Our Mission

NASA’s success in human space exploration, an endeavor spanning more than 50 years, can be credited to the national ability to surmount a wide range of complex and difficult biomedical, physical science, and engineering-related challenges. NASA’s historical achievements have been possible because of its strong and productive commitments to microgravity research (space life and physical science) supporting human space exploration, and utilization of this new knowledge for Earth-based applications, as well.

Under NASA’s stewardship, microgravity research continues to enable both exploration and discovery-based research in our federal, academic, and private laboratories. The International Space Station (ISS) National Laboratory, which encompasses the entire U.S. segment of the ISS, is managed jointly by NASA and the Center for the Advancement of Science in Space (CASIS). The ISS is now available for research and habitation at least through 2024, which creates a precious, time-limited opportunity to advance the contributions of U.S. space life and physical sciences to take advantage of this research platform. However, there are challenges maximizing the use of the laboratory. Maintaining sufficient funding, frequent and low cost access to the ISS, and crew time adequate to conduct the research are the most urgent drivers to take advantage of this major investment. The outcomes from space life and physical sciences research are essential to both enable execution of space exploration missions and help facilitate research pathways that have high value applications on Earth.

NASA has long been the steward of research in the spaceflight environment, and continues to expand our knowledge in life and physical sciences. Recently, the NIH and NSF have joined this research enterprise through utilization of the ISS. It is imperative that strategic decisions do not lessen the overall national investment in this research enterprise, which supports:

- Space exploration and commercialization
- Development of new materials
- Sustainable food production
- Ecosystem restoration
- Improvements in human health
- High-tech innovation

Government funding in R&D is a key investment in the nation’s long-term interests and future. It is essential to support early-stage research and technology development that will mature into new innovations and markets. The transition (or tipping) point from public funding to private funding in R&D is very dynamic. The public-private partnerships now being implemented promise a flexible path forward in this arena. Maintaining a balance between discovery-based research and more direct technology “pull” is key to this success.

Strategic policy is also needed to clarify how the research enterprise fits in the context of the national science and innovation agenda. Terrestrial benefits make the nation’s space research portfolio an increasingly relevant piece of this conversation, both within NASA and other Government agencies. Continuing to fund a balance of research that both enables exploration and is enabled by exploration, as called out by the National Academies’ Decadal Survey on Biological and Physical Sciences in Space, is vital.

ISS Research

Space research is a continuum of efforts that extends from laboratories and analog environments on the ground, through other low-gravity platforms like parabolic aircraft and suborbital rockets, and into extended-duration spaceflight. Research on the ISS is a component of this continuum, and the capabilities it provides are essential to addressing many of the most important research questions identified by the National Academies.

For example:
• Long duration studies with animals, e.g. 3-6 months or more, are examining how the musculoskeletal system changes over time in microgravity, as well as the impact of long duration flights on the immune system. Both of these areas have direct ties to more terrestrial research in aging and human health.
• Fundamental physical science research in heat and mass transfer is helping to determine the role of gravity in multi-phase flow systems critical to life support system design. Together with understanding the effects of the spaceflight environment on plants and microbes, this not only supports design of future exploration systems, but also informs studies on healthy buildings here on Earth.

Unfortunately, current NASA prioritization for ISS crew time has relegated Decadal research activities like those above to the lowest priority, decimating space life and physical sciences flight research. Another ISS crewmember will add overall crew time however; the current prioritization still leaves space life and physical sciences research at the lowest priority. Attention is needed to ensure the remaining ISS lifetime is being used to answer these questions for which it is uniquely suited.

NASA’s Space Life and Physical Sciences (SLPS) Division research budget is embedded within the same ISS Research line item that bears significant costs for the operation of on-orbit research facilities. This operational budget pressure leaves a SLPS program that cannot support sufficient extramural grants to ensure a stable community of scientists and engineers prepared to lead future space exploration research.

<table>
<thead>
<tr>
<th>ISS Research budget ($M)</th>
<th>FY17 (CR based on FY16) (Millions)</th>
<th>FY18</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Space Life and Physical Sciences (SLPS) Division Budget SLPS Academic Research (grants)</td>
<td>$75.0</td>
<td>similar to FY17</td>
</tr>
<tr>
<td>2. Multi User Support Systems (MUSS)¹</td>
<td>$22.5</td>
<td></td>
</tr>
<tr>
<td>3. Center for the Advancement of Science in Space (CASIS)</td>
<td>$259.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$15.0</td>
<td></td>
</tr>
</tbody>
</table>

¹ MUSS provides strategic, tactical, and operational support to all NASA sponsored and non-NASA sponsored payloads, including the five international partners’ research payloads. This includes maintenance and operation of the ISS research infrastructure.

RECOMMENDED ACTIONS:
1) Request NASA to report to Congress an estimation of exploration driven, discovery based, commercial and OGA research and development activities and the respective resource allocations (e.g. crew time) on the ISS from now through 2024. Identify a transparent framework to select projects of the highest overall national value for execution on the ISS.

2) Provide direction to develop key strategic national policy that clearly identifies how space life and physical sciences research fits in the context of the national science and innovation agenda, including input from both NASA and other relevant government agencies (e.g., NIH, NSF, DARPA, etc.)

3) Maintain or accelerate research funding levels with federal agencies that are utilizing the ISS for research. Acceleration of federal research funding or increase in seed grant funding will propagate into the U.S. ecosystem of scientific breakthroughs and innovation.

4) Develop a strategy for continuation of a space-based National Laboratory beyond the functional or programmatic life of the ISS, including a pathway for federally funded researchers to utilize commercially provided space research platforms.

About the Organization
The American Society for Gravitational and Space Research (ASGSR), founded in 1984, provides a forum to foster research, education and professional development in the multidisciplinary fields of gravitational research. ASGSR brings together a diverse group of scientists, engineers and students from academia, government and industry to promote research, education, training and development in the areas of Space Life and Physical Sciences research. The knowledge gained leads to a better understanding of the effects of gravity on living and physical systems on Earth and enables human space exploration.

www.asgsr.org