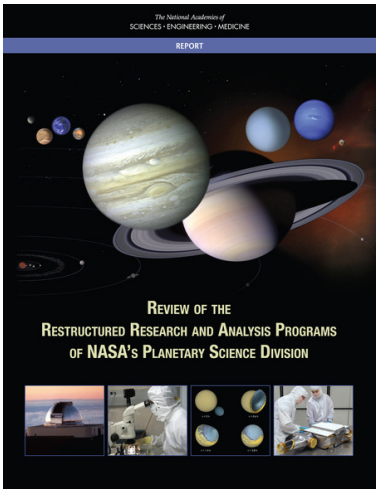
Consensus Study Report

HIGHLIGHTS

April 2017

Review of the Restructured Research and Analysis Programs of NASA's Planetary Science Division



In 2015 NASA's Planetary Science Division (PSD) reorganized its research and analysis (R&A) programs to better align with the agency's strategic goals for planetary sciences. Following the reorganization, there has been significant resistance from the planetary science community and perceptions that realignments of funding priorities did not benefit everyone equally. At the request of NASA, the National Academies looked closely at the new R&A program to determine if it aligns with the agency's strategic goals, supports existing flight programs, and enables future missions. In particular, the study investigated whether any specific research areas that are critical to NASA's strategic objectives for planetary science are not supported appropriately in the current program or have been inadvertently disenfranchised through the reorganization. In general, the study found that the new R&A structure is properly aligned and allows PSD to prepare for future missions and maximize science value from existing missions. The study report included details of a keyword-analysis activity, undertaken by NASA at the National Academies' request, of the types of proposals that received funding in the years leading up to and including the reorganization of PSD. The committee found that the keyword analysis did not reveal any evidence that the reorganization of PSD's R&A programs has had significant negative impacts on the funding opportunities for any specific research communities. However, the report recommends several changes, including ways to better fine-tune the proposal review process and how to pave the way for future missions and experiments.

PROPOSAL REVIEW PROCESS The report finds that the peer-review process used by the various R&A programs is reasonable and consistent. However, although NASA's PSD has a target of one to three external reviewers per proposal, this target is not always met and not all external reviews are of sufficient quality to assist in the review process. Therefore, during the peer-review process for research proposals, PSD should engage the services of several external reviewers well in advance of panel reviews to ensure a fair and effective proposal evaluation process. The report also discusses concerns raised by members of the planetary science community that some NASA program officers do not respond to requests for debriefings or reconsideration of rejected proposals. In addition, the planetary science community appears to be unaware of the official procedures for debriefings and reconsiderations. The report

recommends that PSD should quickly establish the process for the reconsideration of proposal selection decisions, develop and implement a formal mechanism to track debriefing and reconsideration requests across program elements, and inform the community about the process. This transparency can provide the community with greater confidence that NASA has appropriate checks and balances in the selection process.

HIGH-RISK/HIGH-PAYOFF ACTIVITIES The report expresses concern that previous PSD R&A programs have not explicitly encouraged or made sufficient accommodation for high-risk/high-payoff technology projects. Therefore, the report recommends that NASA investigate appropriate mechanisms to ensure that fundamental research and advanced technology development for high-risk/high-payoff activities receive appropriate consideration during the review process.

PROGRAM ASSESSMENT In 2011 an internal NASA committee recommended that PSD conduct a strategic review of its R&A programs every 10 years. The NASA committee said that these reviews should articulate current priorities, budget allocations for all mission-enabling activities (including supporting activities), and how the activities have met their program objectives in the past. Although the National Academies endorses the NASA recommendation, this report goes further by proposing an assessment at least every 5 years of how well the R&A program structure and funding are aligned with the PSD's science goals, appropriately phased to the cycle of decadal surveys and midterm reviews.

PREPARING FOR FUTURE MISSIONS A major facet of NASA's near- to mid-term plans for future robotic missions concerns the return of extraterrestrial samples to Earth for analysis. Nonetheless, NASA has failed to supply sufficient funding for developing the techniques required for the analysis and handling of returned samples, including cryogenic ones, which could result in NASA being unable to effectively and safely implement sample-return missions. NASA should work to develop the technologies required to return astrobiological and cryogenic samples to Earth and maintain appropriate containment, curation, and characterization facilities consistent with both PSD's science goals and planetary protection requirements. Principal investigators often solely rely on R&A awards (normally offered every 3 years) to sustain the critical scientific and technical expertise and infrastructure needed to extract the maximum scientific return from current and future planned missions. This dependency is of particular concern for sample-return missions because analytical facilities may need to be maintained for extended periods (entailing a sequence of R&A awards) so that they are still available when samples are finally returned. In making funding decisions for the various R&A programs, NASA should consider the need to maintain critical scientific and technical expertise and the instrumental and facility capabilities required for future missions.

COMMITTEE ON THE REVIEW OF NASA'S PLANETARY SCIENCE DIVISION'S RESTRUCTURED RESEARCH AND ANALYSIS PROGRAM: Stephen Mackwell, *Chair*, Universities Space Research Association; Michael F. A'Hearn, University of Maryland (emeritus); Joseph K. Alexander, Alexander Space Policy Consultants; Joseph A. Burns, Cornell University; Larry W. Esposito, University of Colorado, Boulder; G. Scott Hubbard, Stanford University; Torrence V. Johnson, Jet Propulsion Laboratory; Peter B. Kelemen, Columbia University; Makenzie Lystrup, Ball Aerospace; Juan Perez-Mercader, Harvard University; John D. Rummel, SETI Institute

This Consensus Study Report Highlights was prepared by the Space Studies Board based on *Review of the Restructured Research and Analysis Programs of NASA's Planetary Science Division* (2017). The study was sponsored by the National Aeronautics and Space Administration. Any opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of any organization or agency that provided support for the project. Download the report at **nap.edu** and learn more about the Space Studies Board at **nas.edu/spaceandaeronautics**.

Division on Engineering and Physical Sciences

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

The nation turns to the National Academies of Sciences, Engineering, and Medicine for independent, objective advice on issues that affect people's lives worldwide.
www.national-academies.org