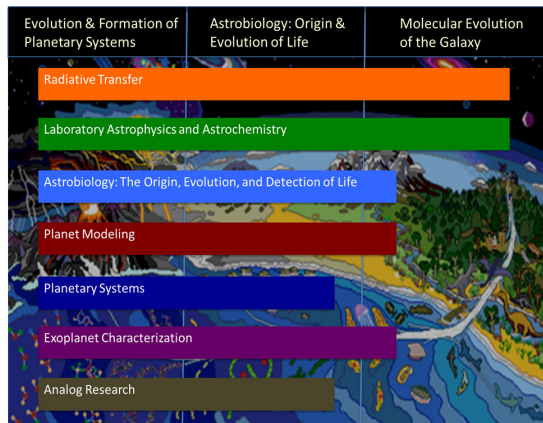


## Vision:

The Space Science and Astrobiology Division provides NASA and the community interdisciplinary scientific expertise and capabilities that advance the Nation's understanding of the Molecular Evolution in the Galaxy, detail the Evolution and Formation of Planetary Systems, and expand our knowledge of the Origin and Evolution of Life in the Universe

## Mission:

The Division's strategic approach focuses on enabling long-term investments in our core capability research areas. We provide leadership and stewardship that enhances and enables the community to make new scientific and technical discoveries and assures the success of NASA's strategic goals.



*The Interdisciplinary Core Capabilities that exist within the Space Science and Astrobiology Division at the NASA Ames Research Center. The Core Capabilities are illustrated with their cross-cutting relationship to the three major science themes of the Division; The Evolution & Formation of Planetary Systems, Astrobiology: The Origin, Evolution, and Detection of Life, and The Molecular Evolution of the Galaxy.*

## The Space Science and Astrobiology Division

The Space Science and Astrobiology Division at NASA Ames Research Center is comprised of three branches. Scientists in each branch specialize in the specific areas of study outlined below. In addition, interdisciplinary projects across the Division are underway as well. This strategic plan details the scientific core capabilities currently existing within the Division.

- **Astrophysics:** Researchers study the physical and chemical properties of astronomical objects and phenomena by observing their radiation at optical, infrared and ultraviolet wavelengths.
- **Planetary Systems:** Researchers develop new, fundamental knowledge about the origins of stars and planetary systems, their evolution and formation, their environment, and astrobiology.
- **Exobiology:** Researchers study the history, distribution, and chemistry of biogenic elements in the solar system; prebiotic chemical evolution and the origin of life; and the history of Earth's early biosphere as recorded in microorganisms and ancient rocks.

**Division Chief** - Steve Howell

**Deputy Division Chief** - Mark Fonda

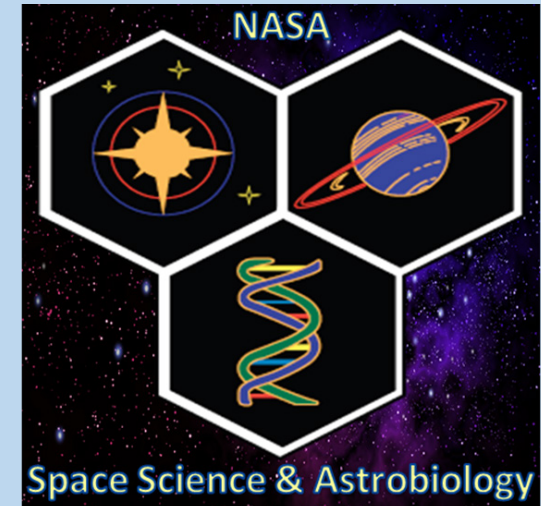
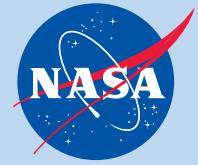
**Astrophysics Branch Chief** - Mark Fonda (acting)

**Planetary Science Branch Chief** - Jeff Hollingsworth

**Exobiology Branch Chief** - Chris Dateo

### More Information:

Space Science and Astrobiology Division  
NASA Ames Research Center  
M/S 245-1  
Moffett Field, CA 94035  
650-604-6429



## Space Science and Astrobiology

## Strategic Plan 2018

# Scientific Capabilities

## Planet Modeling

Theoretical and Numerical modeling of planetary atmospheres, climates, landforms, and geo-chemical processes fundamentally contribute to planetary systems science research at NASA Ames and to NASA's fundamental space exploration goals & objectives. Interdisciplinary and synergistic relationships exist among planetary atmospheric, planetary landform and planetary geochemical modeling that strengthens each beyond what any one is capable separately.

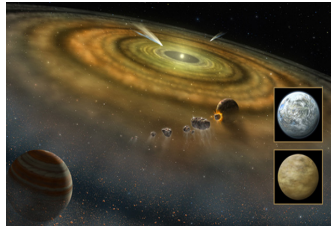


### Objectives:

- Atmospheric and Global Climate Modeling (GCM)
- Geochemical and Spectroscopic Modeling (GSM)
- Landform Evolution Modeling (LEM)
- Establishing an Integrated Planet Modeling Group

## Planetary Systems

The Ames Planetary Systems group provides NASA and the community a unique interdisciplinary resource with a broad range of expertise and a long-term perspective on major outstanding problems not commonly found in academia. The team's research covers the full range of planetary formation from the nebular gas and dust to the planets, satellites and surviving primitive bodies we see today, tying together the disciplines of astrophysics, exoplanetary and planetary science, and meteoritics.



### Objectives:

- Understand Evolution of Protoplanetary Nebulae
- Understand Particle Growth from Dust to Planetesimals
- Understand Formation of Planets, Satellites and Rings, and Their Long-Term Evolution and Dynamics

## Exoplanet Characterization

This capability provides characterization of the host star system leading to a determination of the correct exoplanet radius and density thereby identifying the most promising targets for follow-up.

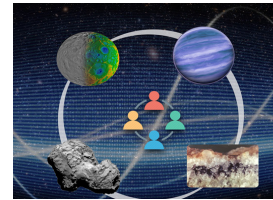


### Objectives:

- Provide Unique Leadership in Exoplanet Discoveries and Characterization
- Develop Exoplanet Atmosphere Models

## Radiative Transfer Research

Radiative Transfer is an essential and unifying toolset needed to interpret all remote observations spanning airless bodies, atmospheres of exoplanets and solar system bodies, and protoplanetary disks.

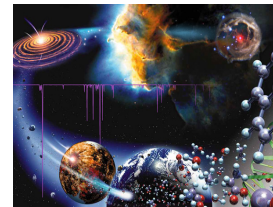


### Objectives:

- Develop Next Gen. Radiative Transfer Methods & Tools
- Develop Smart Spectral Retrieval Tools for Complex Atmospheres & Surfaces

## Laboratory Astrophysics & Astrochemistry

Laboratory Astrophysics consists of experiments and theoretical calculations that are key factors for the understanding of our universe by complementing observations and modeling.



### Objectives:

- Establish a Leading Role in Supporting JWST PAH Research
- Provide New Theoretical & Lab Data for the Study of Exoplanets and Solar System Exploration
- Investigate Astrobiological Relevance of Irradiated Ices and Ice-Grain Interactions

## Analog Research and Instrument Development

The Analog Research Center will continue to lead innovation, mission design concepts for operations, and perform field tests in analog environments using low-cost, prototype instrumentation. The Instrument Development component will develop instruments for flight missions in the areas of life detection, planetary mineralogy and geochemistry, in situ atmospheric, and in situ resource identification and utilization.



### Objectives:

- Positively Affect Robotic and Human Spaceflight Utilizing Terrestrial Environments
- Identify, Explore and Characterize Environments for Habitability & Biosignatures
- Develop and Test New Technologies & Instrumentation
- Develop Instrumentation That Responds to In situ Resource Utilization (ISRU)

## Astrobiology: Origin, Evolution, & Detection of Life

The interdisciplinary nature of cutting edge astrobiology and exobiology, and their mutually beneficial feedback, make Ames the ideal center for researching and understanding the origin, evolution, and distribution of life in the Solar System and beyond.



### Objectives:

- Research the Origins of Life
- Understand the Biological Complexity, Interactions, and Co-Evolution of Life and the Physical Environment
- Investigate Habitable Environments and Biosignatures
- Establish a Center for Life Detection at ARC

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