorough, extensive review process that typically involves the evaluation of (1) 10-page pre-proposals, which are reviewed by a panel, and (2) 36-page full proposals, which undergo both mail and panel reviews. Five or more mail reviews are generally received for each proposal. We found both the mail and panel reviews of the intellectual merit of Continental Dynamics proposals to be very comprehensive. Because Continental Dynamics projects involve many PIs, it is particularly important to manage potential conflicts of interest as noted in the 2005 COV report. We strongly support the recent Continental Dynamics policy of not permitting any panel member who has a proposal pending to attend the panel meeting.

The Continental Dynamics Program mortgages funds at a rate significantly higher than the NSF goal (60-65%). The high mortgage rate (85% in 2007) stems partly from the nature of Continental Dynamics projects, which last 3 to 5 years and cost \$0.5 to \$4M, and partly from the desire to fund more excellent proposals than the current budget permits. As is the case in all DEP Section programs, many excellent proposals cannot be funded. We recommend that efforts be made to decrease the mortgage rate in order to enable funding more new projects each year. In the Continental Dynamics Program, a typical proposal – even after a valuable pre-proposal stage – is submitted two or more times. We therefore recommend that cohort statistics (whereby projects are tracked from the pre-proposal stage through each annual decision cycle) be used to evaluate success rates in addition to annual statistics.

Since its initiation, the Continental Dynamics Program has been well served by the “Chandler” community workshop held in 1985. Now, with more than 20 years of experience and the exciting EarthScope program underway, we believe that the time is right to review and possibly realign the priorities of the Continental Dynamics Program, including geographic project balance, through a geosciences community workshop.