National Aeronautics and Space Administration

BPS Update

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Biological and Physical Sciences Division
NASA's Science Mission Directorate

April 2, 2025

BPS

Biological & **P**hysical **S**ciences

Updates & Awards

Personnel Updates (1/2)

Thank You For Your Service to the Biological and Physical Sciences Division!

Brad Carpenter
Program Scientist,
Physical Sciences

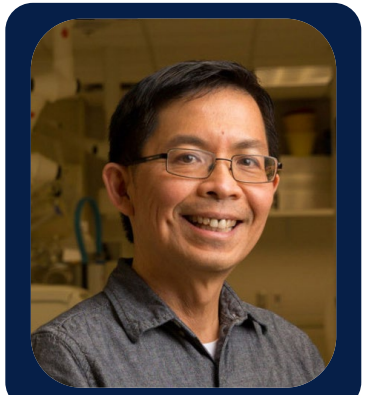
Mike Robinson
Program Scientist,
Fundamental Physics

DeVon Griffin
Program Executive,
Fundamental Physics

Sylvain Costes
BPS Data Officer

Personnel Updates (2/2)

New Roles and New Team Members – *We're building a team that aligns with Decadal objectives, can execute on BPS Goals, and deliver on the NASA mission.*



Elison Blancaflor
Program Scientist, Space Crops

Pioneering scientific discovery related to crop research in space.

Haley Fauntleroy
Commercial Partnerships Lead

Engaging emerging commercial space companies to ensure that BPS science needs are met.

Samrawit Gebre
BPS Data Officer

Enabling the BPS research community to use existing data for improved experiment design.

Dan Walsh
Acting Program Executive, Fundamental Physics

Facilitating knowledge transfer among space-based fundamental physics researchers.

Jennifer Fogarty
Program Scientist, Translational Research

Strengthening the science exchange with Human Research Program (HRP).

Sarah Hemmings
Road Map Lead

Organizing long-term BPS objectives and scientific goals informed by the Decadal Survey.

Congratulations PECASE Winners!

- PECASE (Presidential Early Career Award for Scientists and Engineers)
- **Highest honor** bestowed by the U.S. government on **outstanding scientists and engineers early in their careers**.
  - Recognizes innovative and far-reaching developments in science and technology,
  - Expands awareness of careers in science and engineering,
  - Recognizes the scientific missions of participating agencies,
  - Enhances connections between research and impacts on society, and
  - Highlights the importance of science and technology for our nation's future.

Elizabeth Blaber, Ames Research Center

Egle Cekanaviciute, Ames Research Center

Awards and Solicitations

- **$5 M Total Awarded for Consortia in Biological Sciences** (Oct. 2024)
  - *Biology in Space: Establishing Networks for DUrable & REsilient Systems (BioS-ENDURES) Consortium*; PI: Kristi Morgensen, University of Washington
  - *An integrative anaerobic digestion and phototrophic biosystem for sustainable space habitats and life supports*; PI: Yinjie Tang, Washington University at St. Louis

- **ROSES 2024 Step 1 Proposals Received** (Feb. 2025)
  - **Precision Health:** Model studies relating to biological aging, age-associated diseases, and genetic diversity
  - **Space Crops:** Plant research addressing KSQs related to the decadal-recommended BLiSS campaign
  - **Foundations:** Fundamental physics research on fluids, fire systems and combustion, soft matter, materials
  - **Quantum Leaps:** Concepts for future space experiments in fundamental physics, with an emphasis on quantum science and atomic physics

TechLeap Challenge, CERISS

- **BPS partnering with NASA Space Technology Mission Directorate in NASA TechLeap challenge**
  - The TechLeap challenge offers industry and academia an opportunity to provide a solution to a technology shortfall within the BPS Goals related to in-situ sample preparation or analysis.
  - The Space Technology Payload challenge went live December 2024 and submissions closed on March 20, 2025.
  - **224 TechLeap submissions**
  - BPS awardee is expected to be announced summer of 2025, with a flight within 12 months.
  - Information can be found at: https://www.nasatechleap.org/

Launches*: Precision Health & Space Crops

Understanding risks to crew health and informing future food sources

Precision Health

Combating Antibiotic Resistance (SpX-31)

- **GEARS** (Genomic Enumeration of Antibiotic Resistance in Space)
- PI: Dr. Carr, Georgia Institute of Technology

Understanding Inflammation and Blood Clotting (SpX-31)

- **MeF1** (Megakaryocytes Orbiting in Outer Space and Near Earth: The MOON Study)
- PI: Dr. Schwertz, Univ. of Utah, Salt Lake City

Space Crops

Growing 'Outredgeous' Romaine Lettuce for Crew Nutrition (SpX-31)

- **PH-07** (Plant Habitat-07)
- PI: Dr. Massa, NASA

Mixing Moss with Space Radiation (SpX-31)

- **ARTEMOSS** (Antarctic Isolate 1 (ANT1) Radiation Tolerance Expt. with Moss in Orbit on the Space Station)
- PI: Dr. Zupanska, University of Florida, Gainesville

Determining How Chromosome Ends and Specialized Protein Affect Plant Resilience (SpX-32)

- **APEX-12** (Advanced Plant Experiments in Space-12)
- PI: Dr. Shippen, Texas A&M University

** SpX-31 launched 11/5/2024; **SpX-32 launch NET 4/21/2025***

Launches*: Foundations & Quantum Leaps

Ensuring crew safety and pioneering quantum research

Foundations

Developing Firefighting Techniques in Microgravity (SpX-31)

- **SoFIE-MIST** (Solid Fuel Ignition and Extinction - Material Ignition and Suppression Test)
- PI: Dr. Fernandez-Pello, University of California, Berkeley

Generating Low-cost Engineering Datasets (Parabolic Flight May 2025)

- **MOVE:** CAN-DO (MOdel Validation from Engineering (MOVE): Collaborative AdvaNcement – DemO) for ICME
- PI: Ben Rupp, NASA MSFC
- Partnership with CisLunar Industries

Quantum Leaps

Enabling Probing the Relationship Between Quantum and General Relativity (SpX-31)

- **SEAQUE** (Space Entanglement and Annealing QUantum Experiment)
- PI: Dr. Kwiat, University of Illinois Urbana-Champaign

'Second guessing' Time in Space (SpX-32)

- **ACES** (Atomic Clock Ensemble in Space)
- PI: Dr. Cristophe Salomon, ENS, Paris, France
- Partnership between ESA and NASA

** SpX-31 launched 11/5/2024; **SpX-32 launch NET 4/21/2025***

Launches: Space Labs

Accelerating the pace of research through commercial partnerships

Space Labs

Automating Handling of Complex Fluids in Space (Parabolic Flights Dec. 2024)

- Sierra Lobo's Microgravity Lab Assistant (MLA)
- Funded by BPS's Commercially Enabled Rapid Space Science (CERISS) program
- Additional test campaigns planned for spring and fall of 2025

Sierra Lobo's Microgravity Lab Assistant

Supporting "StarSteel" Production Demo in Space (Launch TBD)

- Mochii
- Supported by BPS's Commercially Enabled Rapid Space Science (CERISS) program
- PI: Dr. Dunand, Northwestern University
- Partnership with JAXA, using ELF (Electrostatic Levitation Furnace)

Growing Plants from Seed to Maturity in Space (NG-23 NET Jan. 2026)

- Redwire's Greenhouse
- Scalable, works with VEGGIE pillows

Redwire's Greenhouse

BIOLOGICAL & PHYSICAL SCIENCES FLEET

- FORMULATION
- IMPLEMENTATION
- OPERATIONAL

*Partner-led

Mars

Moon

ARTEMIS III

FM²

LEIA LEAF*

ARTEMIS II

CAL

CIR

ELF*

EML*

FBCE

FIR

FLARE*

GEARS

BRIC

SOFIE

SEAQUE*

RR

PH

MeF1

ARTEMOSS

VEGGIE

MSRR

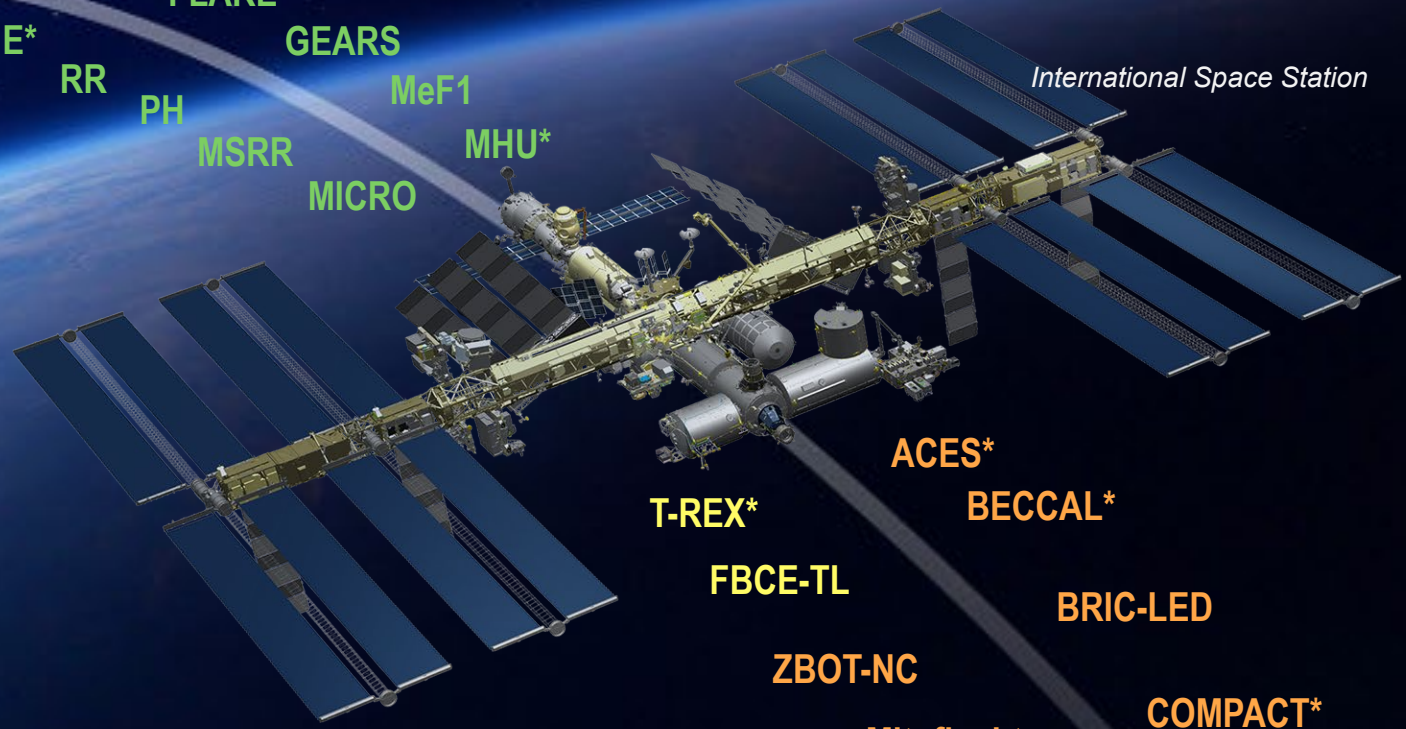
MHU*

APH

XROOTS

MICRO

APEX



International Space Station

ACES*

T-REX*

BECCAL*

FBCE-TL

BRIC-LED

ZBOT-NC

COMPACT*

Mitoflyght

MABL

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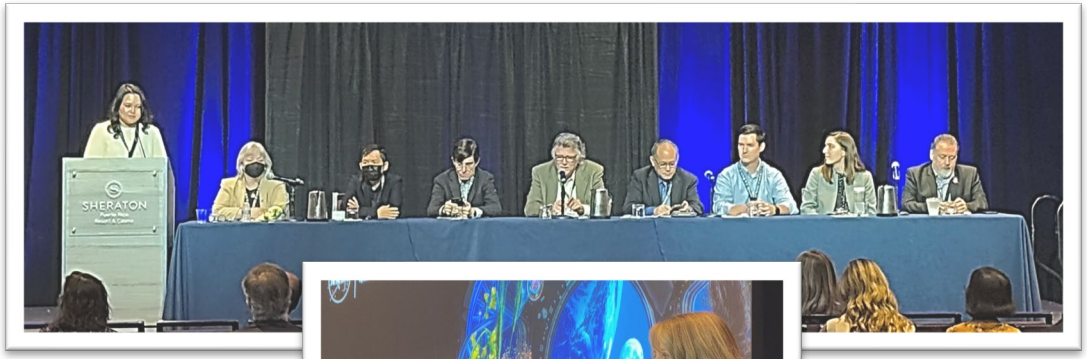
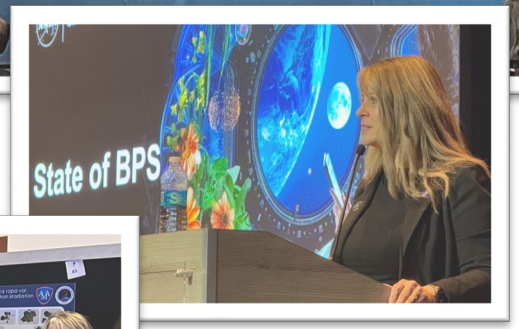
Sharing Mission Updates

Advancing the NASA mission by engaging with the research community

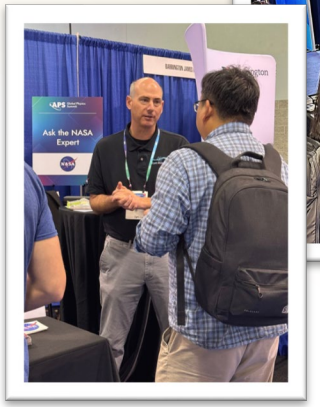
ASGSR 2024





AGU 2024

APS 2025



ISLSWG/IMSPG 2024

International Year of Quantum

Events in 2025 where BPS will promote NASA's work in Quantum:

January 12-16

American Astronomical Society

AMERICAN ASTRONOMICAL SOCIETY

March 15

Quantum Jubilee

Jason Williams (CAL), Paul Kwiat (SEAQUE) presenting

March 16-21

American Physical Society Global Physics Summit

Anaheim, CA

APS

April 2025

Space Symposium

Commemoration Signing of BECCAL partnership with DLR and Nicky Fox

BECCAL BOSE-EINSTEIN CONDENSATE AND COLD ATOM LABORATORY

April 14

World Quantum Day

Celebrating 100 years of quantum mechanics

INTERNATIONAL YEAR OF Quantum Science and Technology

NET April 21

Atomic Clock Ensemble in Space (ACES)

Launch on SpaceX-32

June 16-20

APS Division of Atomic, Molecular and Optical Physics Meeting

Portland, OR

APS Division of Atomic, Molecular & Optical Physics DAMOP

Fall 2025

Next version of CAL SM-3X is launching

More Details TBA

Fall 2025

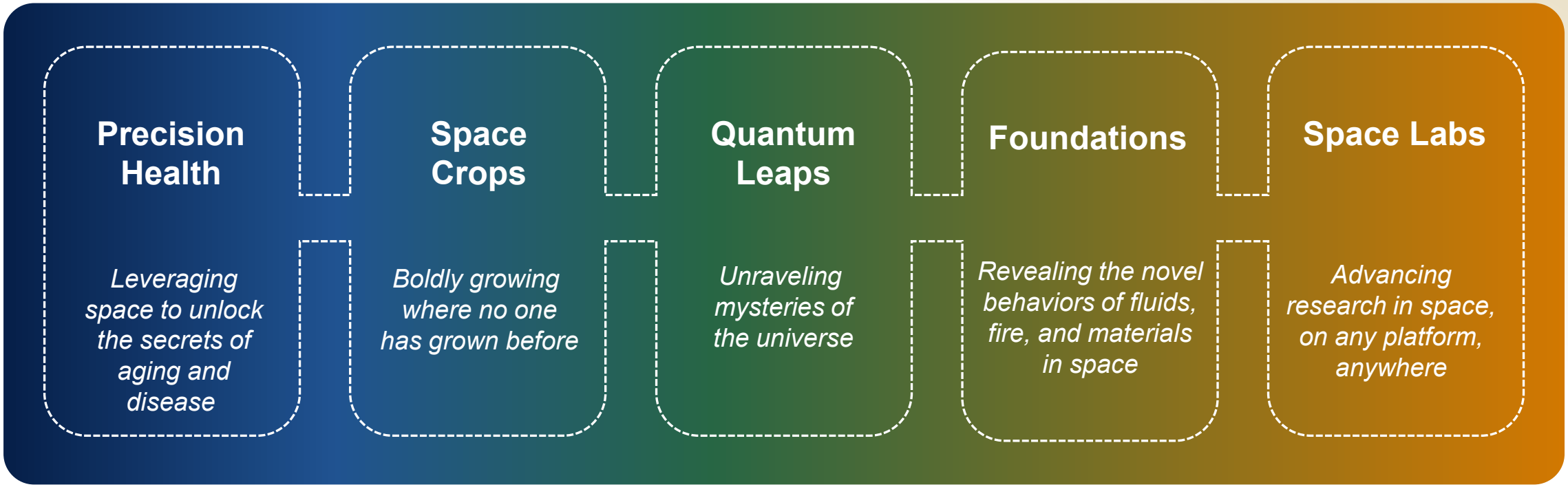
Direct Detection of Dark Energy in the Einstein Elevator (D3E3)

Bremen Drop Tower in Germany (DLR)

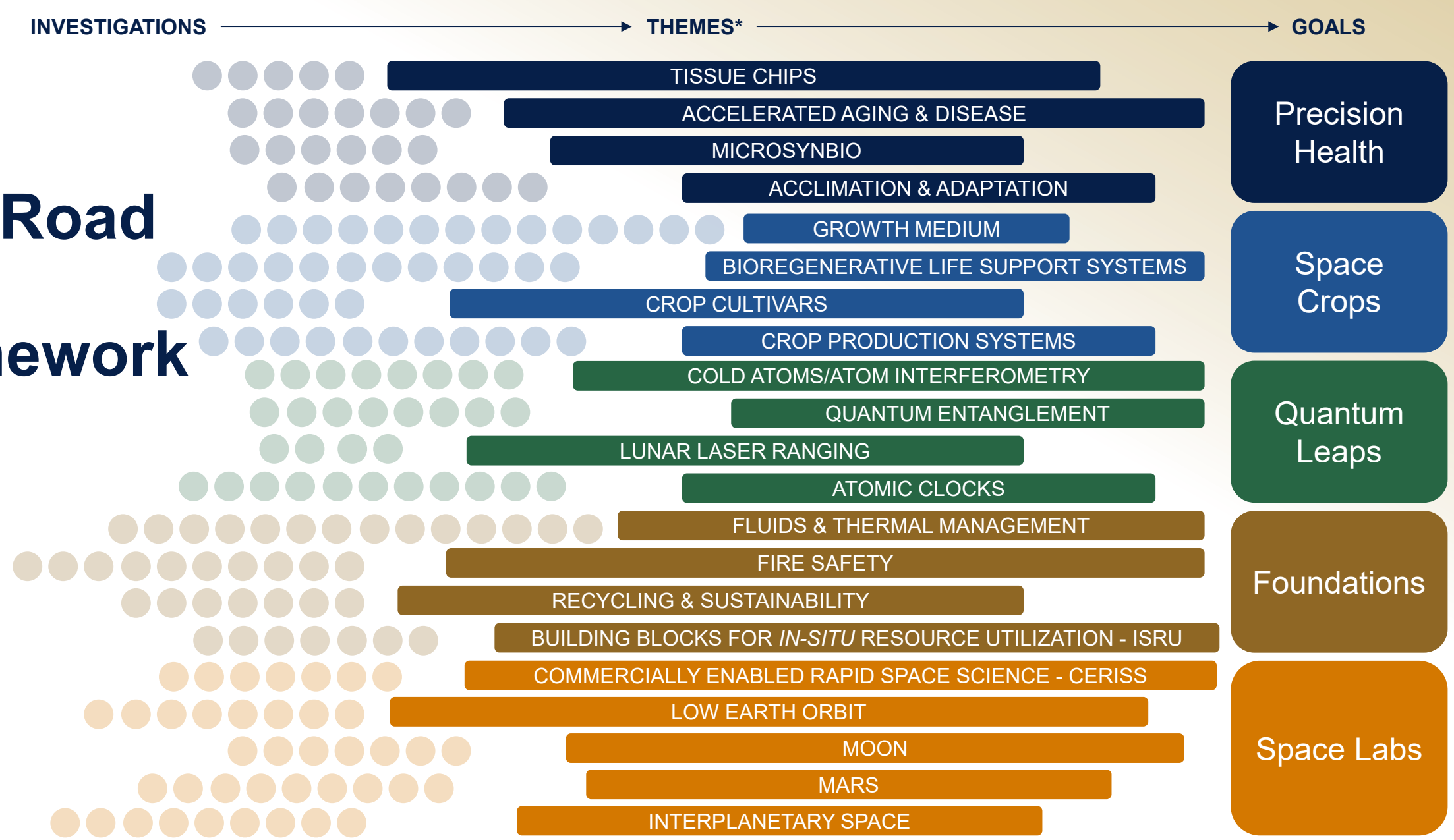
Decadal Road Map Update

Thriving in Space

Revolutionary research in extraordinary places.

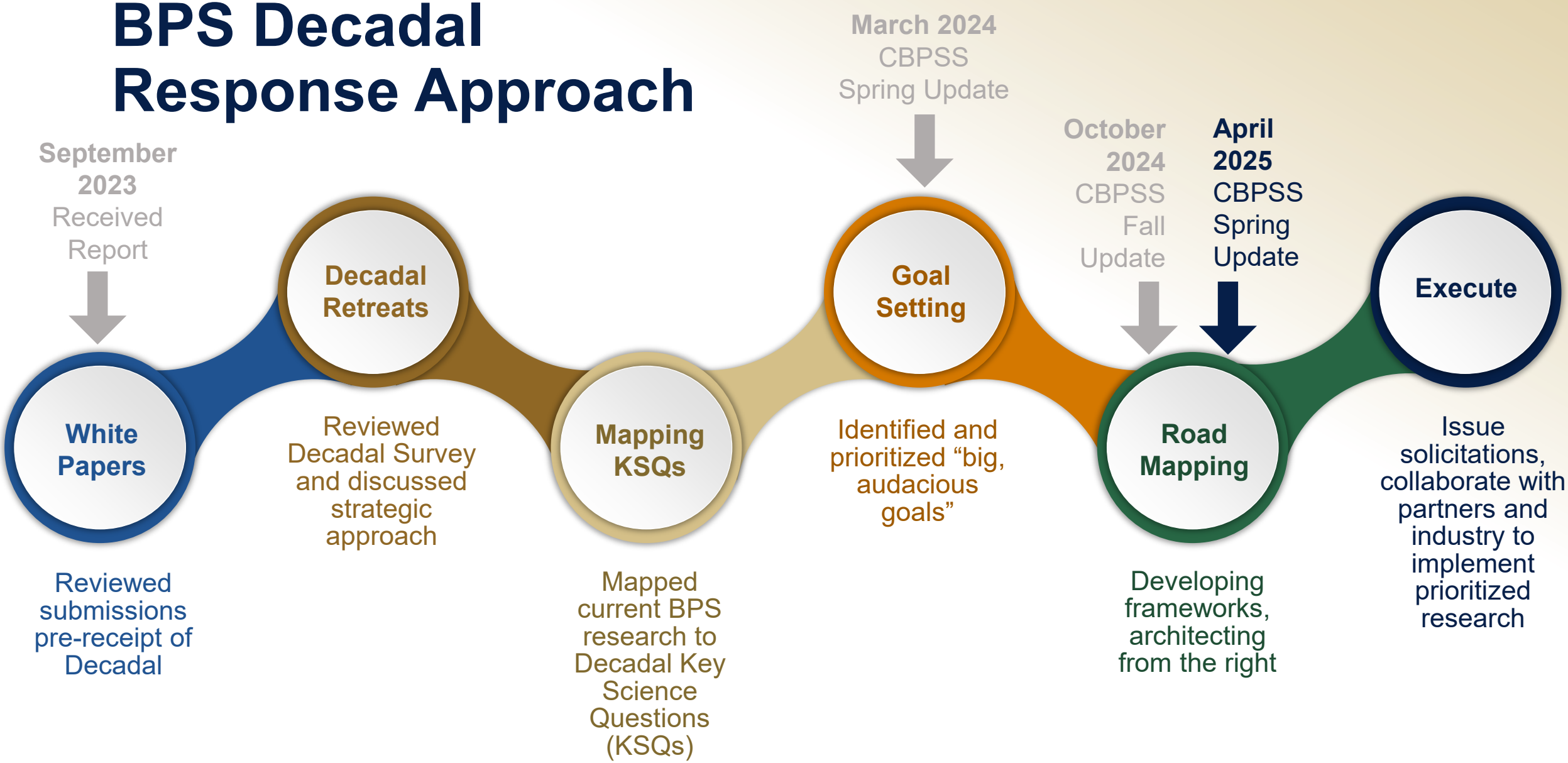


BPS Road Map Framework



*Subject to change

BPS Decadal Response Approach

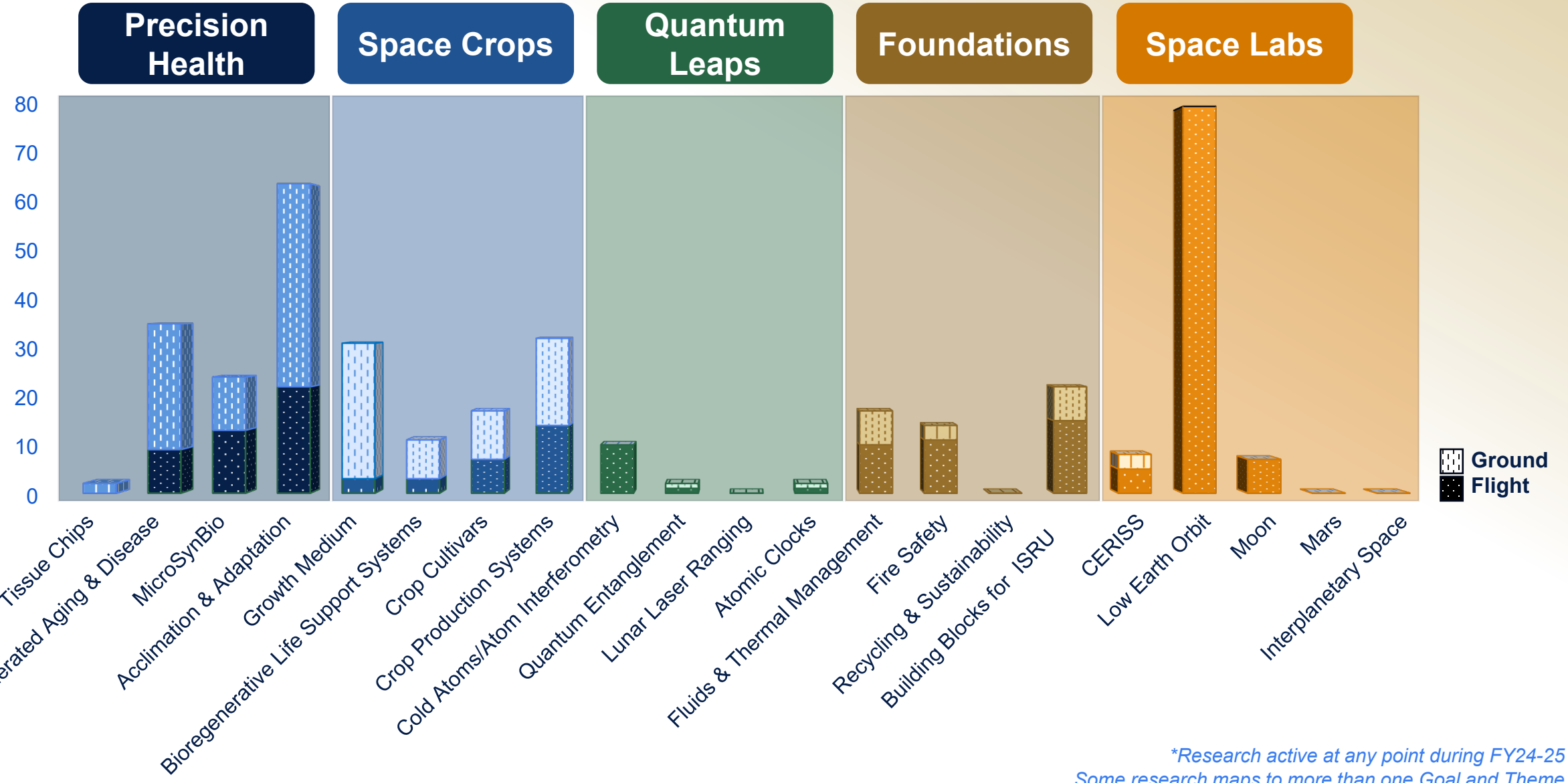


Road Mapping Update

- **Solidified BPS Road Map Themes**
  - Jan. 8, 2025 – Internal Theme Validation Activity to review Working Theme science areas
  - Jan. & Feb. 2025 – Internal review to solidify science subject matter covered by Road Map Themes

- **Developed Content for BPS Road Map Response**
  - Current BPS grants mapped to solidified Themes
  - March 5-6, 2025 – Internal Virtual Road Mapping Workshop to determine sunsetting and emerging science directions

FY24-25 BPS GROUND AND FLIGHT RESEARCH*



*Research active at any point during FY24-25
Some research maps to more than one Goal and Theme

Sunsetting and Emerging Science

Goal	Sunsetting	Timeframe	Emerging Science	Space Labs (CERISS, LEO, Moon, Mars, Interplanetary Space)
Precision Health	• Research on individual systems	1-5 years	• Systems biology • Integrated physiological systems	• LEO • Partial gravity • Interplanetary space
Space Crops	• Gene expression in whole plants (transcriptomics) studies in 1g & ISS microgravity	1 year	• Cell-type specific 'omics' in space environments • Genes relevant for Earth-to-Space transitions	• Partial gravity • Suborbital flights
Quantum Leaps	• Cold Atom Lab (CAL)	5 years	• Bose-Einstein Condensate and Cold Atom Lab (BECCAL)	• LEO
Foundations	• ISS Combustion Integrated Rack	1-3 years	• Flammability of Materials on the Moon (FM^2)	• Partial gravity


NASA
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BPS | THRIVING IN SPACE

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