

2018 Committee of Visitor's Report on the Integrative Programs Section
of the Ocean Sciences Division of the Geoscience Directorate
June 5-7, 2018
National Science Foundation
Submitted: June 12, 2018

Committee of Visitors Review Process

The Committee of Visitors (COV) met June 5-7, 2018 at the National Science Foundation to review the Oceanographic Centers, Facilities, and Equipment programs of the Integrative Programs Section (IPS) within the Ocean Sciences Division (OCE) of the Geosciences Directorate (GEO). The specific programs reviewed included: Ship Operations (SO), Submersible Support (SS), Oceanographic Instrumentation (OI), Oceanographic Technical Services (OTS), Shipboard Scientific Support Equipment (SSSE), Ship Acquisition and Upgrade (SAU), Ocean Technology and Interdisciplinary Coordination (OTIC), International Ocean Discovery Program (IODP), Ocean Drilling Program (ODP), Ocean Observatories Initiative (OOI), and Education/Human Resources (EHR). The charge to the COV was to provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions and (2) the degree to which the outputs and outcomes generated by awardees have contributed to the attainment of the NSF's mission, strategic goals, and annual performance goals.

The COV session began with opening remarks regarding the state of OCE and IPS by Bob Houtman, Acting Division Director of OCE, followed by a welcoming statement by Scott Borg, Deputy Director of GEO. Program presentations were then provided by the IPS Program Directors, Bob Houtman (OOI), Rose Dufour (SO), Brian Midson (SAU and SS), Elizabeth Rom (EHR), Kandace Binkley (OTIC), James Holik (OI, SSSE, and OTS), and James Allan and Tom Janecek (IODP and ODP). Previously established teams of COV members met separately with Program Directors for follow-on discussions of their programs.

In preparation for the COV meetings, panel members reviewed e-Jackets and other program documentation provided by the Program Directors to the COV. Additional documentation provided during the course of the COV meeting, internal panel discussions, and follow-up discussions with Program Directors provided the basis for this panel report. Findings for specific programs from the four-year period spanning 2014 through 2017 are integrated into this report under **Summaries, Findings, and Recommendations**. The COV Report Template, tailored to more traditional proposal-driven research programs, was not always a direct fit for this review.

We thank Matthew Erickson (IPS), Rose Dufour (IPS), and the other Program Directors for providing materials in advance and during the meeting, and for their prompt and cooperative help in facilitating our review. We especially appreciated their willingness to meet with us on an ad-hoc basis throughout our review. A special note of appreciation is extended to Gloria Perez, who provided significant assistance before and during the meeting to facilitate travel and

preparation for participation in the COV.

Comments and Observations: Overall Program Assessment

- The program managers excel in managing the diverse portfolio of programs within IPS. The culture of communication, professionalism and transparency among the program managers within the section is impressive. There is good community engagement and communication with PIs both pre- and post- award.
- The proposal review process has improved in response to comments from the previous COV and appears to be very well managed.
- IPS has responded effectively to the recommendations from the Sea Change Decadal Survey and to community input on the portfolio rebalance.
- Where there is capacity for distributed awards, IPS is making excellent efforts towards a well-balanced portfolio with regard to institutional diversity, gender diversity, geographic distribution, etc.
- The section has done an excellent job at managing available financial and human resources, and in working with other sections to maximize the cost/benefit of resources.
- Given the impact of ongoing continuing resolutions and administration changes, the section has done a remarkable job addressing institutional strategy and goals, managing budgetary challenges, and ensuring the successful operations of facilities and programs that are fundamental to the support of the ocean science community.

COV Process: General

COV Gen1 Finding: COV found it challenging to assess the scope and breadth of the proposals submitted to some IPS programs since the accessible electronic jackets were a subset of all eJackets. The process of selecting eJackets was not very clear to the COV.

COV Gen1a Recommendation: The COV recommends, for transparency, all proposals submitted during the review period be *listed* in the eJacket interface, and those not selected for review by the COV not be accessible/viewable. This would allow the COV to download a spreadsheet of the full program portfolio (funded and declined), with high level information potentially useful in the assessment of the full IPS portfolio.

COV Gen1b Recommendation: The COV recommends the download function in the interface should also carry the COI “stop sign” indicator () into a column in the spreadsheet, so the COV can better utilize it, as they work through the review process.

COV Gen1c Recommendation: The COV recommends NSF update the COV website, so future committees have the option to be able to view all documents online, rather than having some of them download automatically.

COV Gen1d Recommendation: The COV recommends using a data-driven system for dividing labor on programs reviewed by COV members (e.g. include total number of potential jackets to review per program as part of the program selection process).

COV Gen2 Finding: The COV appreciated the webinar(s) held prior to the COV meeting at NSF.

COV Gen2 Recommendation: The COV recommends future COV's be provided additional guidance on the following:

- the scope of the COV review, in terms of the availability and relative importance of different documents (e.g., spend less time reading individual proposals, and focus more on the reviews, panel summaries, data and analyses available within IPS);
- the variability of review processes across IPS programs (ad hoc reviews only, internal review only, ad hoc and panel reviews, etc.);
- the location of relevant information within the eJackets to facilitate the review process.

COV Gen3 Finding: It is difficult to fit reviews for this facilities-focused section within the formal NSF COV template. The questions and content addressed in the template are relevant, but much of the format of the template is not user friendly for this Section.

COV Gen3 Recommendation: The COV recommends development of a more flexible, IPS-centric assessment template for future COVs.

COV Gen4 Finding: Given the breadth of the IPS programs reviewed and the amount of reference material, there was insufficient time between establishment of the COV and the commencement of the on-site work at NSF to understand the task, review the supporting reference material, and formulate a strategy for maximizing the available time at NSF. All members of this IPS COV were active scientists and program managers, with work and travel commitments.

COV Gen4 Recommendation: The COV recommends providing more time for IPS COVs orientation, planning of their assessment roles, coordination with IPS Program Directors, and for reviewing the materials prior to the actual COV onsite meeting (minimum six to eight weeks).

Summaries, Findings, and Recommendations

Education/Human Resources (EHR)

Summary:

OCE Education supports efforts to integrate ocean research and education via two main program areas:

- 1) Research Experiences for Undergraduates (REU) Site Program: This program provides funding to Universities and Marine Laboratories that allows them to offer summer internships to undergraduate students who would like to participate in ocean-related research efforts.
- 2) Faculty Early Career Development (CAREER): This program supports pre-tenure researchers who would like to combine their research efforts with excellent educational programs. CAREER proposals were reviewed in the science COV process.

For this particular COV (June 2018), the focus was just on the REU Program rather than both program areas. The sampling of proposals provided to the COV included new programs, renewals and supplements to existing grants. The COV was provided materials from the FY 2015 OCE Science Research and Education COV that referred to the REU program as well as materials from the FY 2015 ICER (Integrative and Collaborative Education and Research) COV that examined Pathways to Geoscience (GEOPATHS), Geoscience Opportunities for Leadership Development (GOLD), Global Learning and Observations to Benefit the Environment (GLOBE), and Polar Special Initiatives.

The COV would particularly like to thank Program Officer Lisa Rom for the OCE REU Site Program Comments on COV Questions.

Proposals evaluated during 2014 and 2015 were by ad hoc, mail reviewers only. In 2014, OCE funded a total of seven awards including one new OCE REU site and two new REU sites funded via GEO. In 2015, OCE funded a total of nine awards including two new REU sites.

In 2016, 14 proposals were evaluated by ad hoc, mail reviewers and an OCE panel. In addition, some proposals were jointly reviewed by panels organized by other divisions. OCE funded eight awards including three new REU sites.

In 2017, 18 proposals were reviewed by an OCE Panel. In addition, some proposals were jointly reviewed by panels organized by other divisions including Earth Sciences and Biological Infrastructure. OCE funded a total of 11 awards including five new REU sites.

This COV reviewed 12 actions between 2015-2017 that included both REU proposals and supplemental funding requests. For this program, the review methods are appropriate, and the

use of panels enhances the process. Both merit review criteria are addressed, and the panel summaries and program officer documentation are excellent.

The program strives to use a wide variety of reviewers including current REU site directors/PIs as well as reviewers with expertise in undergraduate research experience and education.

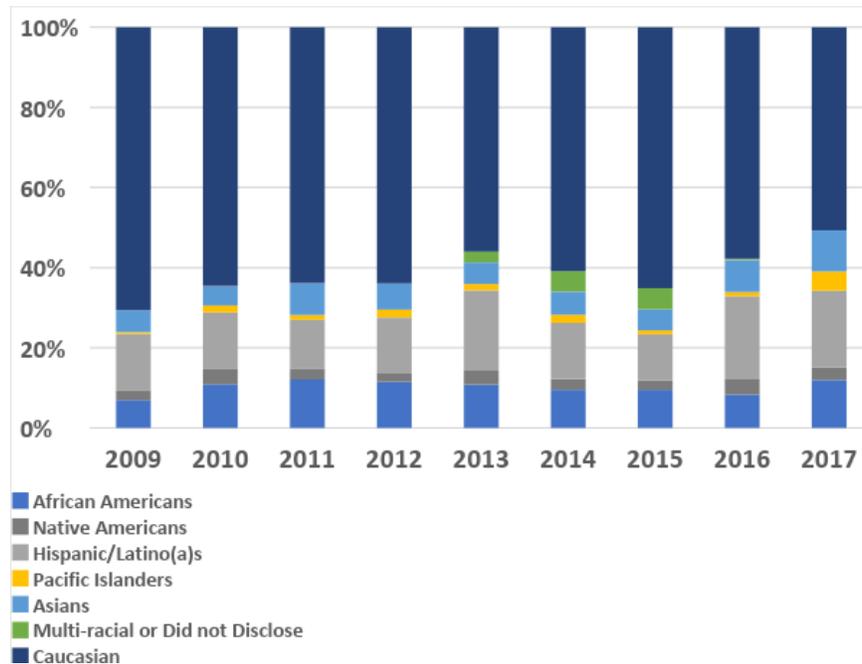
The program has done an excellent job in program management with annual reminders to PIs, and joint PI meetings (three over the past seven years approximately every other year). There is a GEO REU website (<https://scied.ucar.edu/soars/reu>) that provides a listserv as well as program management documents. The COV would particularly like to acknowledge the efforts of summer interns at NSF in collecting data useful for program management.

In terms of responding to emerging research and education opportunities, the program has made an effort to acknowledge and recognize the importance of community colleges, which is where many students from under-represented groups begin their college experience, and has resulted in successfully increasing the diversity of the students served. In addition, reviewers and the panel have been asked to focus more on social aspects of the program, mentoring, and/or professional development.

New REU sites are at a disadvantage in the review process, and this is taken into account by the program. As a result, the program does a good job ensuring new REU sites are awarded each year.

In terms of responding to previous COV comments, the REU program now uses a panel (or multiple panels) as recommended, and will continue to do this in 2018. There are four new west coast REU sites (as of 2018), as recommended by the previous COV, and renewed funding for two existing west coast REU sites.

In response to the previous COV recommendation to try and increase recruitment and retention of minorities in ocean scientists, some of the REU sites have been selected with this in mind, and/or the selection process within each site has included this goal. The end result is that as of 2017, students from underrepresented groups make up 49.2% of the cohort (292 students total).



Percent of under-represented participants (2009-2017)

OCE REU sites have a very diverse range of projects and organizational format. This increases the variety of potential research topics for applicants. A typical award is usually for three years at ~\$11,000/student. Costs are tracked by the program (costs/student/week, % of management costs/student costs). There are some sites with five years of funding (strong history with previous support and strong diversity recruitment). Some sites without either of these have been supported for less than three years.

The program does an excellent job at working with other NSF divisions to supplement the REU funding and increase the number of REU sites. There were 12 REU sites (2014-2017) that are co-funded.

EdHR1 Finding: The COV believes that all REU sites are evaluated annually. It would be helpful to see an overview of these evaluations to see if a particular organizational strategy or management format is more effective – but this would require that the REU program develop success metrics, and consider working on a method to follow/track REU participants to determine the short and long-term impact of the REU program. BIO does have a particular evaluation format to follow, while OCE does not at this point. Many REU sites track their own participants and this information could be requested and collated.

EdHR1 Recommendation: The COV recommends EdHR consider sharing the longer term tracking data that successful programs have gathered. If newer and/or younger programs are interested in continued funding, it would be helpful for them to continue to collect this type of data.

EdHR2 Finding: Participation in professional meetings is an important part of networking and continued success in STEM fields. It is not clear how many of the REU sites provide this level of support. While funding cannot realistically be done for all REU participants (292 in 2017), it would be very advantageous to have one or two supported participants from each REU site.

EdHR2 Recommendation: **The COV recommends EdHR consider recommending that REU sites make professional meeting attendance a part of their proposal/award by including support for a few participants from each REU site to attend and ideally present at a professional meeting.**

EdHR3 Finding: The program director mentioned the expectation that a common application format would be in place soon.

EdHR3 Recommendation: **The COV recommends a common application be given a high priority, as this would greatly simplify both the application process and future data collection.**

EdHR4 Finding: The COV found the information regarding gender of the REU participants interesting in that there is nearly a 70% female to male ratio. We have come to the point where instructions to the PIs from the program director include the following: “Women are not considered ‘under-represented’ at the undergraduate level”. The COV doesn’t have any specific recommendations regarding this gender issue, as it likely is an accurate reflection of the undergraduate students in the various fields. There was some discussion about the change in gender ratio at the graduate/faculty level, and perhaps this is an area where the program might play a role. Representation beyond the undergraduate level is also an issue for underrepresented students.

EdHR4 Recommendation: **If appropriate, the COV recommends the Advisory Committee consider the issue of diversity beyond the undergraduate level, and determine if there are practices that may be helpful in addressing this issue. GOLD (GEO Opportunities for Leadership in Diversity) and Sparks for Change are existing programs addressing this issue at the faculty level.**

EdHR5 Recommendation: **The COV recommends the process of using summer interns (or other staff) to gather and collate data continue as the data are very valuable.**

Oceanographic Technical Service (OTS)

Summary:

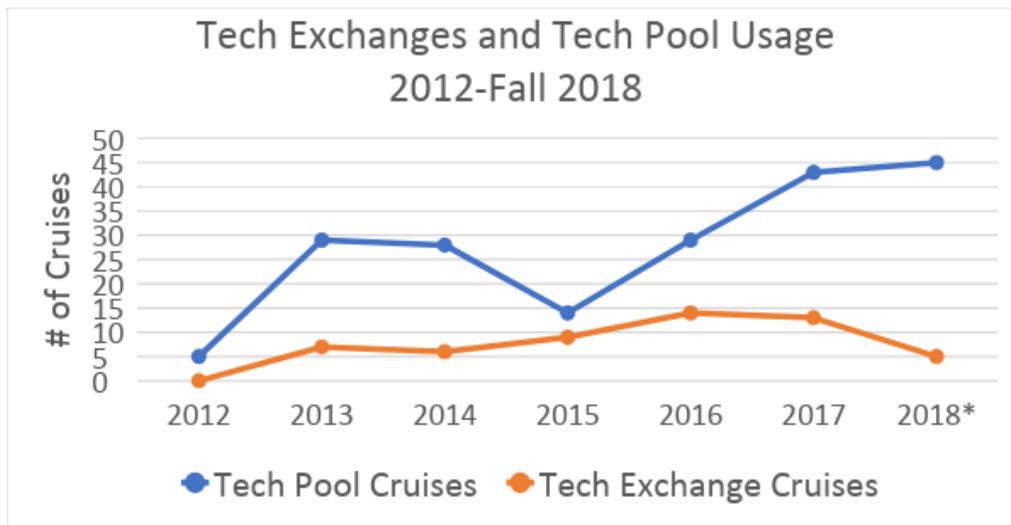
The OTS Program provides support to enhance the scientific productivity of research programs using major facilities, primarily research vessels, but also including a range of shared-use infrastructure programs such as the shipboard ADCP and R2R programs. Effective use of such facilities is enhanced by providing institutional technical support services to all users of an institution's facilities. Allowable costs include salaries and related expenses, maintenance and calibration of sensors and instrumentation, and travel. Services provided include quality assurance, scheduling of technical support, logistical assistance, and at-sea supervision of the

instrumentation and shared-use equipment available to sea-going researchers. Like Ship Operations, Oceanographic Technical Support requests must be directly attributable to NSF-sponsored science. The awards are made on a five-year continuing grant cycle. Proposals have a 45- page project description limit with a total limit of 250 pages (including the special information and supplementary documents).

There were eight items in e-Jackets provided to the COV, including four proposals from 2012 and four proposals from 2015/2016 (within the 2014-2017 review period for this COV). The four 2012 proposals were included as they are five-year grants, and part of the grant period fell within the scope of this COV. Comments on the review process for these four 2012 proposals are not included within this COV.

The four 2015/2016 proposals were reviewed by a panel, resulting in three awards and one declination. The review analyses and panel summaries were mostly well done. In the case of one proposal receiving all “Excellent” reviews, the Panel Summary was very short, and with no recommendations. It is interesting to note there is 100% success rate with proposals. The only exception to this was the competition for the technician pool (four proposals with only one being funded).

OTS1 Finding: The panel was interested in learning if the technicians participating in the technician pool and exchange are in favor of this management scheme. The Program Director felt they were happier with this, as it created the ability to work part-time. The downside to this arrangement is the loss of benefit and retirement plans.



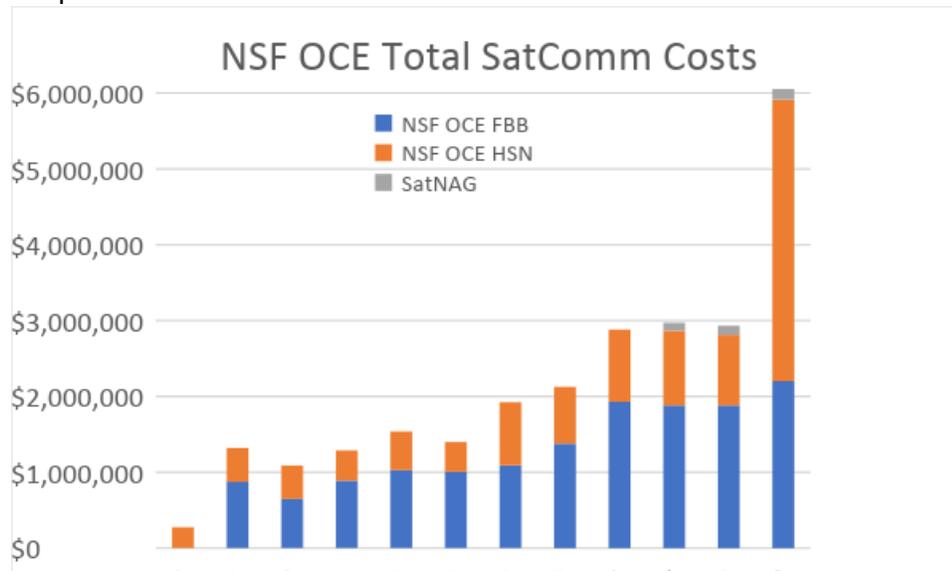
OTS1 Recommendation: The COV recommends the program survey the existing pool of technicians involved in these components to determine level of satisfaction with the scheme.

OTS2 Finding: During the last 4-5 years, three new research vessels have come on line (*Sikuliaq, Armstrong, Ride*) that are equipped with a broad and diverse suite of sensors and

instrumentation, such as multiple types of sonars and multiple sonars within each type (e.g., Acoustic Doppler Current Profilers (ADCPs), Multibeam systems, EK80 bioacoustics arrays). The upcoming Regional Class Research Vessels are likewise designed and planned to be equipped with a similar array of instrumentation. Operating this diverse array requires significant investment of technician time and expertise, on-board instrument networking, and data management and archiving that presents challenges far greater than had been required on other ships in the fleet. At present, the program has latitude for up to three marine technicians on some cruises to support this greater complexity of science infrastructure.

OTS2 Recommendation: The Committee supports this effort, and recommends the program should continue to provide support for 3-4 marine technicians on the ships when needed, particularly for cruises that rely on multiple sensor systems as core to the scientific mission.

OTS3 Finding: Satellite communications. The research fleet is currently using HiSeasNet (primary) or Fleet Broadband/Express (Fx) for satellite communications with the only unifying theme seemingly being complaints about connections, speed, and capability. Costs for Satellite Communication are increasing and the program has constituted the Satellite Network Advisory Group (SatNAG) which is responsible for assessment, definition of project scope, and development of common tools, resources, and solutions for the fleet. Given the increasing need for effective communication between ship and shore for diverse needs (e.g., telepresence, outreach, data transmission, basic e-mail communication), supporting efforts to maximize these communication capabilities within the limits of satellite communication is critical.



OTS3 Recommendation: The COV recommends the program continue to pursue means to increase bandwidth, and to efficiently manage use of individual scientists' computers, shipboard computers, and telepresence equipment in order to maximize the quality of the internet experience and ability of personnel on board to communicate with shore. The SatNAG group is an agile and knowledgeable team that can help address these issues.

OTS4 Finding: At present, the SatNAG site provides information only on how to stop automatic updates for the commonly used operating systems. In this age of constant connectivity many services run automatically in the background, but methods to temporarily disable these are not included in this resource. The committee reviewed the UNOLS Internet use policy that is available on the UNOLS site and commends the SatNAG for writing an easily understood document.

OTS4 Recommendation: The COV recommends further guidance be provided to enable science party and crew on the vessels to minimize background Internet communication by services such as Dropbox, iCloud, Google drive, etc.

Oceanographic Instrumentation (OI) and Shipboard Scientific Support Equipment (SSSE):

Summary:

The Committee elected to evaluate these two programs together given the similarity in their objectives, that they have been reviewed together by a single panel for the last few years, and that they are managed by the same Program Director. Both of the programs provide an annual opportunity for vessel operators to procure needed equipment to be used on research vessels in fulfillment of ongoing science mission requirements. The OI program supports the acquisition of ship-board or portable instruments to be shared-use equipment for the major research facilities. Portable instruments could include coring equipment or optical plankton systems used from multiple platforms, while shipboard equipment could include hull-mounted sonars for individual ships. The SSSE program supports acquisition of equipment used on-board ships to enhance ship scientific capabilities. This includes winches and cranes, and can include overhaul of existing scientific support equipment. For both programs, scientific needs and drivers justify the acquisition of the equipment.

The Committee had access to 14 eJackets between the two programs for proposals submitted in each of the four years under consideration (2 for 2014, 3 for 2015, 5 for 2016, 4 for 2017). The success rates of the two programs are very high, with 83% of the proposals receiving funding over these four years, almost all having some reduction in the award from the request based on the justified need from the proposals and the consensus of the panel.

The portfolio of the program is dictated by the makeup of the US research fleet, with proposals being generated by ship-operating universities, institutions, and educational organizations. As such, the portfolio covers a wide geographic area, and includes both large and small operators utilizing coastal to global vessels.

The makeup of the panels is diverse, including marine technicians, program managers, marine superintendents, and at least one scientist per panel. The Program Director has endeavored to include a mix of genders, career levels, and geographic distributions, and has done a good job given the available pool of potential panelists. Conflicts of interest are appropriately addressed. The review analyses are comprehensive, and well written, and clearly convey the rationale for decisions. These analyses also addressed the two NSF review criteria.

The program management is very good, with frequent communication between the Program Director and the PIs. Proposals are reviewed promptly, and decisions are sent to the PIs within 6 weeks or so of the panel date.

OI/SSSE1 Finding: The programs support acquisition both of core, critical instrumentation (e.g. CTDs) and of new cutting-edge instrumentation to be shared-use equipment. This permits the program to be responsive to emerging science needs. That said, acquisition of instrumentation, both new and replacement, should require sound scientific motivation, and specifics about scientific motivation are frequently lacking in the proposals.

OI/SSSE1 Recommendation: The COV recommends proposals should be reviewed and rated with respect to sound scientific justification. The program should strive to include more than one scientist in the review panels or, alternatively, send proposals out for ad-hoc review to scientists in appropriate fields.

OI/SSSE2 Finding: Most panel summaries do not specifically address both review criteria (intellectual merit and broader impacts), and for those that do, the criteria are mentioned in a single sentence with no substantive description. The COV panel recognizes that these two criteria are a requirement of the NSF review process.

OI/SSSE2 Recommendation: The COV recommends panels specifically review and provide feedback on the two evaluation criteria, even though the linkage to those criteria of the proposals can sometimes be tenuous.

OI/SSSE3 Finding: The quality of proposals has not increased substantially since the recommendation of the 2014 COV, nor since the proposal writing workshop at RVTEC in 2015. The scientific justification for the requested instrumentation should be clearly articulated to be consistent with the NSF mission, even if the instrument requested is a core facility that requires replacement (such as a CTD). We recognize this deficiency is at least in part due to the turnover in lead marine technicians and to inexperience in proposal writing.

OI/SSSE3 Recommendation: The COV recommends that the Program Director continue to work with the marine technicians to improve the quality of their proposals. The summary document from the 2015 RVTEC proposal writing workshop, which is available on the UNOLS website (https://www.unols.org/sites/default/files/201511rvtap30e_breakout.pdf), could serve as a starting point. Each operating institution should also be encouraged to reach out to scientists within their home institutions for assistance in writing short scientific justifications for each instrument requested. If possible, an example of a well-written project description could be shared (with the permission of the proposal writer). Perhaps one way to present this to the proposers is that their proposal needs to persuade an uninformed, non-expert reader the need is scientifically justified.

OI/SSSE4 Finding: IPS has moved towards implementing the recommendation of the 2014 COV report to merge the two programs, with joint review of proposals by a single panel at a single

review. However, the two programs are still treated as distinct with two different element codes.

OI/SSSE4 Recommendation: The COV recommends IPS consider completing the merger of the two programs under a single element code. We do not recommend any reduction in the overall budget.

Ocean Drilling Program (ODP) and the International Ocean Discovery Program (IODP)

Summary:

The Ocean Drilling Program at the National Science Foundation, oversees the US participation in IODP. The program is an international collaboration dedicated to advancing understanding of the Earth, primarily by drilling of the sea floor to obtain core material and installation of instrumentation for long term monitoring of sub-sea floor conditions. The research produced by IODP scientists informs our understanding of the origins of the seafloor, its structure, and its role in geo-hazards, the history of life, its extent in the depths, and the history of the Earth's climate with implications for the future. The present IODP began in 2013, building on the foundation of four previous ocean drilling programs starting with the Project Mohole in the 50s, the Deep Sea Drilling Project (DSDP), the Ocean Drilling Program (ODP) and the first IODP, the Integrated Ocean Drilling Program.

The current IODP at NSF manages three Cooperative Agreements (CAs) with Texas A&M for JR operations, with Scripps Institution of Oceanography to support the advisory planning system, and with Lamont Doherty Earth Observatory (LDEO) for support of scientist participation on the IODP drilling platforms. Significant contributions also come from the Ministry of Science and Technology of the People's Republic of China (MOST), Korea Institute of Geoscience and Mineral Resources (KIGAM), Australian-New Zealand IODP Consortium (ANZIC), India Ministry of Earth Science (MoES), and Brazil's Coordination for Improvement of Higher Education Personnel (CAPES). Overall, the IODP constitutes a coalition of over two dozen countries. In the previous IODP, the three major partners co-mingled funds, and managed the three different types of platforms in a coalition. Today each manages their own platforms with NSF solely responsible for the US platform, the *Joides Resolution (JR)*. The international partners contribute significantly to the operating costs in exchange for participation of their scientists on expeditions and on the advisory panels.

Expeditions of the *JR* result from a "bottom up" process, whereby the scientists submit research proposals related to the science plan described in *Illuminating Earth's Past, Present and Future*, a vision for a decade of drilling, which was developed by the international scientific community. Proposals for use of the *JR* are evaluated by ad hoc reviews and by two panels: the Science Evaluation Panel (SEP) and the Environmental Protection and Safety Panel (EPSP). The two panels provide advice to the *JR* Facility Board (JRFB) which oversees operation of the drill ship.

The JRFB consists of six scientists, representatives from the various funding agencies, and the *JR* Science Operator (JRSO at Texas A&M). The JRFB oversees the SEP and EPSP panels, approves

the annual program plan and budget, sets the annual ship track (currently five expeditions per year), and approves policies and procedures while working with the other facility boards to ensure best practices. The JRSO, under a five-year cooperative agreement, maintains the US core facility and oversees operation of the *JR*.

Prior to 2015, IODP was part of the Marine Geoscience Section of OCE. IODP funded expedition objective research (EOR) proposals, *JR* operations, IODP management, workshops, MARGINS and IODP facilities, including the core repositories, IODP Support Office and long coring. IODP moved to the Integrative Programs Section of NSF in 2015 which funds the JRSO and the US Science Support Program for Ocean Drilling (USSSP). USSSP, through a five-year cooperative agreement with Lamont-Doherty Earth Observatory (LDEO), enables US participation in IODP expeditions, workshops, and panels. It supports participant costs (travel and salary), and a small post-cruise research grant (usually ~15K). It is the major education and outreach arm of IODP through and runs a distinguished lecture series and a graduate fellowship program. There are typically 10 US berths on a *JR* cruise, of which three are reserved for US graduate students.

IODP operations of the *JR* are reviewed annually by an NSF panel that meets for three days at TAMU. The COV was provided with three annual reviews (2015, 2016, and 2017) and the NSF responses. These panels are asked the twin questions of whether the *JR* is required to meet the IODP Science Plan, and whether it is being appropriately utilized to meet the Science Plan. The COV was also provided jackets for eight proposals, including two for the cooperative agreement for management of USSSP.

IODP at NSF also reviewed what would be regarded as “regular” NSF proposals. These were considered by ad hoc reviewers and/or NSF panels. The COV was given eight of these as a representative sample. These included a proposal handled by IODP because of COI considerations between the PI and the program which would ordinarily review it [a spouse is a program director], proposals for cooperative agreements and several “expedition oriented research proposals”.

IODP1 Finding: Changes in the management of IODP by NSF included the creation of the JRFB, the funding of cooperative agreements for the JRSO and USSSP, and the transition to IPS. These changes have resulted in vastly improved management of the *JR* and related science programs. The COV echoes Site Visit reports in commending IODP for its vision in redesigning the program and for management since 2015.

IODP1 Recommendation: The COV recommends that IODP remain in IPS, and maintain the current management plan through the cooperative agreements to LDEO and TAMU.

IODP2 Finding: The current five-year program is in its fourth year. Planning for the second five years of the 10-year program is well underway. However, site reviews point out that the *JR* is aging, which results in lost days in a tightly planned expedition schedule. NSF has responded to these challenges, but concerns remain regarding potential major failures resulting in significant downtime. The COV endorses recommendations by the Site Review panels.

IODP2 Recommendation: The COV recommends IPS, through JRSO, place a priority on developing plans to mitigate risk for drilling operations.

IODP3 Finding: The proposals, reviews, and panels including the three site reviews provided to the COV addressed “broader impacts” of IODP. The COV salutes the success of the many Outreach activities, including graduate student fellowships, distinguished lecture series, and the proposed collaboration with the American Museum of Natural History (AMNH) and aboard the *JR* both in port and at sea.

IODP3 Recommendation: The COV recommends continuing education and outreach efforts while maintaining a judicious balance between science and outreach.

IODP4 Finding: In response to the Sea Change Report suggestion to immediately retire the *Marcus G Langseth*, IPS has developed and executed a well-thought and deliberate plan for long term support to science community seismic requirements, and provided some breathing room for replacement of the current seismic capabilities, required for site surveys in support of the IODP expedition planning process. However, the looming divestiture of the *Langseth* may pose a threat to IODP planning in the future.

IODP4 Recommendation: The COV recommends IPS continue efforts to support the seismic community’s science requirements, and in particular the site surveys supporting IODP after the *Langseth* divestiture.

Submersible Support (SS)

Summary:

The Submersible Support (SS) program sustains a variety of deep-submergence assets, and provides the primary funding for the National Deep Submergence Facility (NDSF), hosted at WHOI. The NDSF operates, maintains, and coordinates the use of three deep ocean vehicles: the upgraded Human Occupied Vehicle (HOV) *Alvin*, the Remotely Operated Vehicle (ROV) *Jason/Medea*, and the Autonomous Underwater Vehicle (AUV) *Sentry*. All three vehicles enjoy healthy schedules.

The NDSF is primarily supported through a 5-yr Cooperative Agreement with NSF (other support comes from NOAA, ONR, and other federal and non-federal sources). The current agreement was initiated 1 August 2016 following a successful peer review. Funding of the program is negotiated annually, based on the number of NSF-funded operating days. A key activity for the current award period has been the successful upgrade of *Jason/Medea* to a single-body configuration, as well as an upgrade to its handling system to accommodate heavy lifting needed to support the OOI program. *Jason* has retained the capability of operating as a 2-body system, but is constrained to working depths above 5000m, and experienced some loss of maneuverability. *Jason* control vans have been replaced and upgraded. *Sentry*’s command and control system has also been upgraded, and *Sentry*’s new Wave Glider-tender allows the support ship more flexibility to undertake parallel operations with AUVs, HOVs. *Alvin*

is planned to be upgraded to 6500 m in its next major overhaul (tentatively scheduled following the 2019 operating season), and a Major Overhaul Stabilization Account (MOSA) has been recently established to fund activities associated with the overhaul. The MOSA will be expended by the end of the 5-yr agreement.

The SS program, in responding to recommendations of the 2014 COV, funded the DEveloping Submergence SCienceE for the Next Decade – 2016 (DESCEND–2016) Workshop (14-15 January, 2016, Cambridge MA). DESCEND-2016 delivered a final report with findings and recommendations regarding current and future deep-submergence needs; the report is posted on the UNOLS website.

(https://www.unols.org/sites/default/files/DESCEND2%202016%20FINALFINAL_small.pdf)

SS1 Finding: The transition of *Jason/Medea* to a single-body, heavy-lift configuration and its requirement to maintain OOI infrastructure may limit the availability (possibly the suitability) of the system to non-OOI deep-submergence research programs.

SS1 Recommendation: The COV recommends the SS program should continue to assess, monitor, report to the community, and mitigate any impacts of the *Jason* reconfiguration on non-OOI programs as needed.

SS2 Finding: The planned upgrade of *Alvin* to 6500 m will have an associated cost, albeit a fraction of the total cost of the major overhaul. It is not clear the cost-benefit ratio of this upgrade continues to be deemed favorable by the deep-submergence science community relative to other potential uses of those funds, particularly given the existence of ROV and AUV assets with up to 6500-m capabilities.

SS2 Recommendation: The COV recommends IPS direct the UNOLS Deep Submergence Science Committee (DeSSC), which provides oversight for NDSF, to review and provide their endorsement (positive or negative) of the planned *Alvin* 6500 upgrade, particularly in light of reduced working depths of 2-body ROV operations.

SS3 Finding: NDSF maintains an outstanding record of supporting NSF research by providing operationally capable and reliable systems, but more and more deep-submergence systems are accumulating in national and international arenas.

SS3 Recommendation: The COV recommends the SS program continue to highlight and leverage the strengths of NSF-funded deep-submergence assets for broad scientific research both within NSF, with other federal agencies (NOAA, NASA, BOEM, etc.), and with the scientific community at large.

SS4 Finding: DESCEND2 provides guidance regarding future deep-submergence needs, including a specific recommendation (development of a full-ocean capable ROV) and more general recommendations (i.e., support advances and initiatives in robotics, automation, sensor

development, and big data management/analyses; foster new avenues for exploration and advance our understanding of geological, geochemical, and ecological processes in the ocean, on the seafloor, and within the Earth's interior; increase attention to, and support for, exploring and studying underserved habitats such as the shallow shelf, midwater, sub-ice ocean, abyssal plains, and trenches).

SS4 Recommendation: The COV recommends the SS program continue to align its priorities with guidance from DESCEND2, and report via DeSSC to the user community on these alignments.

Ship Acquisition and Upgrades (SAU)

Summary:

Regional Class Research Vessels (RCRVs) are key elements of NSF's fleet modernization plan, and will be critical for coastal ocean research as part of the University-National Oceanographic Laboratory System (UNOLS). The RCRVs will serve as platforms for multi-disciplinary ocean observations, sampling and process studies, and for training future scientists, engineers, and educators. Oversight of the construction and transition to operations for the first of (up to) three RCRVs has been awarded, and is being managed under NSF's Major Research Equipment and Facility Construction. The COV was provided with two eJackets, neither of which underwent review during the time period of 2014-2017. In addition to the RCRV Project, SAU contributes to the funding of the UNOLS Office and its activities.

The RCRV is being designed to support science missions serving all eight of the *Sea Change* Decadal Survey science priorities, including sea-level change, ocean and climate variability, and marine food webs, among others. There is already a notable effort regarding outreach on the part of the first ship awardee, Oregon State University, indicating they are proactive with respect to education opportunities.

SA1 Finding: The selected operator(s) of the second (and potentially third) RCRV will participate in the design, construction and transition phases of the first RCRV, and to consider modifications potentially necessary and/or relevant for working conditions in the Gulf and/or off the East Coast.

SA2 Finding: The RCRV project has a high level of complexity; documentation provided to the COV suggests a high degree of due diligence in consultations, reporting, oversight and reviews by NSF and oversight by the scientific community.

SA3 Finding: Recommendations from previous COV have been addressed including a rigorous evaluation of the project (underway), and the final design review in late 2016.

Ship Operations (SO)

Summary

Ship Operations (SO) currently supports 18 ships in the Academic Research Fleet owned by NSF, ONR, Universities, or States, distributed along East, Gulf, and West coasts, Alaska, Hawaii, and the Great Lakes. This fleet is described as 'right-sized' for national research needs, and emphasis now is on modernization of the fleet. Science programs using the vessels are generally selected through peer review, and sea time is scheduled through UNOLS.

Most funding distributed by SO is for shiptime. Additional funds go to other activities, including the fleet effort for Civility at Sea. SO also supports Early Career Chief Scientist Training Workshops and Cruises through internally reviewed EAGER awards. SO interacts with operators through 5-year Cooperative Agreements, and employs a number of management and oversight tools, including

- BSR process (Business System Reviews)- *External*
- NSF Cost Analysis (CAPS) –*External*
- NSF Inspection feedback - *External*
- UNOLS Post Cruise Assessment Report (PCAR) feedback – *External*
- Inspector General- *Internal*
- Office of General Council
- Large Facilities- *External*
- UNOLS Council & RVOC - *External*
- Site Visits- *Internal/External*
- Compliance with the American Innovation and Competitiveness Act (AICA).

MOSA is funded for each ship in the ARF to cover normal maintenance, shipyard dry docking, and minor repair requirements.

The COV had four eJackets available to review, three of which were submitted and reviewed during the 2012 panel and outside of the period of the COV review, and the fourth of which was for only a partial year, and was not externally reviewed. These eJackets provided information on the extensive communications between the Program Director and ship operators, and insight into the proposal review process.

This program is very well managed. The Program Director engages in frequent and specific, focused discussions with the ship operators, with the science programs at NSF that fund the research, and with the ONR program manager (as owner of a number of ships in the UNOLS fleet). The AICA will require extra effort by the Program Director to assist the ship operators in achieving compliance, particularly with respect to the structure of the MOSA and with the required branding. Significant efforts are made to engage the scientific community in identifying strategies to maintain research capacity and capability within the fleet, such as ongoing efforts associated with the *Marcus Langseth*.

SO1 Finding: Early Career Scientist training programs are excellent tools to develop new leaders in oceanographic research, with more applicants than can participate. At present, EAGER proposals to support these programs are reviewed internally. Identification of PIs for these proposals is *ad hoc*.

SO1 Recommendation: The COV recommends SO consider issuing a solicitation for the subset of training proposals that exceed a certain funding level (TBD by the program) as a means of attracting PIs and mentors to the program with diverse backgrounds, expertise, and approaches to leadership and leadership training, and as a means of ensuring competitiveness through the external review process.

SO2 Finding: While pre-2014 eJackets were outside the review window for this COV, ship operations proposals from the 2012 panel were included in the COV eJackets provided for reference, and were reviewed by COV members. Proposal lengths were notable in their variability, with one proposal exceeding 90 pages. The COV understands the ship operations solicitation is due to be updated.

SO2 Recommendation: The COV recommends as part of the process of updating the proposal solicitation for SO, consider consultation with operators to identify and share best practices in proposal preparation that lead to efficient delivery of essential information.

Ocean Technology and Interdisciplinary Coordination (OTIC)

Summary

The Oceanographic Technology and Interdisciplinary Coordination (OTIC) Program supports a broad range of research and technology development activities. Unsolicited proposals are accepted for instrumentation development having broad applicability to ocean science research projects, and enhance observational, experimental or analytical capabilities of the ocean science research community. The OTIC Program supports development of new instrumentation or technologies having broad applicability to ocean science research, and having direct relevance to OCE priority research activities.

The COV was provided with 21 items in eJacket; nine awards were made with 12 declinations (dates ranged from 2015-2017). OTIC receives and funds a wide variety of projects covering all of the OCE research disciplines from design through calibration and initial testing. The current review methodology is primarily *ad hoc* mail review with occasional involvement with other existing panels. The COV recognizes the difficulty in trying to convene a panel specifically for OTIC, given the wide range in topics and disciplines. The current *ad hoc* reviews do appear to present a good balance between technical and science perspectives. The success rate for proposals has been increasing (2015 – 24%, 2016 – 37%, and 2017 – 54%) with a very good geographic representation.

OTIC 1 Finding: OTIC provided 19 awards in 2017, 22 awards in 2016, 17 awards in 2015, and 19 awards in 2014.

OTIC1 Recommendation: The COV recommends that given the size and funding investment of ocean science research programs in OCE, IPS should consider continuing their efforts to bring the OTIC budget back up to the 2009 level.

OTIC 2 Finding: The COV lauds the current collaborations with Improvements in Facilities, Communications, and Equipment at Biological Field Stations and Marine Laboratories (FSML) and the National Ocean Partnership Program (NOPP).

OTIC2 Recommendation: The COV recommends OTIC pursue wherever possible, additional collaborative efforts (e.g. BOEM, NASA, NOAA, Navy).

Recent trends in successful projects include sensors on mobile platforms, sensor types, miniaturization, moving to deeper depths, looking at alternative power, and soft matter. OTIC has also sponsored workshops to foster collaborations and/or generate ideas.

OTIC3 Finding: Past developments have spanned disciplines, and there has been good success at bringing some developments to commercial distributions. However, it is noted there is currently a gap in helping PIs mature their developments to maturity for distribution for community use and/or commercialization.

OTIC3 Recommendation: The COV recommends OTIC pursue a pilot effort to take one or two projects to completion (either open source or commercialization).

OTIC4 Recommendation: The COV recommends OTIC add instrument related software, algorithm, and/or technique development to the portfolio, perhaps in conjunction with other programs (e.g. Computer Science).

Ocean Observatories Initiative (OOI)

Summary

The Ocean Observatories Initiative (OOI) program is comprised of 5 stations/arrays (Station Papa, Cabled Array, Endurance Array, Pioneer Array, Irminger Sea), of which only the Pioneer Array is listed as relocatable (following a 5-year review). In response to the *Sea Change* Decadal Survey call for balancing infrastructure and research portfolios of IPS, OOI was de-scoped by 20% during the solicitation process for a new Operations & Maintenance award. Through the proposal process, this resulted in the removal of the Southern Ocean and Argentine Basin arrays. A Facility Board (OOIFB) has been established to provide “independent input and guidance regarding the management and operation of the OOI. It provides a way to expand scientific and public awareness of OOI, and ensures the oceanographic community is kept informed of developments within OOI” - from <http://ooifb.org/>. Communication and discussion of community feedback on the de-scoping strategy took place in the September 2017 meeting of the OOIFB. Elements of the Southern Ocean array have been restored through an international agreement with the United Kingdom.

Baseline data capacities of OOI are now established, and an aggressive enhancement program has been implemented, where limiting factors of the cyberinfrastructure are captured from users and addressed by the cyberinfrastructure team.

OOI1 Finding: A record of publications resulting from OOI data and proposal pressure for OOI research will accumulate, and will allow the community to understand and track the return on the investment in OOI infrastructure, and to suggest improvements.

OOI1 Recommendation: The COV recommends metrics of the use of OOI data and nodes be tracked and provided to the OOIFB and the greater scientific community.

OOI2 Finding: Failure of mission-critical elements can compromise the value of an OOI array. The video system (which has been offline for some time now) would seem to be one example where a redundant system on the seabed would be critical.

OOI2 Recommendation: The COV recommends the program evaluate the cost/benefit in building in redundancy deployments of mission critical elements.

OOI3 Finding: It is not obvious how OOI arrays are positioned and integrated into the global scheme(s) of ocean observing systems.

OOI3 Recommendation: The COV recommends the OOI website include acknowledgment and description of global observing efforts and coverage of observing systems at the seabed and in the water column, with some context for oceanographic questions their systems can address.

OOI4 Finding: OOI places significant demands on research fleet shiptime (equivalent of 1 shipyear) and deep-submergence assets (including reconfiguration of the *Jason* ROV).

OOI4 Recommendation: The COV recommends NSF track and report the impact of OOI maintenance and servicing activities on non-OOI shiptime requirements, to maintain a balanced portfolio of accessibility to ocean-going assets.

OOI5 Finding: There are challenges to maintenance of the OOI network infrastructure.

OOI5 Recommendation: The COV recommends the program consider charging the OOIFB to serve as a clearing house for program lessons learned, and for effective anticipatory (preventive) and mitigation measures.

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**FY 2018 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)**

The table below should be completed by program staff.

Date of COV: 5-7 June 2018
Program/Cluster/Section: Integrative Programs Section
Division: Ocean Sciences
Directorate: Geosciences
Number of actions reviewed: 73 Awards: 48 Declinations: 25 Other:
Total number of actions within Program/Cluster/Division during period under review: 192 Awards: 146 Declinations: 46 Other:
Manner in which reviewed actions were selected: Selected actions for FY2014 through FY2017 were reviewed. Additional actions were added for activities that began prior to FY2014, but were active in the review period. The additional actions came from the Program Elements of Ship Operations, Oceanographic Technical Services, Ship acquisition and Upgrade, and the Ocean Drilling Program.

COV Membership

	Name	Affiliation
COV Chair or Co-Chairs:	CAPT RT Schnoor, USN(ret) Dr. George Matsumoto	Office of Naval Research Monterey Bay Aquarium Research Institute
COV Members:	Dr. Cindy Van Dover Dr. Vicki Ferrini Dr. Carin Ashjian Dr. Lisa Tauxe	Duke University Lamont-Doherty Earth Observatory Woods Hole Oceanographic Institution UCSD-Scripps Institution of Oceanography

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments:</p> <p>The mix of review methods (e.g. ad hoc and panel, ad hoc only, and panel only) employed by different program elements seems sensible within IPS given the nature and variability of the programs in the section's portfolio.</p> <p>Data Source: EIS/Type of Review Module</p>	<p>YES</p>
<p>2. Are both merit review criteria addressed</p> <ul style="list-style-type: none"> a) In individual reviews? b) In panel summaries c) In Program Officer review analyses? <p>Comments:</p> <p>The broader impacts criterion was not explicitly addressed by the panels of the SSSE, OTS, and OI although the program managers did consistently address them.</p> <p>Data Source: Jackets</p>	<p>a) YES & NO</p> <p>b) YES & NO</p> <p>c) YES</p>

<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p> <p>Comments:</p> <p>Some ad hoc reviews in OTIC were a bit thin on comments.</p> <p>Data Source: Jackets</p>	<p>YES & NO</p>
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments:</p> <p>Some of the panel summaries did not include ranking.</p> <p>Data Source: Jackets</p>	<p>YES & NO</p>
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>[Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.]</p> <p>Comments:</p> <p>Data Source: Jackets</p>	<p>YES</p>
<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>[Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in</p>	<p>YES</p>

<p>the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.]</p> <p>Comments:</p> <p>Data Source: Jackets</p>	
<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p>	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>COV recommends additional scientific expertise could be helpful to recognize scientific importance and justification for instrumentation through OI and SSSE and infrastructure and technical support through OTS.</p> <p>Data Source: Jackets</p>	<p>YES & NO</p>
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments:</p>	<p>YES</p>

Data Source: Jackets	
<p>3. Additional comments on reviewer selection:</p> <p>Panel members and ad hoc reviewers for proposals for Ship Operations, Ship Acquisition and Upgrade, and Submersible Support reflected a broad range of specific expertise critical for assessment of different critical elements of the proposals as well as demographics (including institutional character, gender, etc.). IPS is commended for this effort.</p>	

III. Questions concerning the management of the program under review. Please comment on the following:

<p>MANAGEMENT OF THE PROGRAM UNDER REVIEW</p>
<p>1. Management of the program.</p> <p>Comments: <i>Please see the 2018 COV Narrative</i></p>
<p>2. Responsiveness of the program to emerging research and education opportunities.</p> <p>Comments: <i>Please see the 2018 COV Narrative</i></p>
<p>3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.</p> <p>Comments: <i>Please see the 2018 COV Narrative</i></p>
<p>4. Responsiveness of program to previous COV comments and recommendations.</p> <p>Comments: <i>Please see the 2018 COV Narrative</i></p>

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

Programs should provide materials to the COV regarding portfolio goals and can insert specific targeted questions about their portfolios. (Some dimensions of portfolio balance to consider include: balance across disciplines and sub-disciplines, award size and duration, awards to new and early-career investigators, geographical distribution of awards, awards to different types of institutions, innovative/potentially transformative projects, projects with elements of risk, inter- and multi-disciplinary projects, projects that integrate research and education, participation of groups that are under-represented in science and engineering, and projects that are relevant to agency mission or national priorities).

Data was provided by IPS in the COV documents to assist in addressing the following dimensions of portfolio balance:

- Balance across disciplines and sub-disciplines
- Award size and duration
- Inter- and multi-disciplinary projects
- Geographical distribution of awards
- Awards to different types of institutions
- Awards to new and early-career investigators
- Participation of groups that are under-represented

Please see the 2018 COV Narrative for the panel response.

OTHER TOPICS

1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.

Please see the 2018 COV Narrative for the panel response.

2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

Please see the 2018 COV Narrative for the panel response.

3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

Please see the 2018 COV Narrative for the panel response.

4. Please provide comments on any other issues the COV feels are relevant.

Please see the 2018 COV Narrative for the panel response.

5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

Please see the 2018 COV Narrative for the panel response.

The Committee of Visitors is part of a Federal advisory committee. The function of Federal advisory committees is advisory only. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the Advisory Committee, and do not necessarily reflect the views of the National Science Foundation.

SIGNATURE BLOCK:



12 June 2018

For the Integrative Programs Section
Robert T. Schnoor, COV Chair

APPENDIX: Suggestions for future IPS COV Panel Members

- Divide the programs so at least 2 COV members review each program
- Divide the eJackets in each program among COV members - ensuring that each has approximately the same number of declined and funded awards to review.
- Consider the total number of eJackets in each program as part of the process of dividing jacket reviewing responsibilities.
- eJackets: Focus on content in eJackets related to the evaluation and execution of the projects, e.g. ad hoc reviews, panel summaries, program officer comments, review analyses, and diary notes. Be aware that there will be variability in the presence/absence of these documents across programs. Delve into reading the proposals only if/when issues arise in your review of the review process.
- Be sure to review COV Documents early in the process.
- Use both previous COV reports and the report template as your guide in conducting your review.