UNITED STATES GOVERNMENT

M E M O R A N D U M

DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES

Date: March 26, 2009
From: Assistant Director, MPS
Subject: **Response to the Division of Physics Committee of Visitors Report**
To: MPS Advisory Committee

Please find attached the MPS response to the Committee of Visitors (COV) report from the 4-6 February 2009 COV review of the Division of Physics. The review was thorough and insightful, and the findings will be very helpful to me and to the Division of Physics in fulfilling our responsibilities to the scientific community and to the nation.

The Division of Physics drafted the attached response, and I concur with its content. I therefore adopt it as the official response of the MPS Directorate. I hope the full MPS Advisory Committee finds this COV review and the MPS response useful and acceptable.

Tony F. Chan
Assistant Director

Attachment: Response to Division of Physics COV Report of 2009

Division of Physics Response to the Report of the 2009 Committee of Visitors

INTRODUCTION

The 2009 Committee of Visitors (CoV) for the Division of Physics met on 4-6 February 2009 and submitted their report to the Chair of the Advisory Committee for the Directorate for Mathematical and Physical Sciences (MPSAC) on 7 March 2009. The CoV reviewed the proposal and award actions made by the division for the fiscal years 2006-2008. They examined in depth all aspects of the operation of the division, including review procedures, decisions and decision process, portfolio balance, quality of outcomes, strategic vision, priorities, etc.

The COV commended the Physics Division (PHY) for its performance in all areas identified in the charge. This is captured in the full CoV report and in the CoV template, included here by reference only. Within the report the CoV commented on several specific items in detail, highlighting them for consideration by the MPSAC, by the Mathematical and Physical Sciences Directorate (MPS), and the Physics Division (PHY). The present response focuses on these items, provides some initial feedback, and indicates what actions are planned to address specific recommendations made by the committee. This format lends itself to tracking and assessment by PHY, MPS, MPSAC and the 2012 CoV. In addition, this response will be sent to the 2009 CoV to provide feedback and describe proposed actions resulting from their report.

The thoroughness, integrity, and insight exhibited by this panel of 35 representatives of the physics community served by PHY were exemplary. The findings and advice provided in summary report and the very informative subpanel reports will help strengthen PHY in the years ahead. The Division of Physics would like to express its deep gratitude to the CoV members for this vital contribution to the physics enterprise. We wish to express special gratitude to Dr. Sidney Wolff, CoV Chair, for her masterful leadership of this complex, yet crucial review.

ITEM 1: Instrumentation and Equipment

The 2009 CoV report echoed the comments made by the 2006 CoV on the need for "more funding and more flexibility in funding amounts to support the acquisition of instrumentation and equipment". The report recommended that this area be given highest priority for funding after improvements in success rate and/or grant size. The CoV commended the Physics Division on having created the Accelerator Physics and Physics Instrumentation (APPI) program but further noted that "APPI remains unfunded, has no presence on the NSF website, and has issued no call for proposals."

PHY Response: PHY is only too well aware of the needs of the community for funds to support the acquisition of instrumentation and equipment. It was for this reason that the APPI program was originally created. The CoV correctly identifies the situation that the Division has not been able to fully launch a competition in this area due to the lack of

sufficient funding to make a competition feasible. Nonetheless, the Division has slowly begun allocating funds to provide for this critical need in conjunction with awards made through the disciplinary programs. Funds are provided only for one-time instrumentation acquisition or instrument development with a well-defined timeline. As each project rolls off, the funds are retained for use for equipment needs, thereby slowly building up sufficient funding to launch a competition within APPI. PHY concurs with the CoV that the dollar limits should range widely and uses the definition of equipment to be funded through APPI as equipment whose cost would greatly exceed the resources of the disciplinary program and that does not fit within the context of the Major Research Infrastructure (MRI) program.

ITEM 2: Large Projects

The CoV report highlights the need for ensuring that projects that are candidates for Major Research Equipment and Facilities Construction (MREFC) funding are "well managed and that the total life cycle costs be clearly and accurately established before construction is authorized." Although the report commends the Division for the steps taken to date in planning for the Deep Underground Science and Engineering Laboratory (DUSEL), the report further cautions that the Division alone does not have sufficient resources to properly implement planning for DUSEL without severely disrupting the portfolio balance within the Division. Therefore, planning for DUSEL, and major activities like DUSEL, will likely require a commitment from the Foundation as a whole and partnerships with other agencies and other countries.

PHY Response: PHY fully appreciates the need for life-cycle planning for large facilities, beginning with the Research and Development (R&D) necessary to establish a reliable baseline for construction and continuing through the support of Operations and Maintenance (O&M) of the completed facility and awards to investigators to utilize the facility. For this reason PHY has added a Chief Facilities Officer to the staff, as noted in the CoV report, and is developing a funding profile for the initial planning phase of DUSEL. In addition to supporting the planning phase, the proposed profile also provides for a slow build-up of resources to support O&M once construction is completed. At the same time, PHY has established a partnership with the Department of Energy (DoE) similar to that currently in existence for the Large Hadron Collider (LHC) to work together on joint planning for the experiments that will be housed in DUSEL.

PHY remains keenly aware of the impact that large facilities can have on the Division's portfolio. The Division maintains a Master Plan for continual monitoring of the Division's finances and making predictions for future needs. The Plan allows the Division to track the balance between funding for facilities, funding for the Physics Frontiers Centers (PFC) program, and funding for the separate disciplinary programs that provide the bulk of the research support. It is this plan that allows the Division to maintain the larger-than-50% allocation to the principal investigators recommended by the CoV and the 10% cap on PFC funding also recommended by the CoV, while at the same time adhering to the CoV observation on program balance that "progress at the

frontiers of physics requires investments at all scales – from principal investigators to large facilities."

ITEM 3: Interdisciplinary Research

The CoV noted that many of the most transformational programs lie at the boundaries of physics and other disciplines. They further noted that "some of the most compelling examples of the broader impacts of physics research involve interdisciplinary programs." They recognized the fact that many programs in the Division regularly interact with units outside the Division. But they also pointed out that several barriers impair the handling of interdisciplinary proposals in coordination with these other NSF units, of which two seem to stand out. One is that interaction among programs is handled largely through personal relationships and works better in some cases than in others; a second is that stringent enforcement of the six-month cutoff for proposal processing can act as an impediment to the review. They made the following four recommendations: (1) identify a program officer as an entrepreneurial "owner/incubator/champion" of multidisciplinary proposals and empower this individual to obtain reviews wherever necessary; (2) do not include proposals that cross disciplines or cross agencies in the calculation of proposals to be completed within six months; (3) consider encouraging interdisciplinary proposals through co-funding from a higher level within NSF than the Division; and (4) monitor a newly-minted cross-disciplinary program carefully to ensure that sufficient funding is available to meet the demand.

PHY Response: Physics as a field has a broad reach across all the physical and biological sciences. Support of cross-disciplinary research driven by intellectual curiosity is a keystone of the Division's portfolio, and the Division encourages Program Directors to pursue interactions with other units inside and outside NSF to foster these areas of research. Because the primary driver for successful interdisciplinary research must lie in the intellectual excitement engendered by the scientific questions, the Division considers every Program Director for every program to be an entrepreneur for multidisciplinary research connected to that program. The Division empowers each Program Director to negotiate with units outside the Division and, in consultation with the Division Director, to enter into joint funding relationships with these units. PHY regularly participates in NSF-wide priority areas such as the National Nanotechnology Initiative (NNI) and the Cyber-enabled Discovery and Innovation (CDI) initiative. Funding for these initiatives is allocated at the level of the NSF Director. At the MPS level the Office of Multidisciplinary Activities (OMA) provides co-funding for the support of the initiation of multi-disciplinary research projects. PHY regularly funds awards with joint OMA support. PHY will continue to empower all Program Directors to pursue these interactions in response to points (1) and (3) mentioned above and will include an examination of how well this succeeds as a special focus in the 2012 CoV.

PHY operates fully with the assumption that the Division will process 70% of the proposal actions for the Division within six months, action that the CoV deemed appropriate for the Division. The Division will continue to monitor those proposals that require a longer time than six months to ensure that the majority of these involve cross-

Divisional or cross-agency review and, for those that do, that the time factor did not hinder a complete and thorough review.

PHY shares the concern of the CoV that new programs within the Division that grow out of multi-disciplinary research receive adequate funds to become and remain healthy. The needs of these new programs will be considered a priority in the allocation of funds each year until the programs are fully established. PHY also does not see any additional new programs on the horizon beyond those that have been created within the last ten years, as the current disciplinary programs are evolving to capture the impact of interaction with other disciplines through the base funding.

ITEM 4: Portfolio Balance and Changes

The report was pleased with the overall balance in the portfolio between individual investigators, facilities and centers. However, there were some specific concerns about the current organization of some of the scientific sub-programs within the Division. Examples of these concerns include: (1) the current categorization of the proposals in the Atomic, Molecular, Optical, and Plasma Physics (AMOP) program is outdated; (2) connections between the Atomic, Molecular, and Optical (AMO) component and the plasma physics component of the AMOP program are sufficiently tenuous that combining the two under the same funding portfolio is no longer warranted; (3) in some cases research could benefit from a stronger coupling between experiment and theory; (4) careful attention should be paid to maintaining a strong gravitational theory program unrelated to the Laser-Interferometer Gravity Wave Observatory (LIGO) efforts; and (5) the grid computing part of the Physics at the Information Frontier (PIF) program might more properly belong within the same program as the LHC and not within PIF. In general, the panel recommended that the organization of the Division be kept highly flexible so as to be able to rapidly adjust to changing scientific opportunities. Options such as reallocation of funds, changing the way review panels are set up, changes in the portfolio, and changes in the review process to engage other divisions and agencies should be among those considered.

PHY Response: PHY is very appreciative to the panel for pointing out scientific areas that are in the process of changing that the Division should be especially attentive to. Within each disciplinary area the Division empowers, and will continue to empower, Program Directors to adjust their individual portfolios to reflect changes in scientific directions within the field. Program Directors will also be encouraged to institute whatever new and revised review procedures may be deemed necessary to obtain the information necessary to make informed decisions on proposals, consistent with the review requirements established by the National Science Board and the requirement on confidentiality within the review process. Each year the Division will examine the Program Descriptions for each program and will revise these announcements to reflect new directions in the programs. The Division will constantly monitor the overlap between programs to ensure that programs funded under the same umbrella remain sufficiently connected to warrant co-mingling of funds. PHY will seriously consider the

specific recommendations of the AMOP subcommittee regarding program viability and the PIF subcommittee recommendations concerning support for grid computing.

ITEM 5: Education and Workforce Issues

The CoV highlighted four topics in the general area of education and workforce about which they had some concern. (1) The panel felt that the Division placed too much emphasis on innovation in evaluating a Faculty Early Career Development (CAREER) proposal and recommended that the Division encourage applicants to take advantage of existing resources and adapt these to their own needs. (2) The panel was distressed that the MPS OMA office no longer provided funds for Research Experience for Teachers (RET) supplements, as this is a very effective program (3) The panel is very concerned that the field may lose a generation of young scientists due to freezes in hiring and encourages the NSF to examine possibilities for addressing this problem. (4) The panel pointed out how valuable were four-year colleges in producing graduates that go on to careers in science and encouraged the Division to give greater weight to the broader impacts when evaluating proposals for research at four-year colleges to compensate for the heavy teaching loads of faculty at these colleges and their limited access to facilities.

PHY Response: PHY appreciates the panel's comments on these four topics. Items (1), (2), and (4) have been topics of discussion within the Division since the various programs mentioned were initiated, CAREER, RET and the Research at Undergraduate Institutions (RUI) program that funds faculty at four-year colleges. With regard to the CAREER program, and how it is defined within the Division, the Division will revisit its expectations for the education component of the CAREER award and will examine how to incorporate the association with an existing university program into the panel review guidelines. Current OMA practice is that RET support is the responsibility of the Division. The Division is in agreement with the panel that the RET program is extremely valuable and will provide resources to ensure that this program is continued. All disciplinary programs within PHY have strong RUI components, reflecting research that is of the highest quality while at the same time providing a strong educational experience for undergraduates. The Division will ensure that instructions are provided to proposal reviewers and to panelists that specifically highlight the goals of the RUI program and ask that these reviewers review the proposals with these goals in mind and prepare their comments accordingly. With regard to point number (3), there is concern throughout NSF about the potential loss of junior scientists in all fields of scientific research, and a number of options are being explored. As with all global NSF concerns, PHY will be a partner in these discussions and will see that the input and needs of the physics community are included as plans are formulated.

ITEM 6: The Review Process

The CoV found the reviewing of proposals submitted to the Physics Division to be excellent. They commended the Division on the use of both ad hoc mail reviewers and panel reviews and stressed the value of allowing the Program Directors discretion in making final funding recommendations. They pointed out that the review analyses were

"outstanding in terms of analyzing the proposals and providing the basis for the ultimate funding decisions." Their one recommendation in this regard was that the Program Directors make more of this justification for their final recommendation available to the applicants. This could be an excellent form of mentoring, especially for new faculty.

PHY Response: PHY is pleased with the CoV's strong commendation of the proposal review process and proposal analysis by Program Directors in the Division. PHY will examine the use of PO Comments in the FastLane system to communicate with applicants and determine if use can be made of this option to provide some of the information leading to the recommendation, while at the same time not unduly adding to the already very heavy workload acknowledged by the report and strictly adhering to the confidentiality requirements of the review process.

ITEM 7: Improvements for Future COVs

The report commended the Division for responding to the recommendations of the 2006 CoV in having the materials available on the web several weeks in advance of the meeting; in scheduling a pre-meeting conference with sub-panel chairs; in providing ten-year rather than just three-year statistics; and in limiting the duration of the initial presentations so that the panel could begin reviewing jackets much earlier. However, the panel expressed frustration with obtaining easy access to those jackets that had not been pre-selected by the Program Directors prior to the meeting. They recommend that, consistent with the needs of identifying conflicts of interest, a mechanism be found that would allow the CoV members to browse through all the proposals and make their own selections at will.

While the report indicated that the panel was pleased by having access to the proposals much earlier than in prior years, they did have two recommendations regarding the agenda. They felt that the panel would have benefitted by having each subpanel breakout session begin with a 30-minute overview of the program prior to the examination of the jackets. They also expressed a lack of opportunity to really examine the portfolio balance within the Division. They suggested that the presentations on the first day might be restricted to an overview of the general status of the Division, followed by the examination of the jackets through most of the second day. The second day should then end with a presentation on priorities and future directions that would lay the groundwork for the discussion of these topics on the third day.

PHY Response: PHY regrets the confusion caused by the difficulty in obtaining immediate access to jackets not identified prior to the meeting and apologizes to the panel for causing frustration. While the requested open browsing option may be difficult to implement, given the conflicts constraints, the Division will begin an inquiry into what e-business possibilities exist for streamlining access to proposals as part of ongoing IT systems development. PHY is also aware of the limit on the time available for sufficient discussion of program priorities because of the need to fulfill the GPRA analysis. At the close of the meeting the Division worked with the CoV Chair, Dr. Wolff, to develop a draft agenda that would incorporate the two suggestions made by the panel and will use

this agenda as the starting point for the 2012 CoV. Finally, the Division appreciates the suggestion from the Physics of Living Systems (PoLS) subpanel that tracking of researcher history, such as time since the Ph.D., could be valuable and will begin collecting such information for the 2012 CoV.