



The Nexus for Exoplanet System Science

<https://nexss.info>

Dr. Mary Voytek
Senior Scientist for Astrobiology

SMD, NASA HQ

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**NExSS:
NASA Exoplanet System Science
Research Coordination Network**

A Cross-division Initiative



Objectives

To further our joint strategic objective to explore exoplanets as potential habitable and inhabited worlds outside our solar system.

- Exoplanet research cuts across divisions in SMD including Planetary Science (PSD), Heliophysics (HPD), Earth Science (ESD) and Astrophysics (APD)

To leverage existing Programs in SMD to advance the field of Exoplanet Research, specifically research in comparative planetology, biosignature and habitat detection, and planet characterization.

Establish a mechanism to break down the barriers between, divisions, disciplines and stove piped research activities.



What is a Coordination Network?

A virtual structure to support groups of investigators to communicate and coordinate their research, training and educational activities across disciplinary, organizational, divisional, and geographic boundaries.



What Research Coordination Networks have accomplished?

Provided opportunities to foster new collaborations, including international partnerships, and address interdisciplinary topics.

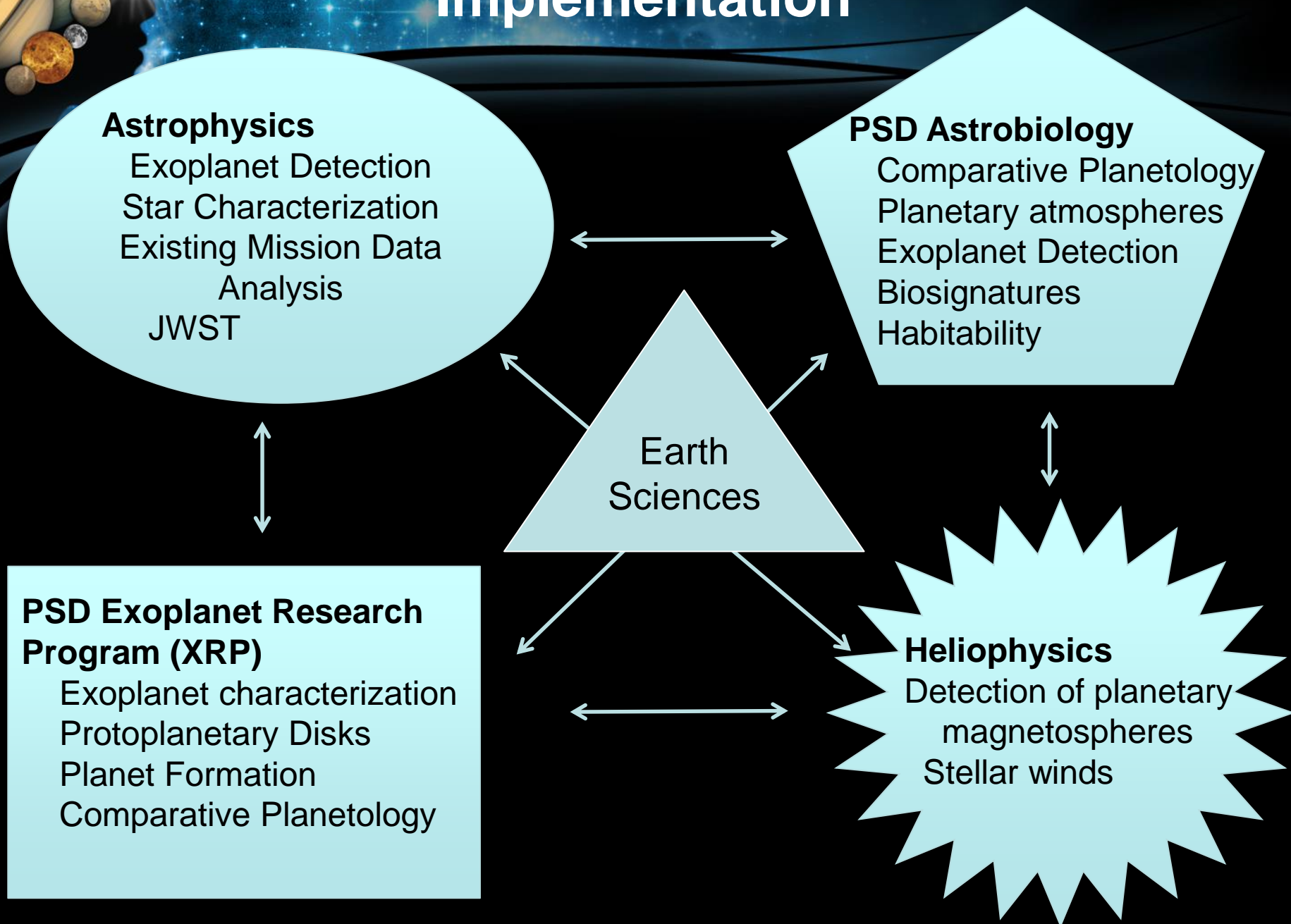
Provided innovative ideas for implementing novel networking strategies, collaborative technologies.

Supported the development of community standards for data and meta-data.

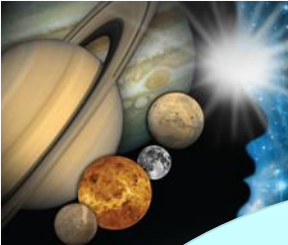
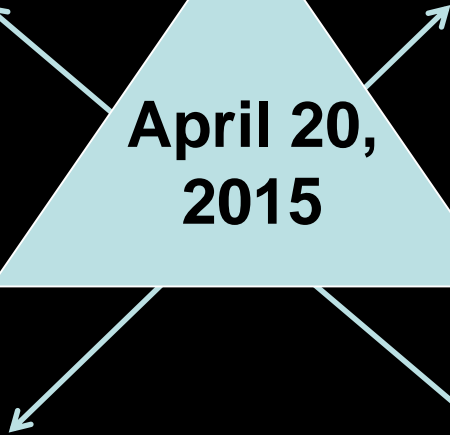
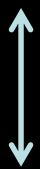
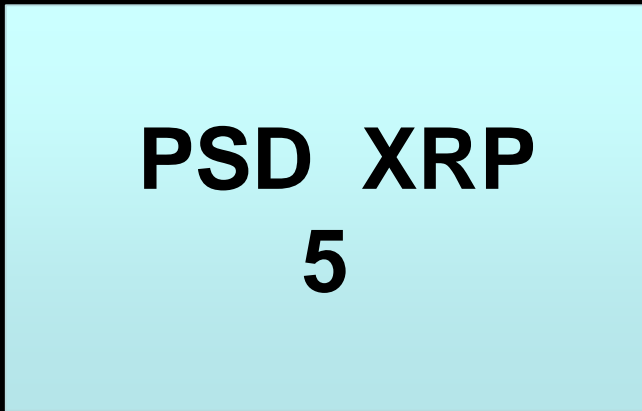
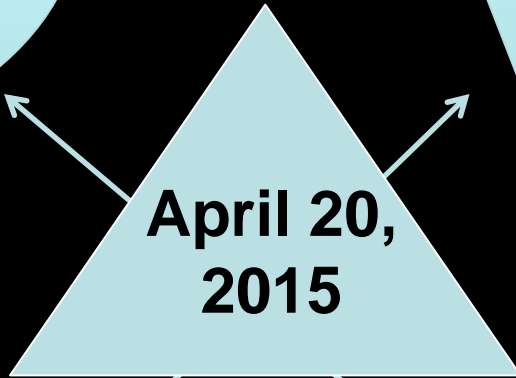
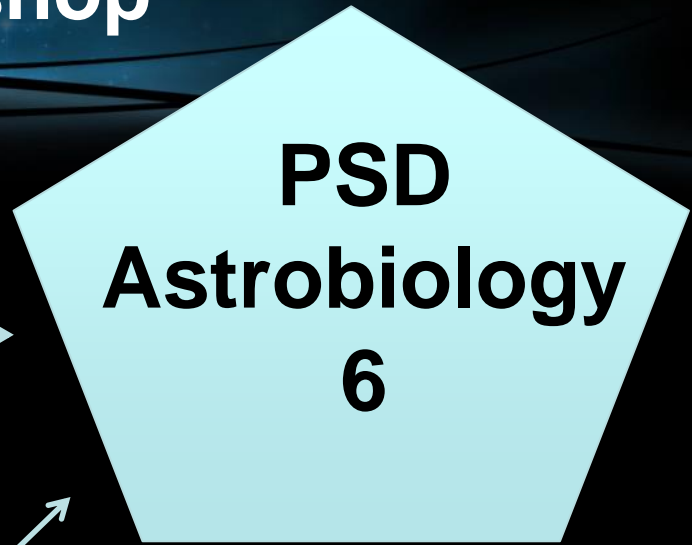
Supported the means by which investigators can

- share information and ideas,
- coordinate ongoing or planned research activities,
- foster synthesis and new collaborations,
- develop community standards,
- and in other ways advance science and education through communication and sharing of ideas.

Implementation



Kickoff Workshop





Example Activities

Host a workshop (not mini symposium) to define the Habitable zone to include factors optimal orbit, size, distance from star, star type, radiation, magnetospheres, etc.

- Process is just as important as product

Develop an understanding of what future observations are needed to determine if exoplanets are habitable and inhabited



Measure of Success

Investigators carry out and propose interdisciplinary research through new collaborations

Produces a plan for utilization of current space telescopes

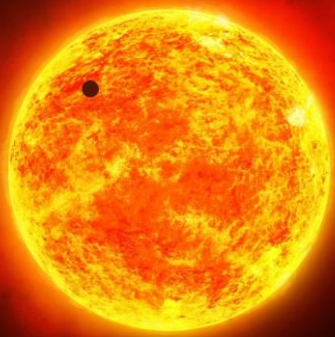
Spawns ideas for new and exciting missions

Identifies new targeted technologies needed not yet reported elsewhere

Influences Decadals for both PSD and APD

Enhances International engagement

PI Name	Institution	Title
Deming, Drake	University of Maryland, College Park	A Statistical Characterization of the Atmospheres of Kepler's Small Planets
Fischer, Debra	Yale University	Characterizing the Habitable Zone Planets of Kepler Stars
Jensen, Adam	University of Nebraska, Kearney	Exploring Exoplanetary Exospheres: Extended Atmosphere Detection, Characterization, and Evolution in Exoplanets
Fortney, Jonathan	University Of California, Santa Cruz	Forward and Inverse Modeling of Brown Dwarf Atmospheres
Lithwick, Yoram	Northwestern University	Deciphering Kepler's Planetary Systems
Wright, Jason	The Pennsylvania State University	Extending Spitzer to the Ground: A Novel Technique for Probing Exoplanetary Atmospheres
Del Genio, Anthony	GISS	Rocky Planet Habitability: Insights from Solar System Climate Dynamics Through Time
Graham, James	UNIVERSITY OF CALIFORNIA Berkeley	Exoplanets Unveiled: Formation, Evolution and Prospects for Life
Apai, Daniel	UNIVERSITY OF ARIZONA	Earths in Other Solar Systems: Toward forming and discovering planets with biocritical ingredients
Desch, Steve	ARIZONA STATE UNIVERSITY	Exoplanetary Ecosystems: Exploring Life's detectability on chemically diverse exoplanets
Moore, William	HAMPTON UNIVERSITY	The Living, Breathing Planet
Manaka, Hiroshi,	SETI Institute	Laboratory investigation of plausible photochemical haze particles in hot exoplanetary atmospheres
Turner, Neal	Jet Propulsion Laboratory	The Planet-Forming Environment Close to Young Stars
Jang-Condell, Hannah	University Of Wyoming	Structure, Dynamics, and Evolution of Planet-Forming Disks: Modeling the Inner Walls of Transitional Disks
Ford, Eric	Pennsylvania State University	Bulk Properties of Small Transiting Planets and Implications for their Formation
Henning, Wade	University of Maryland	Tidal Dynamics and Orbital Evolution of Terrestrial Class Exoplanets with Time Varying Internal Melt Fractions

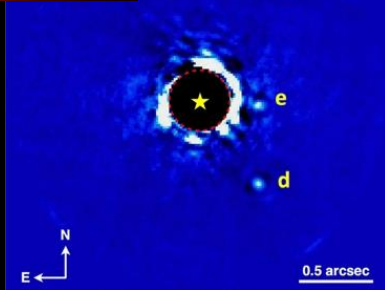
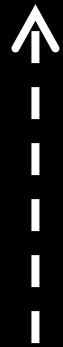


D. Fischer
 E. Ford
 J. Wright
 D. Deming
 A. Jensen
 J. Graham

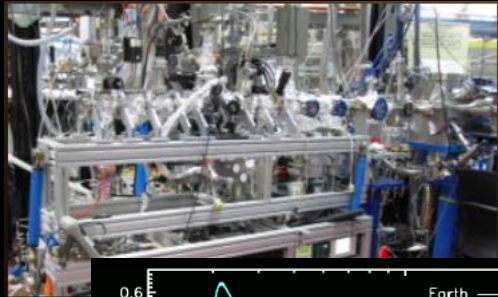
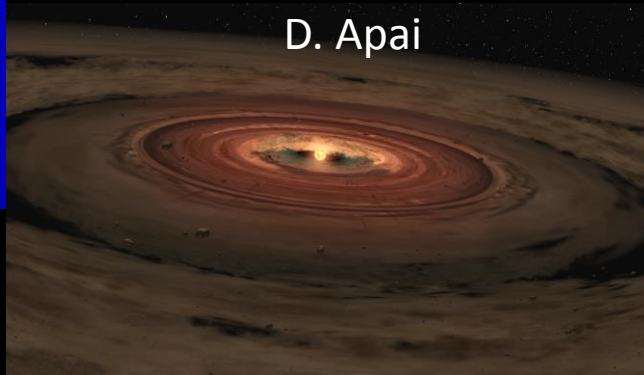
The NExSS Teams

HQ reps:
 Mary Voytek (PSD)
 Martin Still (APD)
 Jeff Newmark (HPD)
 Shawn Domagal-Goldman

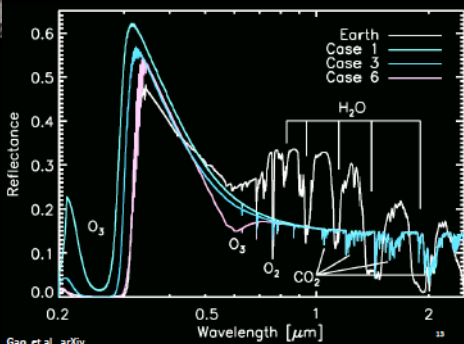
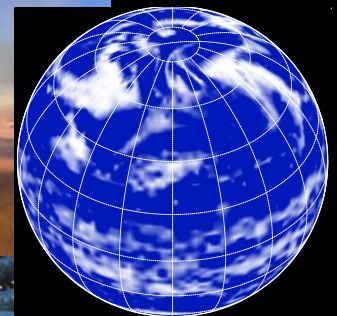
Co-leads:
 Natalie Batalha
 Dawn Gelino
 Tony Del Genio



N. Turner
 H. Jang-Condell
 D. Apai



H. Imanaka
 J. Fortney



B. Moore
 V. Airapetian



W. Henning
 S. Desch
 V. Meadows
 T. Del Genio

NExSS white paper: Laboratory Work for Understanding Exoplanet Atmospheres (led by J. Fortney)

- Needs for future measurements
 - Pressure-induced line broadening parameters (self- , foreign)
 - Optical properties of particles, haze formation
 - Reaction rate constants
 - Photoabsorption cross-sections at high T
 - Lab spectroscopy of continuum absorption
 - Oxygen absorption by early magma ocean
- Draft to be released for community comment by next month
- Relevant to APDA ROSES NRA highlighting timeliness of Laboratory Astrophysics research in support of JWST

Upcoming workshops:

Upstairs Downstairs: Consequences of Internal Planet Evolution for the Habitability and Detectability of Life on Extrasolar Planets

- Tempe, AZ, Feb. 17-19 (led by PSD)
- Joint NExSS-NAI-NSF effort, in-person + virtual participation (Workshop Without Walls) + winter school for students/postdocs

Biosignatures workshop (led by PSD, APD), summer 2016

- Joint NExSS-NAI-ExEP effort
- Partnering with tentatively approved ExoPAG SAG-13 in support of JWST, WFIRST, HabEx/LUVOIR studies

Possible workshop in support of SAG-15 (Obs constraints and science questions for direct imaging missions, led by PSD, APD)

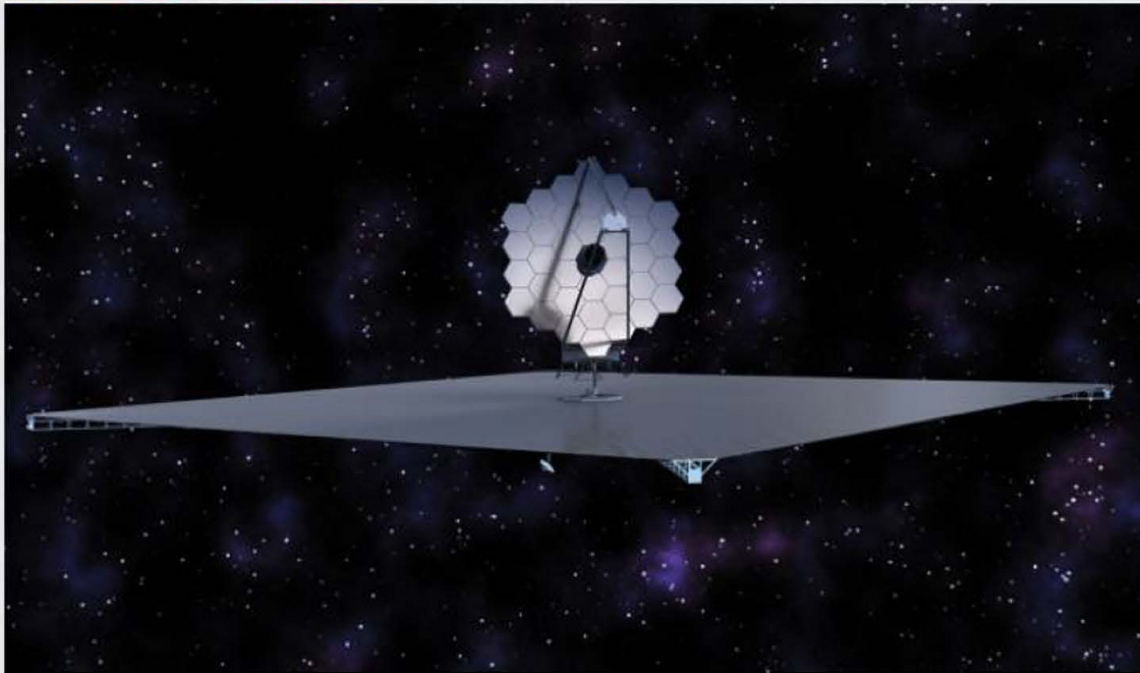
Other activities, collaborations:

- Other workshop ideas (priorities identified by poll of teams)
 - How to identify potentially habitable planets (ESD, PSD)
 - Space weather constraints on habitability (HPD, APD)
 - Stellar, disk histories favoring habitability (APD, PSD)
- Cross-team, cross-discipline collaborations occurring in NExSS
 - Planetary scientists and astrophysicists to characterize short-period rocky planets
 - Statistical and machine learning approaches to detect low-mass planets in presence of stellar activity
 - Heliophysicists and astrophysicists to estimate mass loss in young Sun-like stars
- Monthly webinars since June 2015, monthly PI telecons, possible full NExSS team meeting summer/fall 2016

MANY WORLDS

Movement in The Search For ExoLife

Posted on 2016-01-22 by Marc Kaufman



A notional version of an observatory for the 2030s that could provide revolutionary direct imaging of exoplanets. GSFC/JPL/STScI

Assuming for a moment that life exists on some exoplanets, how might researchers detect it?

About Many Worlds

There are many worlds out there waiting to fire your imagination.

Marc Kaufman is an experienced journalist, having spent three decades at The Washington Post and The Philadelphia Inquirer, and is the author of two books on searching for life and planetary habitability. While the "Many Worlds" column is supported by the Lunar Planetary Institute/USRA and informed by NASA's NExSS initiative, any opinions expressed are the author's alone.

This site is for everyone interested in the burgeoning field of exoplanet detection and research, from the general public to scientists in the field. It will present columns, news stories and in-depth features, as well as the work of guest writers. Many Worlds will be updated on most Tuesdays and Fridays, and sometimes in between.

To contact Marc, send an email to marc.kaufman@manyworlds.space.

Many Worlds Blog Traffic

