OBPR Near Term ISS Research Priority Definitions (2002-2006)

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OBPR

Office of Biological & Physical Research

1. Crew Health and Safety (mission-driven): Biomedical Research is a cross discipline, cross divisional effort focused on increasing safety, ensuring health of astronauts and reducing risks associated with long duration space flight. The knowledge gained through this research will be applied for public health benefits. It will cover research in radiation health, bone and muscle loss in space, psycho-social issues in extreme environments, cardiovascular deconditioning, neurovestibular adaptation, and advanced technology for medical care and human support in space. Research will investigate basic mechanisms for changes in human physiology in space, development of models for human physiology, and human experimentation which will culminate with the validation of technologies and techniques for operational use. The Biomedical Research will be carried out through a combination of ground and space based research.

2. Biotechnology Research (application-driven): The Biotechnology program is a cross-disciplinary, cross-divisional effort involving fundamental and applied research. The low gravity environment of low-Earth orbit allows advanced research in many areas of Biotechnology with potential for significant impact on Earth-based applications. In the general category of Biotechnology are included research areas such as *Cellular and Molecular Biology, Structural Biology, Genomics and Proteomics, and Biomolecular Physics and Chemistry*. Such disciplines can be effectively addressed by using a focused approach using gravity effects as revealing tools to probe aspects of physical, chemical, and biological processes not reachable at 1 G. In the more applied arena, *Tissue Engineering, Biomaterials, Biofluid dynamics and Microfluidics applications to biomedical research, Pharmaceuticals* development, and *agricultural and food biotechnology* are specific sub-disciplines that can directly benefit from on-orbit research.

3. Fundamental Research: The long duration exposure to the space environment afforded by ISS provides a unique opportunity for conducting fundamental biological, physical, chemical, and engineering research. A high priority within the NASA research program will be to address scientific, technological, and industrial challenges on Earth. Previous results of low-gravity research have shown that significant advances in technological and biological processes will be achieved when ISS-based research facilities are implemented. Ground-breaking advances in *atomic physics, evolutionary, developmental, and integrative biology, combustion, materials science, and engineering* will impact the development of future technologies such as atom lasers, advanced composite materials for defense and civilian applications, biomedical research, and energy production. The effective exploitation of the low-gravity environment will require the use of dedicated and technically capable research facilities that expand beyond the scope on small sub-rack level payloads. This fundamental research is also crucial to achieving NASA's mission goals.

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