



# BIOLOGICAL AND PHYSICAL SCIENCES DIVISION

## Science Mission Directorate

### REVOLUTIONARY RESEARCH IN EXTRAORDINARY PLACES

Conducting experiments in the extreme conditions of space enables researchers to study biological and physical phenomenon in ways not possible on Earth — expanding scientific knowledge for the benefit of all. This research has contributed to many advancements on Earth: agricultural innovations, medical treatments, greener combustion engines, new technologies, consumer products, and more. And it's also led to commercial patents and spin-off companies that impact our everyday lives.

### ADVANCING U.S. SCIENCE LEADERSHIP

The mission of NASA's Biological and Physical Sciences Division (BPS) is to lead the world in fundamental space-based research, pioneer transformational discoveries, enable sustained human space exploration, and improve life on Earth and in space.

#### BPS administers NASA's:

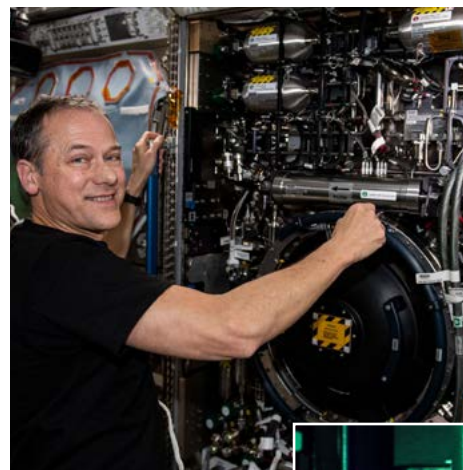
- Space Biology Program, which uses the space environment to advance our knowledge of how gravity, radiation, and other spaceflight stressors affect living organisms.
- Physical Sciences Program, which uses the space environment as a tool to understand how systems, such as combustion, fluids, and materials respond to spaceflight.
- Fundamental Physics Program, which advances our understanding of physical laws, nature's organizing principles, and how these laws and principles can be manipulated.
- Commercially Enabled Rapid Space Science program (CERISS), which aims to develop transformative research capabilities with commercial space industry to dramatically increase the pace of research.



Astronaut Kjell Lindgren sampling greens grow on the International Space Station.



Plant Habitat aboard the space station.



NASA astronaut Thomas Marshburn configures the Combustion Integrated Rack (CIR) aboard the space station in microgravity.



The Solid Fuel Ignition and Extinction (SoFIE) experiment.

## BPS'S GOALS FOR THRIVING IN SPACE

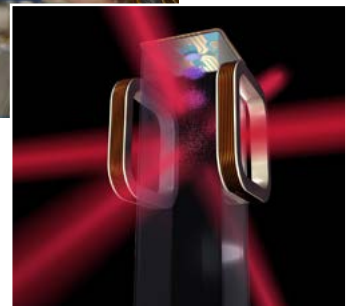
BPS's research priorities are guided by Decadal Surveys issued by the National Academies of Sciences, Engineering, and Medicine. The 2023-2032 Decadal for Biological and Physical Sciences Research in Space outlined the key science questions and recommendations for the next decade.

BPS's strategic response to addressing Decadal priorities include five key goals:

- **Precision Health:** Leveraging space to unlock the secrets of aging and disease
- **Space Crops:** Boldly growing where no one has grown before
- **Quantum Leaps:** Unraveling mysteries of the universe
- **Foundations:** Revealing the novel behaviors of fluids, flames, and materials in space
- **Space Labs:** Accelerating the pace and productivity of research



*Astronaut Christina Koch unloads new hardware for the Cold Atom Lab aboard the International Space Station.*

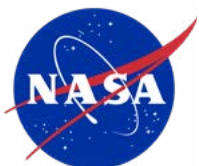


*Artist concept of a magneto-optical trap and atom chip used by NASA Cold Atom Laboratory aboard the International Space Station.*

## ACCOMPLISHMENTS

NASA-funded research has contributed to many scientific advancements, including:

- Advancing cancer and disease research through fundamental experiments and joint solicitations with ISS National Lab and other government agencies.
- Supporting the first NASA-funded researcher to tend to his experiment via a commercial suborbital flight.
- Agricultural advancements on Earth, such as contributing to hydroponic farming and LED grow lights.
- A cooling technique created for use in space that also makes charging electric cars on Earth quicker and easier.
- Informing improvements to software utilized by Space-X and other commercial companies, which can help reduce the risks and costs associated with storing cryogenic propellants.
- Gathering soft matter colloids data that was fundamental to the development of new consumer products, resulting in five patents.
- Pioneering quantum discovery, including producing the first dual-species Bose-Einstein Condensates in space, the first dual-species atom interferometers in space, and demonstrating the first 'ultra-cool' quantum sensor for the first time in space.



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