

National Aeronautics and Space Administration

Office of Biological and Physical Research

**BIOLOGICAL AND PHYSICAL RESEARCH
ADVISORY COMMITTEE**

February 19-20
Washington, DC

MEETING REPORT

Original Signed By _____
Bradley Carpenter
Executive Secretary

Original Signed By _____
Kenneth M. Baldwin
Chair

BIOLOGICAL AND PHYSICAL RESEARCH ADVISORY COMMITTEE**NASA Headquarters****February 19-20, 2002****MEETING MINUTES****TABLE OF CONTENTS**

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**BIOLOGICAL AND PHYSICAL RESEARCH ADVISORY COMMITTEE
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Tuesday, February 19

Welcome/Chair's Review of Agenda

Dr. Kenneth Baldwin, Chair of the Biological and Physical Research Advisory Committee (BPRAC), called the meeting to order and welcomed members and attendees.

Review of BPRAC Recommendations

Dr. Bradley Carpenter, Executive Secretary, reviewed the status of the BPRAC recommendations from the last meeting. Most of the responses were incorporated into presentations at this meeting. At the last meeting, the BPRAC went on record opposing earmarks, but there was no action for the Office of Biological and Physical Research (OBPR) on this particular topic. With respect to BPRAC meeting logistics, Dr. Carpenter apologized for the delay in getting the electronic copy of the presentations out to the Committee members. Dr. Jessup suggested posting a "text only" version of the presentation material instead of the full Powerpoint presentation. This would make it easier for members to download. He noted that the important thing is to make sure that the communication channels between OBPR and the Committee members are kept open. Dr. Baldwin agreed to take an action item to ensure that members are informed about meetings and other important activities. Dr. Carpenter indicated that the BPRAC would be hearing about the status of the National Space Biomedical Research Institute (NSBRI) at this meeting, but the regular briefing on the NSBRI and other institutes would be made at a future BPRAC meeting. Dr. Faeth suggested that the BPRAC hear a briefing on other major infrastructures, e.g., the Astrobiology Institute and the NASA Specialized Centers of Research and Training (NSCORTs), at least once a year. The BPRAC needs to hear about other Institutes that are relevant to biological and physical research. Dr. Carpenter took an action to arrange an integrated presentation on NASA institutes at a future meeting. Ms. Porter noted that the CAS has been getting regular reports on the Commercial Space Centers (CSCs) at its meetings.

OBPR Program Overview

Dr. Eugene Trinh gave the OBPR presentation on behalf of Dr. Kathie Olsen, who was not able to be with the Committee at this meeting. OBPR's fundamental questions involve understanding nature's forces in space and understanding and enabling the human experience in space. Although there is a set of several research platforms, the International Space Station (ISS) remains the primary flight platform. The transfer of the ISS Research Budget management is in progress and early ISS research is ongoing. There were 430 proposals for three NASA Research Announcements (NRAs) in FY 2001; 80 were selected for funding. The goals and challenges for the next year are threefold: to enhance research and technology; to manage the ISS Research Budget to optimize science return; and to fly STS-107. OBPR is undertaking a major re-plan of the research program for the out-years. A total of 12 disciplines are currently being served by the ISS. In light of research budget reductions, there is a need to focus our resources on our priorities. Dr. Trinh noted that Ms. Erickson would be discussing the OBPR budget later in the meeting. Overall, the budget has increased in real terms. OBPR received two of the three new initiatives in the NASA budget—Generations: A Space Biology Initiative; and Radiation Research. Dr. Trinh indicated that these two initiatives would be discussed more thoroughly in later presentations. Dr. Baldwin observed that there are other medical concerns that are in parallel with the radiation risk.

Dr. Trinh showed the statistics on the NRAs in FY 2001. As noted earlier, the selection rate was about 20%; the average award ranged from \$152,000 to \$182,000. Most of the funding was done at the university level. A recent National Academy of Sciences (NAS)/National Research Council (NRC) report has stated that OBPR has created a vigorous and productive program of peer reviewed space research and has built up a unique set of expertise, skills, infrastructure, and facilities. The research community has been strengthened and the peer review process has been widely praised. Fundamental research contributions appear in major research journals and textbooks. The major issue is access to space for timely execution of research. Research missions traditionally have taken a back seat with respect to other priorities in Office of Space Flight (OSF) Shuttle manifest planning. Comments from Mr. O'Keefe, NASA's new Administrator,

support research as being the prime driver for the Space Station. Immediate concerns include: consistent and reliable access to the Space Station; repeated slips to the planned STS-107 mission; cancellation of the previously planned R2 Shuttle mission; and cancellation or postponement of selected flight investigations. For the most part, the cancellations or postponements are being driven by lack of appropriate facilities for the investigations. The actions that OBPR would like to undertake to address the immediate concerns are: to conduct appropriate research on the ISS during the assembly phase; to exploit the available Space Shuttle research opportunities; to maintain adequate support for ground-based research; and to fly STS-107. Dr. Trinh summarized the STS-107 mission and the R2 mission. STS-107 includes biological experiments, crew health and safety research, combustion science, and ISS risk mitigation. STS-107 incurred significant multiple launch date slips and additional costs. Although Congress allocated additional funds, the allocation was not enough to completely fund the mission. NASA canceled work on the R2 mission in October 2001, and applied the remaining funding toward STS-107. In response to a question, Dr. Trinh indicated that STS-107 now appears to be targeted for July. Other near term concerns within OBPR are: the \$1 billion cut to ISS research over five years; the reprioritization of research content (due to reductions in resources); and dependence on the Space Shuttle and Space Station for all flight research. OBPR is pursuing other flight opportunities and platforms and is in the process of reprioritizing the research program for a restructured ISS.

Dr. Trinh showed the ISS Research Program budget for FY 2002 and FY 2003. The FY 2002 Congressional Operating Plan is \$371.2 million. The OBPR has conducted an initial exercise to prioritize research content (programmatically) based on reduced ISS resources. In response to a question, Dr. Trinh indicated that the reprioritization task force will be looking at research priorities based on maximizing science return from the restructured ISS program. Dr. Liskowsky indicated that he would provide an update on the Fundamental Biology restructuring and what that program would be providing to the reprioritization task force. Dr. Borer suggested that the BPRAC reiterate the importance of the Centrifuge Accommodations Module (CAM). Dr. Jessup stated that it is important to understand the mission of the Space Station in order to reprioritize the research program. The mission description and the prioritization aspects have not been articulated; this would drive the need for certain facilities, e.g., the centrifuge. He indicated that the Space Station Utilization Advisory Subcommittee (SSUAS), which met the previous week, had developed a recommendation in this area. The task force will have to develop two options: the limited capability that is consistent with the current ISS resource constraints; and recommendations for relieving that limitation. The ISS Management and Cost Evaluation (IMCE) Committee recommended that NASA establish research priorities, provide the CAM and Centrifuge and make them available earlier than FY08, and establish a research plan that is consistent with the priorities and compliant with the approved budget. The NASA Advisory Council (NAC) agreed with the IMCE Committee recommendations. OMB has directed OBPR to create a \$275 million science "wedge" for FY03-FY07 from the research and technology budget. It also directed OBPR to utilize the external community in the reprioritization activity. The reprioritization task force will be asked to evaluate and validate the high-priority science and technology programs, validate a broadly accepted set of evaluation criteria that OBPR will use to create a research roadmap, and identify currently unavailable ISS research capabilities that will be required to execute the high-priority research programs within the "Core-Complete" and "End State" options. Dr. Jessup noted that the ISS is a platform that can also be used for Earth science and space science applications, and questioned why the task force is only addressing biological and physical research. Dr. Trinh stated that OBPR needs to do this exercise because of the science "wedge" and the constraint on OBPR's research program. The other science organizations do not have a similar constraint and are in no hurry to prioritize their research for the Space Station. They have other reliable platforms. The main issue at this point in time is the research for the pressurized (internal) facility. Dr. Jessup observed that fundamental physics would use some of the external sites and is dependent on the EXPRESS pallet. The SSUAS has identified the EXPRESS pallet as a major issue and has made a recommendation about it. Dr. Trinh added that OBPR has the responsibility for ensuring that all science users are accommodated on the Space Station, but is not responsible for the research content. An OBPR "deputy" in the ISS Program Office will be responsible for ensuring that the user requirements are met. With respect to the task force, the first of a series of at least three workshops will take place in April, aiming for a final report in May and a briefing to the NAC in June. No determination has yet been made on how the funding wedge will be allocated among OBPR programs. These decisions will be based upon the reprioritization exercise. The reprioritization effort will include the entire OBPR budget. Dr. Baldwin directed the Committee's attention

to one of the back-up charts that showed what is currently “in” and what is currently “out” of the ISS Research Program (before the reprioritization effort). Dr. Trinh noted that the “in” list has incorporated some additional items as a result of Congressional direction.

Lunch Presentation

Dr. Mary Musgrave gave a lunch presentation on plants in space—the physiological consequences of microgravity. Dr. Musgrave reviewed the history of food in space and the advantages of growing food from raw materials for long-term space flight. A strong role would be played by plants, particularly seeds. In her presentation, Dr. Musgrave focused on the ability of plants to produce seeds in space and the role of gravity in plant production. Many early Soviet experiments were not successful. From a developmental biology standpoint, seed production is very important. Any one of the processes could be influenced by microgravity. Dr. Musgrave discussed the *Arabidopsis thaliana* experiments in the Plant Growth Unit that flew on several Space Shuttle missions, *Brassica rapa* seed experiments that flew on a subsequent Shuttle mission, and a long-term *Brassica rapa* experiment in a large growth chamber on the Mir station. The latter experiment allowed the comparison of seeds from plants grown on Mir and those grown on the ground, and comparison of a second generation of plants from seeds produced in space. Dr. Musgrave highlighted the significant contribution of crew to these experiments. The BPRAC and Dr. Musgrave discussed several questions related to plant and seed expression upon reintroduction to gravity as well as in microgravity.

OBPR Management Status

Ms. Kristen Erickson reviewed the status of OBPR since the last meeting. Last year, there were a series of reviews related to the President’s Budget Blueprint and the \$1 billion reduction in the research program. In spite of the oversight and intensive review activity, there was considerable research accomplished in flight. The mission statement for OBPR is to lead high-quality research in space. OBPR has been validated and encouraged by the new Administration and by Congress. The Space Station Research Budget was transferred back to OBPR and all of the CSCs are now under this Office. Although there were earmarks, they all came with funding. After the 2002 appropriation process, the Administration validated and confirmed OBPR’s research program, as evidenced by the two new initiatives. This sends a message on the way that the new Administration wants to go. Mr. O’Keefe was instrumental in putting together the President’s Management Agenda and believes that science should drive the mission, not the other way around. He expects OBPR to lead with the science questions and experiments. In addition, he is focused on positive outcome and increased productivity, rather than just investment.

On the workforce front, OBPR is on the way to filling all of its vacancies, and it is about halfway there. OBPR now has a complete business and administrative staff and has received approval to increase the number of “billets” in the organization. In FY02, OBPR has 62 civil service positions in addition to about 15 other (IPA) positions. Several people were transferred to other key positions. The Associate Administrator position is still not filled. Dr. Olsen has been nominated to be the Director for Science in the Office of Science and Technology Policy (OSTP). Until she is confirmed, she will be detailed part-time to OSTP and will be in transition phase. The new NASA Chief Scientist is Dr. Shannon Lucid. Once the Associate Administrator position is filled, other key positions will be filled quickly. Lt. Gen. Charlie Bolden has been nominated to be the Deputy Administrator for NASA.

Ms. Erickson reviewed OBPR’s portion of the FY03 President’s Budget Request. OBPR has restructured the budget along the way that it manages divisionally, i.e., bioastronautics, fundamental space biology, physical science research, and space product development. The current FY02 President’s Budget is \$820 million. This includes institutional support as well as the transfer of the ISS Research Program (research capabilities) funding. Ms. Erickson traced the ISS Research Program budget from FY02 (initial benchmark) to the FY02 Congressional Operating Plan. OBPR was successful in getting an additional \$55 million in the FY02 appropriation process. About \$35 million of this went toward physical research capabilities; \$20 million went toward funding “core” fundamental biology capabilities. This keeps all of the options open through the FY02 transition year. Congress set aside a “wedge” until OBPR goes through the reprioritization process, the results of which are due in August. OMB directed that this wedge be primarily funded out of physical research, space product development, and the NSBRI. Both the NSBRI and the CSCs have periodic reviews. Depending on the outcome of those reviews, there could be some

restoration of funds. The two new initiatives are areas in which the NSBRI does research, and it could have access to some of those dollars. Dr. Jessup observed that the NSBRI received a very positive review at the last meeting. Ms. Erickson indicated that if human research becomes the top priority in the reprioritization process, OBPR will probably reallocate some of the funding. OMB is also looking for OBPR to expand to other platforms in addition to the ISS. Ms. Erickson showed the variety of activities that are ongoing or will be initiated this FY.

ISS Status

Mr. Dan Hedin, Chief of Staff for the ISS Program, reviewed the status of the ISS. He briefly reviewed today's capability. Twelve major elements have been deployed, and ISS science research is underway with five racks in the US laboratory. Thirteen major systems are working across the board. The prime contractor vehicle development activity is about 95% complete. Most of the hardware is at KSC undergoing multi-element integration testing. Russia has completed 6 Progress flights; this will be an overall issue in the years ahead. With four flights a year with Shuttle, the research requirements are only marginally supported. In the outyears, the Office of Space Flight (OSF) is looking at a Shuttle flight rate of more than four flights per year. Payload experiments have run for 50,000 hours, and crews have dedicated 550 payload hours. Fifty-two investigations are either underway or have been completed. Mr. Hedin showed the planned research infrastructure growth through 2005. The Program is on the 4th Expedition crew. Core station capability includes: 20 hours of crew time per week for payload utilization; 3 crew quarters and primary Environmental Control & Life Support (ECLS); 29 racks for stowage; galley (food table warmer) and exercise equipment (treadmill) in the Service Module; four Shuttle and four Progress resupply flights per year; and 2 Soyuz per year. In response to a question, Mr. Hedin indicated that there will be times when the ISS will be challenged to get to 20 hours per week for research. One of the assessments based on four flights shows about 15 hours for crew time for payloads. Dr. Jessup observed that the planning for crew usage does not prioritize science; maintenance is a higher priority and the scheduling for science is problematic. Mr. Hedin indicated that in the 2004-2005 timeframe, there is about 10,000 lbs. backlog of equipment that needs to be put on orbit. In addition to more flights, the Program needs to find ways of doing things in a more efficient manner. This year will see deployment of additional truss elements and solar arrays as well as UF2 (the fifth EXPRESS rack and the Microgravity Glovebox). The most challenging year will be 2003—it will see deployment of the solar arrays and another utilization flight. With respect to the IPs, Japan is having some funding issues; Europe's Columbus Orbiting Facility (COF) will probably be delivered early. Canada is coming to closure on all of its pieces. Russia continues to have funding issues and scheduling uncertainties.

Mr. Hedin reviewed the ICME Task Force findings and recommendations for achieving a credible US core complete program. The status of NASA's actions on these will be briefed to the NAC next week. The Task Force recommended several actions to maximize research. NASA is moving out on many of the recommendations: the science prioritization effort has been initiated; internal and external evaluation teams are in place; teams have been formed to develop cost requirements; the management information requirements are being defined and integrated information systems will be implemented; implementation of the IFMP has been accelerated; and teams have been formed to address the strategies and options with the International Partners (IPs). The IPs will come together next month to have discussions on the near term issues as well as the end state. Near-term funding has been identified to maintain enhancement options, e.g., advanced life support systems, crew return vehicle, and Node 3 for expanded stowage and habitation volume. There is agreement that increased research representation on the Program staff is needed. The Administrator has focused the challenges into the following key areas: management reform, assembly, research prioritization, IP issues, operational issues, and financial management. In response to a question, Mr. Hedin indicated that the Program is looking at tools that would achieve operational efficiencies downstream. Dr. Baldwin highlighted the frustration with getting STS-107 launched and posed the following questions: When will Station be at a point where planning (for science) will be dependable? Will there be a streamlined, efficient way that science can evolve? Mr. Uhran noted that this question has come up in the Payload Operations Study. Everyone cannot do research at the same time, and a modified "campaign mode" has been considered for the assembly phase. The launch vehicle is a very limiting constraint. In response to a question, Mr. Hedin indicated that a six or seven person crew could be enabled by Node 3, additional life support, and a second Soyuz (in the 2007 timeframe).

Division Director Reports

Dr. David Liskowsky gave an update on the Fundamental Space Biology (FSB) Division and provided additional detail related to fundamental space biology issues. Each Division now has a dedicated resources individual. There is an open advertisement for an Intergovernmental Personnel Act (IPA) support scientist. Currently, the Division is about 3-4 people understaffed. Over the summer, the Division finished the solicitation for the 2001 International Life Sciences Research Announcement. Twenty-eight US fundamental space biology proposals were submitted. Thirteen went forward to technical review; six were selected for flight definition. After the definition period, a decision will be made on whether the investigation will go forward for flight. In terms of the ground program, a solicitation was released on the same schedule as last year. Fundamental biology received about 100 proposals. Selection will be made in May, but funding may be deferred until the start of FY03. Some other Program activities are the combined FSB and Cell Science Principal Investigator (PI) Workshop next week in Palo Alto and participation in the Astrobiology Roadmap review. In the President's FY2003 budget submittal, the R&T budget for the FSB Program has been increased due to the addition of funding for the new initiatives. The Generations initiative will investigate the potential for life to transition into space. The planning for this initiative started about two years ago. The central focus is to study the adaptation of organisms to the space environment over multiple generations and the capacity of terrestrial life to evolve in space. It is an extension of what has been done in the biological sciences for the space program. The Generations initiative consists of four major components: scientific research; technology development; multiple platforms (ISS, free-flyers, and bioexplorers); and an aggressive education and outreach program. Dr. Liskowsky provided an update on the ISS restructuring. The Space Station Biological Research Project (SSBRP) is being restructured based on projected costs and available ISS resources (3 crew). There will be an incremental approach, i.e., it will start simple and systems will be added to increase habitat capabilities as ISS resources increase. The core facility of two Habitat Holding Racks, an incubator, a cell culture unit, an insect habitat, software for the NASDA Centrifuge, and the Life Sciences Glovebox has been funded. A "buy-back" of rodent and plant research capability has been proposed. Initial habitats provide early science capability, and are designed to accommodate later enhancements. However, even the initial capability for rodents and plants is dependent on new funding, e.g., allocation from the prioritization "wedge" or augmentation in the FY04 budget. Dr. Liskowsky showed the timeline for approximate delivery dates for flight hardware. OBPR has made a decision to go ahead and build the flight hardware, rather than phase hardware development with the ISS manifest. Dr. Baldwin observed that with the current schedule, there is a disconnect between the animal research and human research. In response to a comment, Dr. Liskowsky indicated that Generations could possibly include research using higher plants and animals, although the main focus is on microbial populations and simple organisms that have a short generation time and can be flown in large numbers.

Dr. Fogleman provided an update on the Bioastronautics Division. After a review of the current Division staffing, Dr. Fogleman discussed the peer review activities. In response to the 2001 International Life Sciences Research Announcement, 25 Bioastronautics research proposals were submitted. Fourteen went forward for technical review; five were selected. The total number of investigators in the flight queue is around 30. The Division has just received proposals on the joint NSBRI/OBPR ground solicitation. Around 150 proposals were received. Funding will not begin until FY03. Proposals for the Advanced Life Support NSCORT were received last October, but funding will slip to FY03. The NSCORT approach may be used to implement the Radiation Initiative. The Advanced Human Support Technology NRA is in preparation; funding will start in FY03. The Division is currently reviewing the schedule for NRAs. Dr. Baldwin observed that the current infrastructure is being impacted by budget constraints at the same time that OBPR is moving forward with new initiatives. Dr. Fogleman indicated that everything in the program is directed toward the top level OBPR goals and objectives. There is a potential expansion of the NSBRI team in the area of radiation. There is a recovery plan for the NSBRI biomedical program and the institute as a whole. In response to a question, Dr. Fogleman stated that it is premature to say what will have priority. Dr. Fogleman highlighted other ground and flight activities. In the last 6 months, two ISS experiments were completed, four ISS experiments were started, and an additional three experiments are ongoing. The HRF Rack 2 is planned to be launched to the ISS in January 2003. The Division's share of the \$31 million reserve that was needed for the ISS Research Capability was \$14.9 million from this year's budget. Awards from recently closed NRAs and the NSCORT were delayed and funds were taken from intramural projects and NSBRI. Dr. Fogleman showed the changes to the NSBRI research budget. In

response to a question, he agreed that the work that NSBRI is doing is on the critical path to the development of countermeasures. He paraphrased the OMB language with respect to the reduction in the NSBRI funding. The Administration directed OBPR to ensure a clear sunset to NSBRI to enable future competition and require outside peer review for any funding above the core level. It directed the NSBRI to satisfactorily address the issues raised in the site visit report and develop a strategic research plan that is peer reviewed and evaluated. Ms. Erickson indicated that OBPR expects to put a strategy in place to have NSBRI grow based on the new initiative money or funds from the science "wedge." There is no intention to reduce or eliminate the NSBRI. Dr. Trinh added that the physical sciences program was also targeted in the recent budget reduction. The BPRAC was very concerned about the reduction in funding for the NSBRI and the impact to biomedical research. Dr. Baldwin cited the positive report on the NSBRI from the external review committee. The Radiation Initiative will be led out of the Division, but it will be an integrated OBPR initiative with significant activities in the other Divisions. The goal is to protect the astronauts from the radiation environment. Dr. Fogleman ended his presentation with a brief update on the status of the Aerospace Medicine and Occupational Health Advisory Subcommittee (AMOHAS). Draft terms of reference for the new Committee have been prepared. This Committee will report to the Chief Health and Medical Officer. It will be collaborate with BPRAC and the corresponding committee in OSF.

Dr. Trinh provided an update on the Physical Sciences Research Division. The NRC Committee for Microgravity Research (CMGR) has issued the first part of an assessment on the Physical Sciences Program. Other new activities include: a joint workshop with the Juvenile Diabetes Research Foundation on encapsulation technology for islets transplantation; a research workshop, co-sponsored with the Society for Physical Regulation in Biology and Medicine; and establishment of the Hauptman-Woodward Institute as an external expert panel for the selection of candidate flight proteins. The first annual Physical Sciences Integrated NRA was released on December 21. Thirteen proposals were received in response to the Cooperative Agreement Notice for the NASA Bioscience and Engineering Institute. Selection is planned for June 2002. The Division is continuing to carry out the flight experiment on colloid physics. Biotechnology research is continuing. The Microgravity Science Glovebox has been delivered to KSC and will be launched in May 2002. It will be available to European investigators. There have been a couple of press releases since October: one on ISS research efforts to study treatments for liver ailments, and one on joint research to develop sensors for health monitoring inside the human body. Dr. Trinh provided a follow-up on the issues that he had brought before the Committee at the last meeting: FY02 funding problems; potential growth in the cost of STS-107; the disposition of decreased flight research and the status of already selected investigators; and the potential limitation of crew size to 3 for a longer term than previously planned. The Division has developed a plan that addresses each of these issues. The Division has put forward a fundable ISS-based research program to accommodate all of the restrictions and reductions. Dr. Trinh reviewed the Division strategy for reduced ISS program implementation. The strategy includes increasing the ground-based research to flight experiment ratio (using a moratorium on flight investigation selection), using resources from the research budget to solve issues in the ISS research budget, restoring the Combustion Integrated Rack into the program, and implementing a "fast-track" technology program to develop next-generation capability for ISS research to emphasize remote operation and automation.

Mr. Mark Uhran provided an update on the Research Integration Division. The field operation at MSFC has been recently reorganized along product segments. Four CSCs have been transferred from the Office of Aerospace Technology. All 17 of the CSCs are now working to the same set of program principles. Mr. Uhran discussed what has been completed on orbit and what is planned. The PI has reported that the Commercial Protein Crystal Growth experiment was a stunning success. There is a robust program for the near term. On sortie flight, Amgen is exploring the use of osteoprotegerin for drug development to combat bone loss. With respect to Space Products Development (SPD) and science discipline collaboration, the Division is going to release an inventory of SPD ISS flight hardware (images and descriptions) on-line at spaceresearch.nasa.gov to inform researchers of available ISS flight hardware. Mr. Uhran showed the budget split between SPD R&T (principally the cooperative agreements with the CSCs) and SPD ISS research capability. OBPR is going to recommend that any reductions be taken against the combined total, not just the SPD R&T. The SPD budget is going from 5% of the OBPR budget to around 3% of the budget. OMB has directed OBPR to put the following in place for all existing and future CSCs: a competitive selection process; regular performance reviews; mechanisms for terminating CSCs if the

reviews are not favorable; and a mandatory sunset provision for CSCs. In reality, all of these things have been done. Dr. Baldwin observed that OMB is not getting its information directly from any of the OBPR Division Directors. OMB's direction appears to be inconsistent with the information that is available and that has been presented to the BPRAC. Mr. Uhran added that a lot of work on the SPD program has been done over the past three years. The only rate-limiting step in the SPD program is reliable access to space flight. The commercial program uses graduate and post-graduate students to build and operate the hardware. The cost leveraging comes through industrial contribution (frequently, equipment and the time of the industrial scientist). The leveraging ratio (cash and in-kind) is about 5 to 1.

ISS Research Planning and Priority Setting

Dr. Mark Lee gave a status report on the preparation of the Biological and Physical Research Maximization and Prioritization (BPRMAP) Task Force. The NAC has requested that OBPR act upon the IMCE Task Force conclusion that scientific research priorities must be established and an executable program, consistent with those priorities, must be developed and implemented. In response to the language in the President's FY03 Budget Submission and the Recommendation of the IMCE Task Force, NASA is assembling an ad-hoc external advisory committee (the BPRMAP Task Force) to assist OBPR in establishing a prioritized program for its entire research portfolio. Dr. Lee reviewed the Task Force charter and the OBPR "guiding principles." The Task Force will be charged to do the following: evaluate and validate the high priority science and technology research programs to be funded by OBPR that will maximize the ISS research potential; validate a broadly accepted set of evaluation criteria that will be used by OBPR to develop a prioritized research roadmap and timetable for the 2005 – 2020 period; and identify currently unavailable ISS research capabilities that will be required to execute the high-priority research programs within the Core Complete and End State options. The Task Force chair and members will be appointed by the Administrator. Dr. Olsen has been asked by Mr. O'Keefe to chair the Task Force. The Task Force will be composed of the leading experts from the stakeholder community in disciplines encompassing the spectrum of OBPR research. The Task Force will report its findings and recommendations to the NAC, which will formally present its recommendations to the NASA Administrator for an Agency response. OBPR will create a prioritized research roadmap and will present the prioritization criteria, the high priority science themes, and the roadmap to the NAS, OMB, and OSTP. The FY03 budget submit will reflect the science research priorities.

Dr. Baldwin expressed concern with the individual(s) being considered for appointment to the Task Force, particularly the Chair. The BPRAC discussed the issue of the Task Force being chaired by a high-level NASA official. Dr. Faeth observed that it is inappropriate for the "replanners" to be the same as the original "planners." This would not be "independent." He felt that a new, fresh view is needed. Dr. Jessup stated that the reprioritization needs to be done within the context of the overall programmatic goals for the ISS. Dr. Faeth felt that the BPRAC should play a role in what goes forward. He suggested that the BPRAC review the output of the Task Force before it goes forward to the NAC. Some of the BPRAC members felt that the Task Force activity is on a very short fuse, and that it should move forward with some members from the Young Committee and other reasonably knowledgeable people, using the general principles formulated by OBPR. Ms. Porter suggested that the BPRAC should look at what would give the program an "A" (by the general public, the university community, and industry) in 10 years. During this discussion, there was not a consensus within the BPRAC on the process as presented by Dr. Lee. Some felt that the Task Force should be functioning in an independent, objective mode. Others felt that there was not enough time to have a completely independent Chair and Task Force. The Young Committee started a clock that is only 24 months long (from December 2001). This evaluation needs to be finished for the budget process. Some BPRAC members felt that the Task Force should be composed of people from the advisory committee as well as outsiders. The BPRAC members all agreed that the Committee should make a formal recommendation on the Task Force and the process. Dr. Jessup noted that the SSUAS had a recommendation that the other science organizations in NASA, i.e., Earth science and space science, should be brought into the reprioritization process. If autonomous payloads will be important for ISS, then attached payloads will be a big issue. Dr. Lee addressed the issue of why this Task Force addresses OBPR only. The Task Force is linked to the development of the OBPR budget and has been requested by OMB and OSTP. About 95% of the OBPR payload is in the ISS pressurized volume; 5% is attached payload. This Task Force will only prioritize ISS resources allocated to OBPR. The other science organizations will integrate their own prioritized research requirements. Dr. Jessup felt that the Task Force should be

expanded to look across all codes that are potential users of the Station. OBPR is the “gate-keeper” of the US users on Station. The activity as currently constructed could disenfranchise non-OBPR users. The BPRAC agreed to discuss the recommendation on the Task Force on the following day. Dr. Baldwin invited comments from members on the OMB direction.

Wednesday, February 20

Non-Governmental Organization (NGO) Status and Planning

Mr. Uhran provided an update on the NGO. The NGO is currently in a competitive-sensitive stage. The Administrator will testify on the Hill on February 27. Shortly thereafter, the information that the OBPR has been working on will come into the public domain. The procurement will be administered by NASA Headquarters. The point of contact in the Office of Procurement is Mr. David Beck. The Website, http://spaceresearch.nasa.gov/research_projects/ngo.html, provides information about all of the internal and external studies, and information about the NGO will be on the Website after the Administrator testifies. NASA will be using a classic procurement process. The Request for Information (RFI) should be released shortly, and a final Request for Proposal (RFP) is anticipated this year, leading to a final selection next year. One of the first key documents is the Implementation Plan, requested by the Hill. It will be provided to Congress shortly after Mr. O’Keefe’s testimony. The next phase an intense series of briefings to the White House, Congressional Staff Offices, advisory bodies, and IPs. The internal team that will be writing the Statement of Work is being formed. The role of NGO is not to do strategic planning for the Space Station; this is a government function. Its activity is principally focused on the tactical, day-to-day management of the program. There are 27 payload sites available on the inside of the Station for US use. There are also 29 sites available on the outside of the Station. The attached sites can be very productive under the current resource constraints. The Administrator is very “pro-NGO” and sees this as an opportunity for a creative, efficient way to manage the Space Station. In response to a question, Mr. Uhran cited the reference model that was developed in 1995. The NGO works as the integrator to bring the distributed projects, the sponsored projects, and the Space Station operator together. The objective is to reduce the number of transactions involved and simplify the system. In some cases, the field Centers are the best performing organizations for the hardware.

OBPR Education and Public Outreach (E/PO) Activities

Ms. Bonnie McClain, Chief of Educational Outreach for OBPR, briefed the BPRAC on the current status and future directions of educational outreach. Last September, there were many great educational outreach activities, but the people were not well connected with each other. OBPR is addressing the priority of first year actions and is improving communications and collaboration among the education and outreach community, within NASA, and with educational organizations. Operational requirements, new directions, and strategies for success are being defined and a demonstration education and outreach “campaign” with STS-107 is being built. Ms. McClain indicated that she is making trips to all of the field Centers and talking with the education and outreach representatives. These people need to be as close to the scientists as possible. There is not a person at every Center, but there is an education and outreach program manager in each of the OBPR Divisions. Each of these people needs to know where all of the science in the Division resides. Funding for the E/PO activities come out of the research budget of each of the Divisions. The OBPR education and outreach office will be extending its reach to non-traditional populations, enhancing the use of e-media, expanding its scope and enriching collaboration, and establishing meaningful assessments. Curriculum support focuses on grades 9-16. Future directions include professional development seminars for teachers. In response to a question, Ms. McClain indicated that OBPR is working with other NASA organizations, e.g., space science and the Space Station program. These relationships need to be nurtured. For example, at public events, exhibits are being “clustered” so that NASA activities are not viewed “piecemeal.” With respect to metrics, the office is beginning discussions with the National Association of Biology Teachers on a “fellows” program to formulate what is needed by those teachers. Assessment will be built in so that the impact can be measured. Each program and project is looking at how to measure impact. For example, students in the Spaceflight and Life Sciences Training Program are tracked.

Mr. John Emond discussed public outreach. He noted that although there is a lot of public fascination about space, there is very little public understanding about what goes on in space and why we have the Space Station. The public outreach goals are to: develop a strategic approach to public outreach efforts; support outreach Website development and other media; foster multi-site, interactive broadcasts that link the technical research community with the public; expand the OBPR newsletter, "Space Research," to include life science, physical science, and commercial research efforts; and explore alternative organizations for public outreach, e.g., public library associations and sports organizations. Mr. Emond cited some examples of public outreach activities (conferences and special events). STS-107 represents a major flight opportunity for public outreach and outreach plans are in various stages of development. The outreach goal is to enable the public to understand what we are doing, why it is taking place, and how the research makes a difference in the lives of people. Dr. Baldwin noted that NASA needs to target and get a greater recognition by the major scientific societies, e.g., the Federation of American Scientists in Experimental Biology (FASEB). The "message" needs to be taken to other broad groups, e.g., the American College of Physicians. Dr. Jessep observed that the question is how the Enterprise will continue to project itself, i.e., ensure follow-up. Mr. Porter noted that the biggest "bang for the buck" is in middle school. Ms. McClain stated that OBPR will continue to aggressively support middle school, but will also focus on high school because that is where career choices can be influenced. The BPRAC was encouraged by the direction being taken by OBPR's E/PO activity.

Dr. Gerald Pitalo discussed the education and outreach proposal for OBPR NRAs. PIs have always been encouraged to develop educational outreach programs. This has worked very well in the graduate arena; OBPR would like to step into the arena of grades 6-12. The current thinking of having scientists talk directly to younger students has become a rich area of activity. Dr. Pitalo discussed a pilot program, which will be implemented through OBPR NRAs. Once NRA selections are made, the selected PIs will have an opportunity to propose for additional funding to implement an education outreach program at the 6-12 level (not to exceed \$5000 per year for the term of the grant). A review of these proposals by educational specialists will determine which proposals will be funded. For the first year, 10 pilots will be selected. Dr. Pitalo invited BPRAC comments. The BPRAC applauded this idea and supported OBPR's approach. The Committee suggested that a "desired outcome" and metrics be included in the program. More guidance to PIs would be helpful. Ms. McClain invited feedback on some of the outreach materials that she distributed at the meeting.

Research Integration in the Physical Sciences Program

Dr. Trinh discussed research integration in the Physical Sciences Program. This is a new approach that sets a priority on integrated research rather than a discipline-oriented emphasis. The research goals are grouped into three major thrusts with integrated contributions from individual scientific and engineering disciplines. A major effort has also been expanded to design a research program that would more closely align with the Biological and Biomedical research programs within the OBPR. The three major thrusts are: basic research targeting human space exploration goals; fundamental research enabled by the microgravity environment; and microgravity research in support of Earth-based applications. A Bioscience and Engineering Program would bring the three thrusts together and link with the Bioastronautics and Fundamental Biology Programs. Dr. Baldwin noted that there is a nationwide movement to expand medicine and engineering into "bioengineering" and suggested that OBPR consider calling the program by that name. The word "engineering" is being used in biology in connection with engineering cells. Dr. Faeth felt that biosciences is a good word to use because it tracks more with biophysics and biochemistry. Dr. Trinh indicated that his Division is laying the groundwork for the Bioscience and Engineering Program as a new initiative. He provided some examples as an illustration of the content. The BPRAC was pleased with the integration approach and encouraged "fine tuning" it.

Review of Issues, Findings, and Recommendations

The Committee discussed draft findings and recommendations on the following topics: the Biological and Physical Research Maximization and Prioritization (BPRMAP) Task Force, the ISS mission statement, sponsorship and public relations, the IMCE Report, leadership for Code U, OBPR interface with operational medicine, the SPD Budget, the NSBRI Budget, interaction Between OBPR and OMB, and E/PO. The first five of these will be taken to the NAC; the remainder are for action within OBPR.

The final recommendations are included in Appendix D.

The next BPRAC meeting is scheduled for June 20-21, 2002. Subcommittees will meet the day before (June 19). Dr. Carpenter will coordinate with the BPRAC members regarding possible meeting dates in the fall. Dr. Baldwin adjourned the meeting at 11:30 a.m.

AGENDA**BIOLOGICAL AND PHYSICAL RESEARCH ADVISORY COMMITTEE MEETING****American Management Association****440 First Street, NW****Washington, DC****February 19-20, 2002****TUESDAY – February 19**

10:00 A.M.	Welcome/Chair's Review of Agenda/Logistics	Dr. Baldwin
10:10 A.M.	Review of BPRAC Recommendations	Dr. Carpenter
10:30 A.M.	OBPR Program Overview	Dr. Olsen
11:30 A.M.	OBPR Management Status	Ms. Erickson
12:00 P.M.	Lunch/Presentation – Plants in Space: Physiological Consequences of Microgravity	Dr. Musgrave
1:00 P.M.	ISS Status	Mr. Hedin
2:00 P.M.	Division Directors' Reports	
	Fundamental Space Biology	Dr. Liskowsky
	Bioastronautics Research	Dr. Fogleman
	Physical Sciences	Dr. Trinh
	Space Products	Mr. Uhran
4:00 P.M.	ISS Research Planning and Priority Setting	Dr. Lee
5:45 P.M.	Summary of First Day	Dr. Baldwin
6:00 P.M.	Adjourn	
7:30 P.M.	Dinner Opportunity	

WEDNESDAY – February 20, 2002

8:00 A.M.	NGO Status and Planning	Mr. Uhran
8:45 A.M.	Integration of Biological and Physical Research	Dr. Trinh
9:30 A.M.	OBPR Education and Outreach Activities	Ms. McClain
	Education and Outreach Policy in Sponsored Projects	Mr. Emond
		Dr. Pitalo
11:00 A.M.	Review of Issues, Findings, and Recommendations	Dr. Baldwin
12:00 P.M.	Adjourn	

BIOLOGICAL AND PHYSICAL RESEARCH ADVISORY COMMITTEE (BPRAC)

February 2002

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**BIOLOGICAL AND PHYSICAL RESEARCH ADVISORY COMMITTEE
Washington, DC
February 19-20, 2002**

MEETING ATTENDEES

Committee Members:

Baldwin, Kenneth M. (Chair)	University of California, Irvine
Bigelow, Nicholas	University of Rochester
Borer, Jeffrey	Cornell University Center
Bula, Raymond	[not affiliated]
Carpenter, Bradley (Executive Secretary)	NASA Headquarters
Daley, Thomas J.	Philadelphia Naval Business Center
Faeth, Gerard M.	University of Michigan
Freeman, Colette	National Cancer Institute
Gross, Leroay P.	Intel Med, Inc.
Harris, Bernard A.	The Harris Foundation
Hill, Walter A.	Tuskegee University
Jessup, J. Milburn "Kim"	Georgetown University Medical Center
Musgrave, Mary	University of Massachusetts
Porter, Elsa A.	Meridian International Institute
Russel, William Bailey	Princeton University
Sanders, Jay	The Global Telemedicine Group

NASA Attendees:

Barnes, Charlie	NASA Headquarters
Chambers, Larry	NASA Headquarters
Clinton, R. G., Jr.	NASA Headquarters
Crouch, Roger	NASA Headquarters
Emond, John	NASA Headquarters
Erickson, Kristen	NASA Headquarters
Folgeman, Guy	NASA Headquarters
Gardner, Rebecca	NASA Headquarters
Hartman, Terry	NASA Headquarters
Kamor, Shari	NASA Headquarters
King, Merrill	NASA Headquarters
Larson, Dave	NASA Headquarters
Lee, Mark	NASA Headquarters
Liskowsky, David	NASA Headquarters
Livingston, Candace	NASA Headquarters
McClain, Bonnie	NASA Headquarters
Ostrach, Louis	NASA Headquarters
Pitalo, Gerald	NASA Headquarters
Schneider, Victor	NASA Headquarters
Shepanek, Marc	NASA Headquarters
Tomko, David	NASA Headquarters
Trinh, Gene	NASA Headquarters
Uhran, Mark	NASA Headquarters
Wargo, Michael	NASA Headquarters
Williams, Rich	NASA Headquarters

Other Attendees:

Austin, Larry
Dooling, Dave
Gabno, Ed
Guastafarro, Carl
Leveton, Lauren

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Infinity Technology
[not affiliated]
Indyne
USRA

**BIOLOGICAL AND PHYSICAL RESEARCH ADVISORY COMMITTEE
Washington, DC
February 19-20, 2002**

FINDINGS AND RECOMMENDATIONS

Biological and Physical Research Maximization and Prioritization (BPRMAP) Task Force [to the NAC]

Finding: The BPRAC applauds the creation of the Biological and Physical Research Maximization and Prioritization (BPRMAP) Task Force. We have concerns, however, about the composition of the task force and the time allowed for its deliberations. It is imperative that the task force receive detailed and unconstrained advice, from NASA employees, grantees, or others appearing before it, and that the scientific community outside view the process as fair and impartial.

Recommendations:

- We urge NASA to appoint as chair of the committee a scientist of considerable stature, with neither current nor past ties of any significance with NASA.
- We recommend that the schedule for the task force allow ample time for presentations delineating the past and present research program of OBPR and plans for the future.
- We recommend that the directors of the individual programs, who have the expertise and perspective, provide the task force an informed and objective view of the situation that includes their priorities and their R&D investment criteria.
- We recommend that the task force membership include reasonably balanced representation of technical areas, both past and present, associated with OBPR research.
- We recommend that this Task Force should be encouraged to develop and recommend its own priorities across all activities in OBPR that will utilize the ISS platform.

ISS Mission Statement [to the NAC]

Finding: The shift of ISS research capability funding to OBPR highlights the fact that fiscal constraints continue to erode and modify the capability to do research on ISS. This draws attention to the need to define the mission of ISS. The currently planned research programs are constrained, for example by the current amount of available crew time and upmass capability. There are investigations that require minimal crew time. Thus we conclude that the success of reprioritization of science depends on the establishment of a clear mission statement for the ISS. Such a mission could include:

- human presence, which involves the study and enablement of humans in space;
- Earth applications, which involve the study of the role of gravity in biological and physical processes;
- and
- space-based observations, which include Earth and space sciences.

These three focus areas provide a balanced research effort that goes beyond the recommendations of the IMCE report.

Recommendation: The BRPAC recommends that NASA clearly articulate the overall mission of the ISS. We suggest that this mission statement include a balance of human presence, Earth applications, and space-based observations. Furthermore, the statement of this mission should define the relative priorities among these elements and develop a phased 10-year plan for science on ISS with particular attention to short-term implementation. We suggest that this be part of the BPRMAP task force effort.

Sponsorship and Public Relations [to the NAC]

Finding: NASA is considering the establishment of a sponsorship program to 1) increase public awareness, and 2) control the use of NASA's image. We conclude that commercial sponsorship could benefit NASA from both a resources and a public relations standpoint. However, the Subcommittee feels that this may come at a cost to NASA's reputation and public image.

Recommendation:

NASA should carefully consider the implications of sponsorship as well as explore other means, independent of sponsorship, by which it can publicize its incredible recent achievements in engineering and research, the dedication and abilities of its staff, and its futuristic objectives and goals.

IMCE Report [to the NAC]

Finding: The IMCE recommends that consolidation of contracts to reduce workload and duplication of effort. Consolidation of contracts has the unintended consequence of reducing contract opportunities for small business, many with innovations beneficial to NASA. This process could impede compliance with the Administration's stated goals of fostering small business growth and opportunities.

Recommendation: The BPRAC recommends caution in proceeding with this initiative in order to avoid outcomes that will negatively impact innovation, creativity, and cost/effectiveness.

Leadership for Code U [to the NAC]

Finding: The re-engineering of Code U has been in process for almost two years and is undergirded by a staff of "acting leaders." The ability of Code U to carry out its roles and responsibilities is significantly compromised by a lack of permanent leadership in a dynamic environment of change for NASA. Notwithstanding these handicaps, the committee applauds the performance of the cast of Acting Directors and subordinates who have a great deal of responsibility without real authority.

Recommendation: The BPRAC restates its previous recommendation to recruit and hire permanent leadership for Code U as soon as possible. Failure to do so will compromise mission accomplishment of this valuable national resource.

OBPR Interface with Operational Medicine [OBPR]

Finding: There are informal routine communications and interactions between the Bioastronautics Research Division, the Chief Health and Medical Officer, and the Office of Space Flight Deputy Associate Administrator for Crew Health and Safety. The committee encourages and applauds these efforts.

Recommendation: The BPRAC requests a briefing on these trilateral initiatives that are directed toward improving the health and safety of air crew members. We would also like to review the proposed NASA directive that formally enshrines the process and procedures of these collaborative efforts.

Space Product Development (SPD) Budget [to OBPR]

Finding: The President's five-year budget request for OBPR currently indicates a reduction of support for SPD from the current \$16.7 million in FY02 to \$5.0 million in FY07. This represents a reduction of over 50% for a productive cooperative program involving industry, academia, and NASA.

Recommendation: The committee recommends that efforts be made to restore the funding level during the out years to that shown in FY02.

National Space Biomedical Research Institute (NSBRI) Budget [to OBPR]

Finding: The President's five-year budget request for OBPR currently indicates a reduction of support for NSBRI from the current \$23 million in FY02 to \$10.0 million in FY07. This represents a reduction of over 50% for a productive cooperative program involving industry, academia, and NASA.

Recommendation: The committee recommends that efforts be made to restore the funding level during the out years to that shown in FY02 President's Budget and reconsider the sunset limitation.

Interaction Between OBPR and OMB [to OBPR]

Finding: The BPRAC senses that there may not be adequate interaction between OBPR and OMB.

Recommendation: We encourage OBPR to invite members of OMB to attend the committee deliberations in order to enhance their understanding of science briefings.

Education and Public Outreach [to OBPR]

Finding: The BPRAC commends OBPR for selection of the OBPR Education and Public Outreach (E/PO) Leadership Team, defining the E/PO mission based on its unique space research program, and the initiation of a systematic E/PO program. We support the location of the E/PO programs in the science directorates at the NASA Centers, the engagement of Principal Investigators, other agencies and external organizations, and the extension of activities to varied audiences. We encourage careful and creative incorporation of appropriate approaches for measuring program impacts. We are concerned that the proposed level of funding for the proposed OBPR NRA supplemental E/PO grants (\$5 K per grant) is too small.

Recommendations: The funding level for the proposed OBPR NRA supplemental E/PO grants be reconsidered and that scientists and educators be involved in the NRA development to ensure a optimum response from the targeted community. BPRAC receive regular updates on successes, opportunities, and challenges.

**BIOLOGICAL AND PHYSICAL RESEARCH ADVISORY COMMITTEE
Washington, DC
February 19-20, 2002**

LIST OF PRESENTATION MATERIAL¹

- 1) Report to the Biological and Physical Research Advisory Committee [Carpenter]
- 2) Presentation to the Biological and Physical Research Advisory Committee [Olsen]
- 3) ISS Status Briefing to the Biological and Physical Research Advisory Committee [Hedin]
- 4) Fundamental Space Biology Division Update [Liskowsky]
- 5) Bioastronautics Research Division Update [Fogleman]
- 6) Physical Sciences Research Division Update [Trinh]
- 7) Space Product Development Report to the Biological and Physical Research Advisory Committee [Uhran]
- 8) Status Report on Preparation of Biological and Physical Research Maximization and Prioritization Task Force [Lee]
- 9) Status of Non-Governmental Organization to Manage ISS Utilization [Uhran]
- 10) Research Integration in the Physical Sciences Program [Trinh]
- 11) Educational Outreach Briefing: Current Status and Future Directions [McClain]
- 12) OBPR Public Outreach [Emond]

¹ Presentation and other materials distributed at the meeting are on file at NASA Headquarters, Code U, Washington, DC 20546.