WHY ASTROPHYSICS?

How did our universe begin and evolve?

How did galaxies, stars, and planets come to be?

Are we alone?

Enduring National Strategic Drivers

Astrophysics is humankind’s scientific endeavor to understand the universe and our place in it.
<table>
<thead>
<tr>
<th>RADIO/SUBMILLIMETER</th>
<th>INFRARED</th>
<th>NEAR-INFRARED/VISIBLE/ULTRAVIOLET</th>
<th>X-RAY</th>
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<th>PARTICLE</th>
<th>GRAVITATIONAL WAVES</th>
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<td>SOFIA</td>
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<td>2 sounding rocket payloads</td>
<td>2 Pioneers smallsats</td>
<td>6 balloon payloads</td>
<td>2 rocket payloads</td>
<td>3 cubesats</td>
<td>1 Pioneers balloon</td>
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BPS Mission

Pioneer Scientific Discovery

- Proactively seek out new ways to expand fundamental scientific knowledge
- Provide expertise and support to others seeking to utilize space

Enable Sustainable Exploration

- Anticipate and investigate critical areas for scientific knowledge and technology development
- Deliver results to other NASA organizations and industry
Major BPS Disciplines

• Pioneer Scientific Discovery
  – Quantum Science
    • Cold atoms
  – Thriving In Deep Space (TIDES)
    • Animal biology
    • Plant biology
    • Microbiology

• Enable Sustainable Exploration
  – Fluid Physics
    • Cryogenic Fuel Management
  – Combustion
    • Solids, liquids, gases
  – Materials Science
    • In situ resource utilization
    • Additive manufacturing
Examples of BPS Research Platforms

- CubeSat
- International Space Station
- Free Flyers (BION)
- Lunar Gateway
- Commercial Lunar Lander Services
- Drop Tower
- Parabolic Flight
- Sounding Rocket Sub-orbital Vehicle
- Electrostatic Levitator
- Human Landing System
- Rodent Unloading
- Centrifuge
- Balloon Flight
- NASA Space Radiation Lab
- NASA Isolation Chamber
- NSF Polar Station
- Russian Isolation Chamber
- Gravity Vector Averaging
- Physical Sciences Informatics
- GeneLab
HELIOPHYSICS SYSTEM OBSERVATORY

- 20 Operating Missions with 27 Spacecraft
- 14 Missions in Formulation or Implementation
- 1 Under Study

CubeSats

In Development
- AEPEX
- AERO / VISTA
- CIRBE
- CURIE
- CuSP
- Dione
- GTOSat
- ICOVEX
- LAICE
- LLITED
- CubIXSS
- petisSat
- SunCET
- DYNAGLO
- REAL
- WindCube

On Orbit
- ELFIN
- SORTIE
- CuPID
- DAILI

Hosted Payloads

In Development
- CODEX
- LARADO
- MinXSS-3
- OWLS
- STORIE

Operational Microwave Imager (OMI)
- AWE (ISS)
- THEMIS
- SunRISE (6)
- TRACERS (2)
- THEMIS-Artemis (2)
- IBEX
- HERMES (Gateway)
- EUVST (JAXA)
- Rad (ISS)
- THEMIS (3)
- MMS (4)
- ACE
- MME (ISS)
- AIM
- IBEX
- Rad (ISS)
- THEMIS (3)
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- THEMIS
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OPERATING & FUTURE
The Sun Wakes Up: Solar Cycle 25 Is Here

December 2019 marked the beginning of Solar Cycle 25, and the Sun’s activity will once again ramp up until solar maximum, predicted for 2025.

This new solar cycle, and anticipated increase in space weather events, will impact our lives and technology on Earth, as well as astronauts in space.

This is the first solar cycle that many new commercial and government stakeholders will navigate.
Heliophysics Big Year

What is the Heliophysics Big Year?
Ties together three major Heliophysics events in 2023-2025 (2 solar eclipses, solar maximum) to maximize participation in a coordinated incentivized citizen science campaign.

- NASA is developing a program to use these remarkable events to highlight and motivate solar system science
  - Two Solar Eclipses cross N. America (14 Oct 2023 and 8 April 2024)
  - The rising phase of the Solar Cycle 25 with Solar Maximum predicted to occur in 2025

- Look out for opportunities to be part of our Big Year
  https://science.nasa.gov/heliophysics/programs/citizen-science

Helio's Big Year is an opportunity to reach a new generation for Heliophysics.

What is a “Big Year”? A big year is a birding term for maximizing a birder’s number of species.
Advancing Earth System Science End-to-End
NASA Earth Observing Fleet

August 2021

NASA Scientific Visualization Studio
svs.gsfc.nasa.gov/4931
NASA Earth Science Guiding Documents

- USGCRP Updated Research Plan (2017)
- US National Climate Assessment (V1, 2017)
- Arctic Research Plan (2022)
- Earth System Predictability (2020)
- US National Climate Assessment (V2, 2018)
- Ocean Science and Tech. (2022)
- IPCC AR6 Climate Change Assessments (2021-22)
- NASEM Decadal Survey for Earth Science (2018)
- IPCC AR6 Climate Change Assessments (2021-22)