

# Exoplanet Program Analysis Group (ExoPAG) Report to APAC

Ilaria Pascucci (U. Arizona)  
Chair, ExoPAG Executive Committee

November 7-8, 2024

Exoplanet Exploration  
(ExEP)  
Program office at JPL



ExoPAG EC

ExoPAG

The ExoPAG is an interdisciplinary  
community-driven forum which  
provides inputs to NASA's  
Exoplanet Exploration Program

Science Interest  
Groups (SIGs)

Science Analysis  
Groups (SAGs)

Findings

# ExoPAG ongoing & recent activities I (since the last APAC meeting)

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- Organize monthly ExoPAG EC meetings (4/17, 6/12, 7/17, 8/21 9/18, 10/25), rep. to APAC, rep. to PAC for GPRAMA (I. Pascucci)
- Reviewed applications for new ExoPAG EC members (I. Pascucci and EC review committee)
- Fostering cross-PAG communications: VEXAG and OPAG shared their activities at the 3/20, 4/17, 9/18 EC meetings + contributions to ExoPAG30 + reps. (Beatty, Dong)
- ExoPAG 30 meeting, at the AbSciCon, Rhode Island (all EC members)
- Working on implementing community suggestions: logo, early career engagement, reach MSI and under-represented Institutions... (all EC members)
- Preparing the ExoPAG 31 meeting at the AAS (all EC members)

# The ExoPAG Executive Committee and its Members

The Executive Committee organizes community input, oversees ExoPAG analyses, and reports ExoPAG findings and inputs to the Astrophysics Division Director



I. Pascucci



T. Beatty, U.  
Wisconsin-Madison



I. Crossfield



C. Dong, Boston U.



D. Dragomir



K. Follette



J. Girard, STScI



S. Johnson



E. May



B. Mennesson



S. Peacock, Goddard



M. Rice



L. Zhao

Thanks to former EC members M. Bottom, O. Cohen, K. Colon, and N. Hinkel for their service!



# ExoExplorers Program Update

(ExoPAG EC rep.: [M. Rice](#))

The Exoplanet Explorers Science Series, sponsored by the ExoPAG Executive Committee and NASA's Exoplanet Exploration Program, aims to enable the professional development of a cohort of graduate students and/or postdocs in exoplanet research ("ExoExplorers").

- The program is completing its fourth year!

The ExoExplorer Steering and Organizing Committees received positive feedback from the cohorts via an anonymous survey

- Ongoing discussions on: 1. adding an in-person component based on demand and as funding permits and 2. how to build the ExoExplorer community
- End of the 4<sup>th</sup> year debrief with current cohorts (July 8)
- Applications for the 5<sup>th</sup> cohort and for the 2025 ExoGuides are being evaluated

# ExoPAG ongoing & recent activities II (since the last APAC meeting)

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- Active Science Interest Groups (**SIGs**) and Study Analysis Groups (**SAGs**):
  - SIG2 “Exoplanets Demographics” (Fernandes & **Johnson**) -> focus on an Eta-Earth report for the Spring of 2025
  - SIG3 “Exoplanets Solar System Synergies”, on-going (Meadows & Mandt) -> focus on community review paper to explore exoplanet/solar system synergies
  - SAG23 “The Impact of Exo-Zodiacal Dust on Exoplanet Direct Imaging Surveys” (Debes, Rebollido, Hasegawa)
  - SAG24 “Exploring the Complementary Science Value of Starshade Observations” (Seager & Shaklan)
  - SAG25: “Technosignatures” (Sheikh, Elowitz, Frank, Schwieterman, Wright)
  - SAG26: “Exoplanet Reflectance Spectroscopy for the Habitable Worlds Observatory” (Hu, Damiano, Robinson, Meadows, Lustig-Yaeger, Mandell, Villanueva, Young, Quanz, Alei, Kreidberg)

# SAG23 “The Impact of Exo-Zodiacal Dust on Exoplanet Direct Imaging Surveys”

(Chairs: Debes, Hasegawa, Rebollido)

SAG23 includes ~40 members working on eight major subject areas

- Half of the subject area drafts have undergone and completed internal revisions
- The review on hot debris dust has been submitted to PASP
- SAG co-leads organized an Exo-Zodi JWST brainstorming session generating two innovative proposals, ~20 SAG members participated and early career scientists took leadership positions in the proposals
- **Final report in Winter 2024/Spring 2025**

# SAG24 “Exploring the Complementary Science Value of Starshade Observations”

(Chairs: Seager & Shaklan)

SAG24 currently includes 25 members and continues to expand. Moving forward on all goals, planning an online report writing workshop in Fall 2025

## Activities

1. Poster presentation on the Starshade SAG at Exoplanets V in Leiden, presenting the SAG goals for **new member recruiting** (June 2024)
2. Poster presentations at SPIE Astronomical Telescopes and Instrumentation in Japan presenting **designs for a 60 m diameter visible/NIR starshade and a 35 m UV-Vis Starshade with imaging simulations**, including the alpha centauri system
3. Presentation at ExoExplorers Science Series, on **modeling of a realistic Starshade system** (including flaws) end-to-end observations of realistic exozodi disk and planets in the UV to blue wavelengths showing planet detectability during orbit



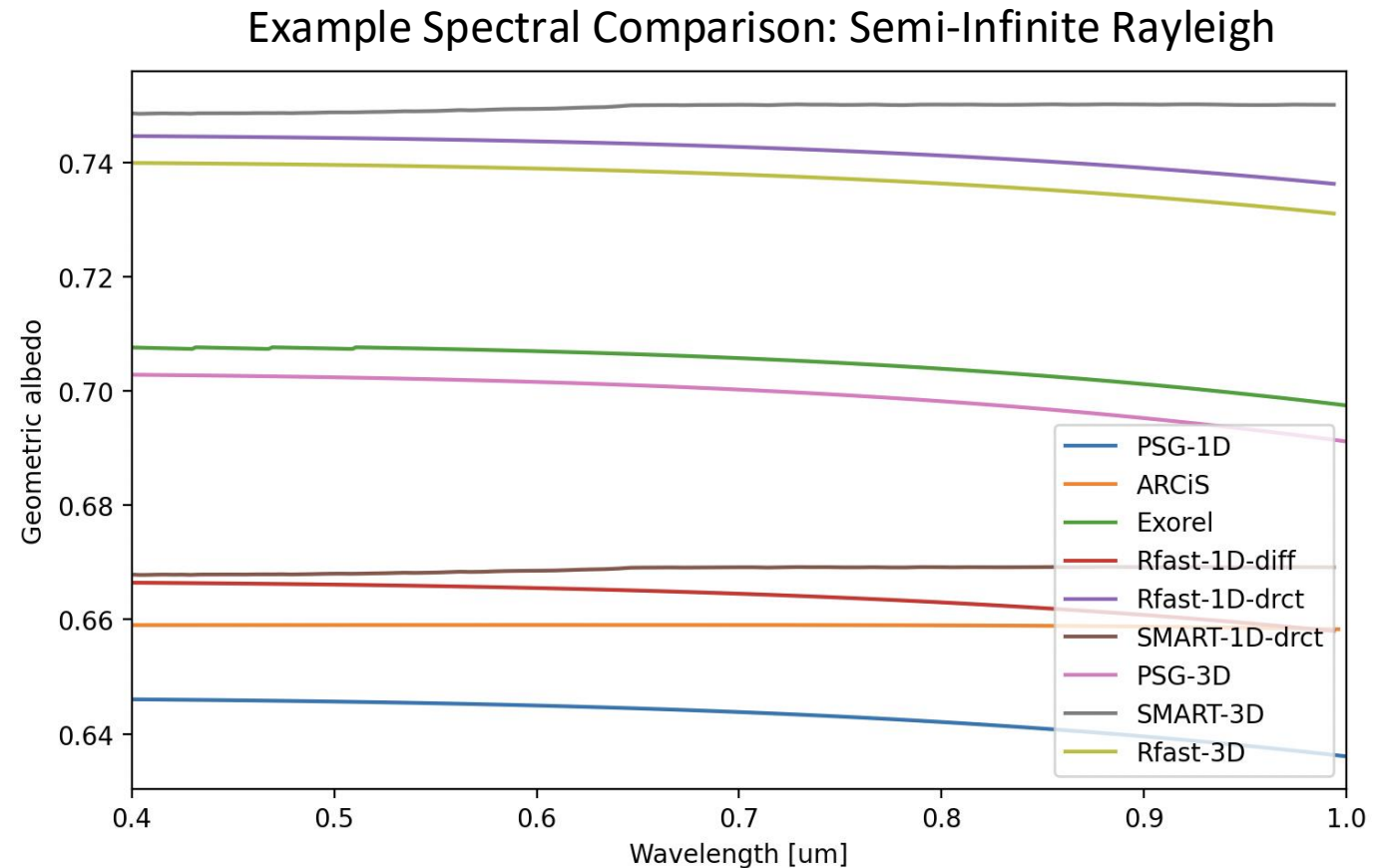
# SAG25 Update: Technosignatures

**MOTIVATION:** The search for technosignatures has rapidly advanced, expanding beyond radio SETI to include atmospheric technosignatures in exoplanetary spectra. This SAG will produce analysis and findings on how NASA's efforts in astrobiology, exoplanetary astrophysics, and other areas can better serve the search for technosignatures, consistent with NASA's goals to understand the prevalence of life in the universe.

- **Steering committee expanded:** Original membership + Steve Croft, Daniel Angerhausen, Megan Li, and Benji Fields
- **SAG participants finalized:** ~70 applications received and accepted to the SAG
- **Working groups created and assigned:** Exoplanetary Technosignatures, Non-Exoplanet Technosignatures, Proposal Review, and Astrobiology Integration
- **First all-hands meeting scheduled:** November 7th, 2024
- **Timeline finalized:** Final report expected ~Q1 2026

# SAG 26 Update – Exoplanet Reflectance Spectroscopy

- Spring 2024 kick-off + Ongoing bi-weekly telecons
- 20 active participants
- Opacity intercomparisons complete:
  - Line absorption: CH<sub>4</sub>, CO, CO<sub>2</sub>, H<sub>2</sub>O, O<sub>2</sub>, O<sub>3</sub>
  - Rayleigh: CH<sub>4</sub>, CO, CO<sub>2</sub>, H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, O<sub>3</sub>
  - UV X-Sections: CH<sub>4</sub>, O<sub>2</sub>, O<sub>3</sub>
  - CIA: H<sub>2</sub>-H<sub>2</sub>, N<sub>2</sub>-N<sub>2</sub>, O<sub>2</sub>-O<sub>2</sub>
- Spectral model comparisons began Fall 2024.
- On schedule w/draft report document started





# ExoPAG 30

May 5, 2024  
Providence, RI



**Goal:** engage different communities in the search for the Life in the Solar System and Beyond

**Attendees:** 52 in person and 35 remote from different backgrounds

May 5, 2024

Session 1 (Chair: Ilaria Pascucci)		Speaker	Time (EDT)	Duration	End
	Welcome + ExoPAG goals and overview of activities	Ilaria Pascucci (ExoPAG Chair, U. Arizona)	9:30 AM	0:10	9:40 AM
	NASA Headquarters Exoplanet Exploration Program Focus on interdisciplinary opportunities	Hannah Jang-Condell & John Wisniewski (ExEP, NASA HQ)	9:40 AM	0:20	10:00 AM
	Exoplanet Exploration Program (ExEP) Office	Dawn Gelino (ExEPO, JPL/Caltech)	10:00 AM	0:15	10:15 AM
	ExEP Science w focus on Science Gap List to search for life on extrasolar planets	Eric Mamajek (ExEPO, JPL/Caltech)	10:15 AM	0:20	10:35 AM
	<b>BREAK (20 min)</b>		10:35 AM	0:20	10:55 AM
	SIG3- Exoplanet / Solar System Synergies	Vikki Meadows (ExoPAG SIG 3 co-chair, U. Washington)	10:55 AM	0:20	11:15 AM
	VEXAG: the potential for past habitability on Venus and science gaps	Noam Izenberg (VEXAG chair, APL)	11:15 AM	0:20	11:35 AM
	MEPAG Mars Exploration Analysis group: searching for life on Mars - science gaps	Victoria Hamilton (MEPAG chair, SWRI)	11:35 AM	0:20	11:55 AM

Session 2 (Chair: Sarah Peacock)		Speaker	Time (EDT)	Duration	End
	NExSS overview and WGs focusing on the search for life beyond Earth	Ofer Cohen (NExSS co-lead, UMass Lowell)	1:55 PM	0:30	2:25 PM
	Cross AG IDEA working group	Jessica Noviello (UMBC)	2:25 PM	0:20	2:45 PM
	OPAG goals in relation to habitability in the outer Solar System	Morgan Cable (OPAG Steering Committee, JPL/Caltech)	2:45 PM	0:20	3:05 PM
	Cross-AG Ocean Worlds Working Group (OWWG)	Cynthia Phillips (JPL/Caltech) and Michael Bland (USGS, Astrogeology Science Center)	3:05 PM	0:20	3:25 PM
	The search for Life in the Solar System	Lori Glaze (Director, Planetary Science Division, NASA HQ)	3:25 PM	0:30	3:55 PM

Lightning Talks

Ziyu Huang, Boston University Post Doctoral  
 Anna Ulses, University of Washington Grad Student  
 Finnegan Keller, Brown University Undergrad  
 Garrett Levine, Yale University Grad Student  
 Eleonora Alei, NPP Fellow, NASA GSFC, Post Doc  
 Miles Currie, University of Washington Grad  
 Laura Chin, Boston University Grad Student  
 Shang-Min Tsai, UC Riverside Post Doc

# ExoPAG 30: agenda

<https://exoplanets.nasa.gov/exep/exopag/exopag30/exopag30-overview/>

Two Sessions with talks from different analysis groups. Each session was followed by Interdisciplinary Exchange time. **Talk by Dr. Lori Glaze** (Director, Planetary Science Division). **Lightning talks**

# Interdisciplinary Exchange Sessions

**Purpose:** identify current challenges in astrobiology and adjacent fields

## Topics:

- Atmospheric mass-loss and water-loss
- Astrobiology and exoplanet habitability
- Climate Studies and Comparative Atmospheric
- Telescope and instruments enabling the search for life



# ExoPAG Attendees Survey

## Group photo



ExoPAG



## Agenda finalized, presentations include:

- Early career science talks (two 30-min slots)
- NASA's Decadal Astrobiology Research and Exploration Strategy
- SIGs+SAGs updates
- Ariel and Roman community involvements

+ two Open Mic community forum

- **Presentations from Early Career Scientists:** We are excited to offer early-career scientists the opportunity to present their work at ExoPAG 31. Presentations should align with the priorities described in the current [Exoplanet Exploration Program Science Gap List](#). Leadership and organizers are particularly interested in fostering diversity and encourage early-career students from diverse backgrounds to participate and share their innovative research. **Application is now open!**

## **ExoPAG Actions requested from APAC**

No requests to APAC this time but the ExoPAG community continues to be concerned about NASA's plans on zero proprietary period and would like to have an update on the implementation details and if/how NASA plans to seek inputs from the community