

**COMMITTEE OF VISITORS (COV) REPORT
for
EARTH SCIENCE RESEARCH PROGRAMS**

**GEOLOGY AND PALEONTOLOGY (GE), TECTONICS (TE), PETROLOGY AND
GEOCHEMISTRY (CH), HYDROLOGIC SCIENCES (HS), GEOPHYSICS (PH), AND
CONTINENTAL DYNAMICS (CD)**

RESPONSE TO SPECIFIC COMMENTS IN THE COV REPORT

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INTRODUCTION

The Committee of Visitors (COV) report reviews and assesses the Division of Earth Science's (EAR) Research Programs in two primary areas: (A) the integrity and efficiency of the processes which involve proposal review; and (B) the quality of the results of NSF's investments in the form of outputs and outcomes which appear over time. The COV report includes a number of recommendations that will help guide the management of EAR's six core programs. EAR is very appreciative of the effort and concerns by the members of the COV. The following sections outline the Division response to the specific recommendations contained in the COV report.

DIVISION-WIDE ISSUES

Overall Program Functioning

The COV assessment of the overall functioning of the EAR Division is best summarized in the following statement from the COV report:

The COV found EAR to be in excellent operating form; the science being funded is receiving international recognition and being published in high-status journals. There is a good balance among field, laboratory and theoretically based research. The Division Director has begun taking steps to address recommendations of the 2001 NRC Report "Basic Research Opportunities in Earth Sciences". Program Directors have good communication with the members of their communities through workshops, professional societies, site visits, and the proposal reviewing process. The proposal solicitation, review, and funding process is balanced and fair, although some highly ranked proposals cannot be funded because of budget limitations. Other proposals are funded at lower than requested levels so that investigators return more frequently to NSF placing a greater burden on the program Officers and the "review community".

COV RECOMMENDATIONS

Scope of Review

In its report, the COV noted that: "Although the COV was asked to focus strongly on 'past performance', the committee believes that the current status within EAR and the future outlook necessarily affect recommendations for future practices."

Response: This recommendation for a change in scope will be accommodated in the next COV.

Staffing, Workload and Proposal Dwell Time

The current COV has again noted that the Division is understaffed. Several times in the COV report, it was pointed out that proposal pressure, as reflected in the combined load of core and cross-directorate programs, is such that personnel workload impacts many other aspects of EAR's mission. The Division's workload, for example, impacts the recommendation to continue to improve documentation of the review process (see below) and to decrease the dwell time for proposals. The workload also has a negative impact on how well the Program Directors reach out to the community.

Response: The staffing level within EAR is a longstanding issue. EAR is addressing this problem through interaction with NSF management, but the situation is slowly improving. EAR will continue to request staffing increases. NSF management is well aware of this issue and we will continue to work to address this problem.

Priority on Core Programs and Multi- and Interdisciplinary Research

1. The COV report emphasized that the importance of core programs should be retained. "The consensus of the COV is that it is crucial to continue to build strong individual investigator-driven research programs, while at the same time developing multidisciplinary and interdisciplinary research initiatives".

Response: Placing the highest priority on the health of the core discipline programs has always been a divisional commitment and it is our intention to continue that policy. Support for facility and instrumentation infrastructure, the linking of research to education, and responding to opportunities that require the development of large, community-wide research initiatives are also essential for the health of the EAR research and education community. The Division also must continue to link the earth science research community to NSF-wide strategic goals and the broad research goals that relate to national needs and priorities. We concur with the COV that the critical issue for the community and EAR management is to negotiate the balance of resources among these competing and deserving elements.

2. The COV suggested that interdisciplinary research appears to be treated in an *ad hoc* basis within EAR. The COV then recommended that a "...division-wide management policy should be developed to conduct fair and just reviews of interdisciplinary proposals within the current disciplinary-based organizational structure."

Unsolicited proposals to core programs often overlap traditional EAR program boundaries. It is standard procedure for these proposals to be handled on a case-by-case basis by the Programs most closely

involved. We will develop a more consistent cross-program management approach and see that these procedures are well documented.

In a larger sense, where a new interdisciplinary field is developing, EAR may create new management structures to address these developments. The COV cites the growing geobiology discipline as an example of a cross-divisional and cross-directorate effort. This interdisciplinary area is being developed as a Directorate-wide program in Biogeosciences beginning in FY03. A program officer for this effort has been added and the first announcement of opportunity is now available. Furthermore, to insure that we can meet the emerging needs of the biogeosciences, EAR is assessing the history of proposal submissions and evaluating program director responsibilities to determine how to best utilize staff and budget resources. Similarly, community-driven efforts in GeoInformatics may need to be handled by developing new management structures within the Division. EAR programs will continue to fully participate in cross-divisional and cross-directorate programs and develop consistent management strategies for handling these interdisciplinary proposals

Accountability of Review Process and PI Feedback

The COV highlights the importance of both the *reality* and the *perception* of fairness in the management of proposal decisions. In particular, the COV pointed out that the thoroughness of written feedback to PIs varies among programs from just adequate to excellent. The COV report added that some of the problem can be attributed to weak panel summaries, excessive program officer workload, and/or poor return of *ad hoc* mail reviews.

Response: The COV is part of the process that provides the community with the assurance that EAR programs are fairly managed. The thoughtful consideration of proposals and the comprehensive communication of proposal decisions to Principal Investigators (PIs) are of major importance to every Program Director. The return of mail reviews is a difficult problem; typically 8-15 requests for reviews are sent out to meet a targeted return of 5 (minimum of 3) returned reviews. Ways to increase the rate of return on mail reviews will be discussed at the EAR Division retreat this fall. With the advent of the electronic "Interactive Panel System", the quality of panel reviews has already increased significantly and we will continue to strive to improve the process. All PIs are sent, or access over the web, verbatim copies of the mail reviews and panel review summaries. They are typically sent a letter or e-mail from the Program Directors explaining the decision, and they also are encouraged to contact the Program Directors to discuss the results of the review process, or even to discuss potential new proposals. Program Directors routinely make themselves available at professional meetings for similar one-on-one discussions. Recognizing the need to continually revisit the review process, issues such as the quality of panel summaries and Program Director's written decision explanation will be reviewed at upcoming Division retreats (see below).

Proposal Success Rate

The COV noted that the proposal success rate among the 6 disciplinary programs in the interval 1998-2001 ranged from 27% to 44%; some programs were consistently low, whereas others were consistently high. It was suggested that division-level changes in organization or budget are needed to reduce the inequity in success rate among the 6 core programs.

Response: Success rate reflects the proposal pressure from the community versus the size of the program budget. Other factors include: the balance between standard and continuing grants, award size and duration, and development of new research directions within programs and disciplines. The success rate also reflects other programmatic decisions, such as co-funding multidisciplinary projects. Those EAR programs with the lower success rates are being targeted for higher percentage increases in their respective budgets, but it will take several years before substantive changes in success rates can be expected. It should be noted that higher funding levels and longer grant duration are a NSF-wide goal. In summary, there are many factors that affect success rate, and many other factors that also must be considered when managing the science programs. Success rate is but one of these, an important factor, but not the only one.

Common Approach to Program Management

The COV has recommended that to increase the effectiveness of program management that retreats be held "...at which the Division Director, Section Heads, program officers and staff could share best practices".

Response: EAR agrees with this recommendation, and such retreats have been held in the past, and one is being scheduled for the near future. The sharing of such management ideas would also help to develop a more consistent approach to COV documentation (see below) and help reduce workloads. A broad range of issues will be discussed at these retreats, including, efficient and effective approaches to program management.

Documentation for the COV

The COV highlighted the unevenness of information they were provided from each of the programs. To facilitate assessment of program success, the committee would specifically like to see: 1) a standard spreadsheet that contains all relevant information for all programs, and 2) a consistent way of highlighting program results.

Response: This recommendation can be addressed by having one of the Program Assistants, under the direction of a Section Head, be assigned to compile both the spreadsheet and program highlights. Furthermore, if this is done on a more periodic basis, and with sufficient lead-time before major deadlines, it will serve the needs of both the COV and yearly GPRA report requirements.

Documenting the success of EAR programs

The current COV reiterates the comment of the 1998 COV...EAR should devote increased attention to documenting the success of its programs and all PDs should communicate the excitement of advances in the earth sciences at every opportunity.

Response: Documenting and disseminating the success of EAR programs is recognized as an important activity for the Division. Traditionally, this documentation has been the responsibility of the Program Directors, who might work through the Office of Legislative and Public Affairs (OLPA) to provide access to the media through regular news releases. Several years ago, the Division's web site was modified to include a "Research Highlights" section, providing another means of communicating program success. However, as noted by the COV, workloads for the Program Directors preclude a regular and consistent

approach for news releases and web site updates. To better facilitate an expanded and timely dissemination of information, EAR will need a new Program Assistant who can work with Program Directors to routinely update the Web Site, compile lists of publications and other program highlights (as noted above), and help develop appropriate news releases. These activities will also facilitate development of COV documentation, and help meet GPRA reporting requirements.

Industry Interaction

The COV suggests that EAR should exam ways to increase interaction with industry, perhaps providing a staff position that would facilitate PI-industry interactions.

Response: Staffing needs are severe for the current EAR programs, hence dedicating a staff position for this activity is unlikely. However, an NSF program does exist that promotes such interaction; Grant Opportunities for Academic Liaison with Industry (GOALI). The COV was briefed on the GOALI Program which encourages industry and academic interaction. To date, the EAR community has demonstrated little interest in this program. However, EAR has established a close relationship with the American Geological Institute (AGI) and will continue to investigate focused ways to better promote industry-academic interaction.

INDIVIDUAL PROGRAMS

The following responses address those comments which bear on the general health of each program; those subjects that were covered in "Division-wide Issues" are not repeated here.

Geology and Paleontology (GE)

The COV noted that the wide scientific scope of this program results in the large number of proposals submitted, and hence the heavy workload for the program staff. The committee took note that the GE Program now has two program officers and that this represented "...an improvement in the management of the program since the time of the last COV review". The COV also indicated that the program has a good balance of field, laboratory and experimental studies, and funds many interdisciplinary projects. The funded projects reflect a "healthy mix of senior to early career scientists." Program leadership was deemed proactive and visionary as evidence by the numerous community workshops and town hall meetings that were supported, as well as the views of the directors on the future directions of the program.

The COV indicated that the ad hoc mail reviews were uneven in quality, suggesting that some ratings were inflated. The unevenness of mail reviews is typical for all programs and is a natural result of the peer review process. Mail reviews are assessed during panel and aberrant mail reviews are typically given special attention, and, as noted by the COV, these problems are "...nearly always overcome by thorough and detailed discussion by the panel." It should be noted that previously, mail reviews were seen for the first time by panel members at the panel meeting. Now however, panel members have access to mail reviews via the Electronic Jacket prior to the panel. Nevertheless, many mail reviews are not returned until a day or two before the panel meets and therefore cannot be assessed by panel members prior to the meeting. We concur in COV's recommendation "...that panels discuss (and Program Officer document)..." reviews that lie significantly outside the cluster of other reviews.

Although the COV indicated that in most cases the "...decisions were adequately documented..." the committee suggested that the factors that influence the decision of funding or declining gray area proposals need to be better documented. The justification for both funding and declining proposals is always explained in the Form 7 that the PD writes and encloses in the proposal's jacket. The COV also indicated that these decision factors need to be more completely relayed to the PI. The Division takes note of the need to improve these aspects of proposal review and documentation.

Geophysics (PH)

The COV indicated that overall the Geophysics Program "...appears to be functioning extremely well" and "...has been extraordinarily successful in stimulating and fostering discoveries across a broad range of topics."

The committee noted that, since the last COV, proposals for seismology and experimental/theoretical geophysics are now considered together, rather than as separate "mini programs". COV believes that the change "...is a good one and will promote the best science being funded." Also, the expansion of the panel from six to seven members was noted as a positive change. The COV noted that the program's move to longer project duration helps the PIs and helps to reduce program workload. It was pointed out that: "a broad selection of senior and junior researchers is represented among the funded projects and the distribution of institutions also is broad."

The COV found that proposal decisions were thoroughly documented and that the Program Directors interacted strongly with PIs by e-mail and phone conversations. The COV noted however, that some panel summaries were overly terse; this may have already been addressed with the advent of the "Interactive Panel System", which makes writing of panel summaries easier, and the results will be reflected in the next COV. The COV strongly endorsed the idea, suggested by the Program Director, to extend the panel meeting by another day to give more time to formulate summaries. Although this will put an additional burden on the panel members, the extra day will be implemented to assess the impact on the quality of panel summaries.

The COV found the review process and proposal ranking to be fair and impartial. However, they suggested that the funding of crustal seismology proposals that address tectonics appears to be lower than it should be. This was discussed by the COV and the Program Directors, and it was noted that this issue is being addressed by interdisciplinary funding across the Geophysics, Tectonics, and Continental Dynamics programs, and will also be helped by having a PH panel member with expertise in tectonics.

Hydrologic Sciences (HS)

COV indicated no concerns with the management of the HS Program.

The COV indicated that the overall review process in HS was thorough and fair, and that "documentation of decision-making is exemplary as is communication and feedback with PIs." COV also noted that "the documentation in the proposal jackets is superb. The decision rationale is presented clearly and thoroughly." Additionally, "the documented feedback to the PIs from the HS Program was equally superb. The PD provided nearly all of the information in the decision documentation in a straightforward, respectful style." The committee noted that dwell times improved significantly, and particularly took note of the co-funded, cross-program projects. The COV indicated that the funded research reflects an appropriate balance of the very broad field of hydrologic science.

The COV cautioned not to place junior scientists at a disadvantage in comparison to senior researchers in particular when assessing whether or not the investigator can overcome flaws in their research design. The COV ". . . did not find any evidence of this in the overall funding pattern", but felt that ". . . a word of caution is appropriate." A general goal of the Division is to help the junior investigators by providing them appropriate details on the quality of their research design. In general, junior researchers tend to be given a little more benefit of the doubt by mail and panel reviewers – which can lead to inflated rankings. In contrast, senior researchers typically have a record of successful projects and research publications as proof that they will succeed even though they do not spell out all the details in their proposal – again, this may produce an score that appears to be high. This contrast in how reviewers assess proposals by junior versus senior researchers will always be an inherent issue in the funding process. Because it is simply impossible to develop a set of rigid rules for this problem, the panel and Program Directors will have to continue to deal with this on a case-by-case basis in as fair and as open a way as is possible.

Petrology and Geochemistry (CH)

The COV had no issues with the management of the CH Program. The switch from balancing funding in five categories to open competition that focuses on the best science and the move of environmental geochemistry and biogeochemistry to other programs were seen as positive steps. This move allows CH to concentrate on its core scientific portfolio.

The COV noted that the workload in the CH program is high – a theme repeated for every core program in the Division. With respect to CH, the COV report recommended adding another permanent director, particularly because of the anticipated continued participation in new cross-divisional and cross-directorate programs (citing the ITR, Math, etc. initiatives). As noted earlier, the Division is very aware of the workload issue and we are working closely with the Assistant Director's office to formulate the basis for new EAR staff positions.

With respect to PI feedback, it is noteworthy to quote the committee's entire assessment:

The formal acceptance and decline letters to the PI's were very specific about the strengths and weaknesses of the proposal, its relative ranking, and the basis upon which the final decision on funding was made. The letters provided by the Petrology and Geochemistry program are a model for all programs. The committee was highly impressed that in cases where the panel and mail evaluations differed substantially, or where one or two mail reviews gave anomalous scores, these issues were explained either in the panel summaries or in the program directors notes. It was exceptionally easy to evaluate the decision-making process for this program. More important, in the event of a negative decision the letter to the PI makes it very clear why a proposal was not successful and what needs to be improved.

Tectonics (TE)

The COV noted several positive aspects of the Program. The choice of external reviewers and the quality of the external reviews are a strong point in the Tectonics review process. They concluded that the balance and diversity of external reviewers was excellent, both in terms of expertise, geographic distribution and gender. The committee particularly noted that TE funds considerable geologic fieldwork, and is the predominant funding source for structural mapping within the academic community. Overall, the COV stated that: "Work funded by the program has been of excellent quality, focusing on first-rate problems around the globe..."

The COV recognized that this is a time of great change within the Tectonics program, which offers opportunities to broaden and strengthen the research supported by the program. The COV particularly recommended broadening the makeup of the tectonic panel, strengthening ties between Tectonics, Geophysics and other relevant programs, improving documentation and PI feedback to assure PIs of the fairness of the review process, and increasing communication and outreach of the new PD to the earth science community.

As indicated by the committee, the review of the Tectonics Program comes at a time of major transition for the Program and the review is hampered by the fact that it primarily reflects the results of the former Program Director. Although the current state of the program is not yet fully integrated into the evaluation, the Division notes that many of the concerns of the COV have already been addressed by the current Program Director. These concerns include: 1) the panel seeing all of the mail reviews, 2) improved decision documentation, 3) improved PI feedback, 4) broadening the makeup of the panel, and 5) strengthening ties between Tectonics and Geophysics. Again, their concerns address past operations only, and do not reflect those of the immediately preceding panel or current makeup of the program.

The COV also reiterated the perception held by some, that the Tectonics program does not sufficiently fund geophysical- or quantitatively oriented studies. We believe, however, that this does not reflect any bias within the program, rather it is a function of the number of such proposals submitted and the result of the peer review process. The Tectonics program also co-funds proposals with the Geophysics Program. Nevertheless, to better deal with this perception, the TE program is funding two workshops during September and October 2002 at which this issue, among others, will be reviewed by a broad cross-section of the tectonics community. Finally, the Web site will be revised to provide a clearer description of the breadth of the Tectonics Program.

Continental Dynamics (CD)

The COV noted that the Continental Dynamics program is unique in that it requires pre-proposals, and the Program Director provides extensive feedback to the PIs during the entire proposal preparation and review process. The committee concluded that the mechanics of proposal processing are working well and that the overall award process is fair and just. They noted that external reviews are generally of high quality, and tap the technical breadth and diversity of the community. The CD panel summaries are very good, and the COV suggested that they are arguably the most detailed and substantive in EAR. The COV found that a good balance of senior and junior researchers was funded, and that a healthy balance of institutions from the range of academic tiers in the community, are represented in funded CD research. The COV agreed that Program Director's effort to decrease the funding mortgages for the program would accommodate more new CD projects (large and small).

The COV report suggested that documentation in the proposal jackets is good, but not as thorough and well organized as in other EAR programs. Similarly, it was suggested that more substantive *written* feedback be provided to the PIs and that the pre-proposal decision process be better documented. Division notes that the Program Director utilizes phone communication during all stages of the proposal and grant process and many of the general points discussed in the phone conversations appear in the final Form 7. Nevertheless, these points are important and will be addressed in future competitions. We also concur in the COV recommendation for a community workshop to address future directions for the CD Program.