Cosmic Origins Program Analysis Group (COPAG 101)

Shouleh Nikzad
COPAG Executive Committee Chair
On behalf of the COPAG EC
& Sabrina Stierwalt, COPAG EC Vice Chair

7 January 2024

Agenda

Opening Remarks

COPAG Introduction

UV Working Group Summary / UV STIG

Galaxies SIG, Stars SIG, Diffuse Gas Cosmic Ecosystems SIG

UV diagnostics of the Starburst ISM

• Massive stars at low metallicity in the lead-up to HabWorlds

• The Baryon cycle in the HWO era, and along the way

The need for space-based IFU spectroscopy

How to start mapping the CGM in emission without waiting 20 years

UV Star Formation Rate

Realizing Transformative Science in the LeadTime for HabWorlds

Science Gaps Panel

Peter Kurcynski

Shouleh Nikzad

Sarah Tuttle

Danielle Berg

John O'Meara

Peter Senchyna

Claudia Scarlata

Erika Hamden

Janice Lee

Rachael Beaton, Moderator Penelists: Session speakers

Swara Ravindranath, Moderator Panelists: Doris Daou (HQ), Enrique Lopez Rodriguez, John ZuHone

HWO Science & Technology Architecture Review Team

John O'Meara & Courtney Dressing

COSMIC ORIGINS Program Analysis Group EXECUTIVE COMMITTEE: Charge and Organizational Context

The National Academies of MEDICINE

Pathways to Discovery in Astronomy and Astrophysics for the 2020s

What are the key scientific challenges for astronomy and astrophysics in the next decade? Pathways to Discovery in Astronomy and Astrophysics for the 2020s, the National Academies' latest decadal survey, identifies the most compelling science goals and presents an ambitious program of ground- and space-based activities for future investment. The report recommends critical near-term actions to support the foundations of the profession as well as the technologies and tools needed to carry out the science. Get involved to represent your communities:

NASA Program Analysis Groups (PAGs) serve as community-based, interdisciplinary forums for soliciting and coordinating community analysis and input in support of NASA SMD Science Program objectives and of their implications for architecture planning, activity prioritization, for future exploration. It provides findings of analyses to the NASA Astrophysics Division Director.

Key Scientific Challenges for the Next Decade



Worlds and Suns in Context

Priority Area: Pathways to Habitable Worlds

Exoplanet Exploration Executive Committee (ExoPAG EC) Chair: Ilaria Pascucci



Physics of the Cosmos Executive Committee (PhysPAG EC) Chair: Justin Finke



Cosmic Origins Executive Committee (COPAG EC) Chair: Shouleh Nikzad

What is COPAG's Charge?

The COPAG serves as a community-based, interdisciplinary forum for soliciting and coordinating community analysis and input in support of Cosmic Origin objectives and of their implications for architecture planning and activity prioritization and for future exploration. It provides findings of analyses to the NASA Astrophysics Division Director.

Science

- future great observatories (c.f. Astro 2020 decadal survey)
- Science gaps & precursor science

Technology

- Astrophysics technology gaps
- Biennial Technology Report

People

- State of the profession
- Diversity, Equity and Inclusion

COSMIC ORIGINS Program Analysis Group EXECUTIVE COMMITTEE: Membership

Member	Ter
Shouleh Nikzad, Chair	April 2022-Octob
Sabrina Stierwalt, Vice Chair	November 2020-
Stephan McCandliss	November 2018-
Christine Chen	November 2020-
Chris Hayward	November 2020-
Hsiao-Wen Chen	April 2022-Octob
Enrique Lopez Rodiguez	April 2022-Octob
Rachal Beaton	January 2023-Oc
Sanchayeeta Borthakur	January 2023-Oc

ber 2024 January 2024 October 2024 January 2024 January 2024 oer 2024 per 2024 tober 2025 tober 2025

Jet Propulsion Laboratory Occidental College Johns Hopkins University Space Telescope Science Institute Flatiron Institute University of Chicago **Stanford University** Space Telescope Science Institute

Institution





Nov' 20 - Jan '24

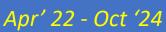
Shouleh, Chair







Arizona State University







Jan' 23 - Oct '25

COSMIC ORIGINS Program Analysis Group EXECUTIVE COMMITTEE: **New Members**

<u>Member</u>	<u>Term</u>	<u>Institution</u>
Shouleh Nikzad (Chair)	April 2022–October 2024	Jet Propulsion Laboratory
Stephan McCandliss	November 2018–October 2024	Johns Hopkins University
Hsiao-Wen Chen	April 2022–October 2024	University of Chicago
Enrique Lopez Rodriguez	April 2022–October 2024	Stanford University
Sabrina Stierwalt, Vice Chair	November 2020–October 2025	Occidental College
Rachael Beaton	January 2023–October 2025	Space Telescope Science Institute
Sanchayeeta Borthakur	January 2023–October 2025	Arizona State University
Rana Ezzeddine	February 2024–January 2027	University of Florida
Varsha Kulkarni	February 2024–January 2027	University of South Carolina















Apr' 22 - Oct '24

COSMIC ORIGINS Program Analysis Group EXECUTIVE COMMITTEE: Ex Officio Members and Liaisons

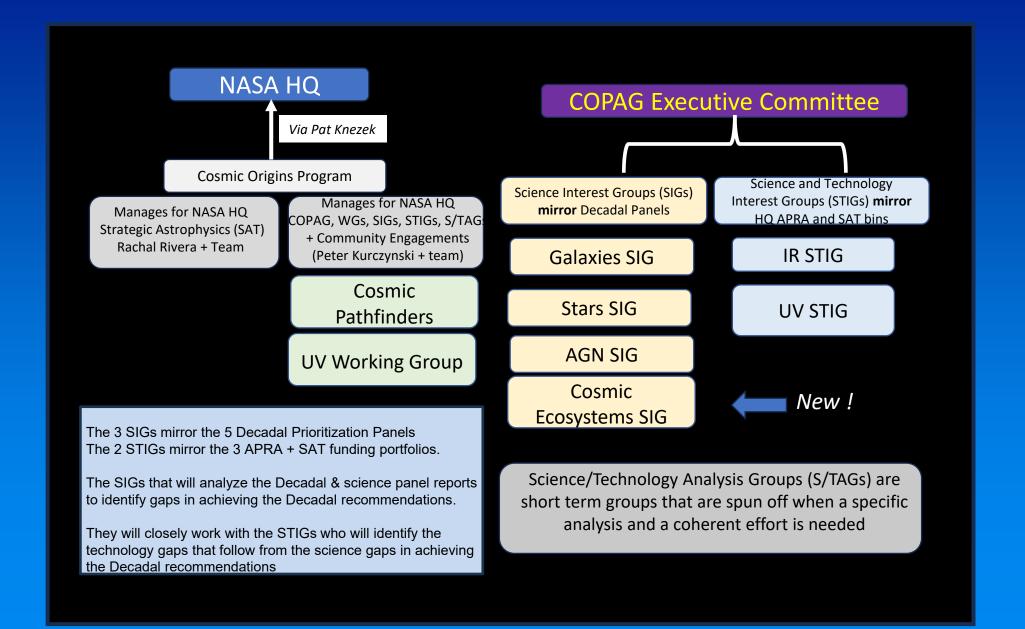
Program Support Manager: Stephanie Clark

COR Chief Scientist: Peter Kurczynski

COR Deputy CS: Swara Ravindranath

Program Scientist: Patricia Knezek

COSMIC ORIGINS Program Analysis Group EXECUTIVE COMMITTEE: Organizational Context of SIGs and WGs



COSMIC ORIGINS Program Analysis Group Science Interest Groups and Science and Technology Interest Groups

Galaxies SIG







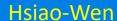


Shobita



Cosmic Ecosystem SIG







Erika

IR STIG







UV/Visible STIG

Cosmic Pathfinders Program

Cosmic Pathfinders is a student-focused program of online events and in-person gatherings that provides an interface to NASA astrophysics. It is motivated by an immediate need to develop the next generation of the STEM workforce in space-related fields. The program includes an ongoing series of virtual colloquia, called *Cosmic Chatter*, that addresses astrophysics research and professional development topics. The program also includes virtual hack-a-thons that offer instruction for analyzing NASA mission and archival datasets. Finally, the program sponsors in-person sessions at professional society meetings and opportunities for engagement with NASA astrophysics Program Analysis Groups.

Cosmic Pathfinders Program Goals

 Promote Open Dialogue: The program initiates discussions on prominent challenges that students face in today's STEM professional landscape.



Image credit: Ronald Gamble, NASA Goddard Space Flight Center/University of Maryland, College Park

COPAG Strategic Plan



Introduction

The Cosmic Origins Program Analysis Group (COPAG) undertook a thorough strategic planning process during Spring 2023. The process was kicked off with a 2-day meeting on May 11 and 12 at the Keck Center Think Tank.

This report is the culmination of this extensive process. This strategic plan will guide COPAG over the next five years and beyond as we transform into a more focused, responsive, and collaborative organization.

Our commitment to community and our desire to serve that community with the highest level of engagement and inclusion will be strengthened by the implementation of this far-reaching plan.

Our executive committee will use this strategic plan as a road map into the future, guiding our analysis, processes, and interactions with the community and NASA. The COPAG-EC will measure progress towards the established goals of this plan periodically in order to ensure our vision is kept on target.

The COPAG-EC and leaders of the COPAG-affiliated Science Interest Groups have a great deal of enthusiasm for this strategic plan. Its implementation will only ensure the successful future and effectiveness of COPAG to serve the astrophysics community and help NASA uncover mysteries of the Universe and discover our cosmic origins.

Shouleh Nikzad, Ph.D. Chair⁻, COPAG EC Manuel Bautista, Ph.D.

Peter Kurczynski, Ph.D.

NASA HQ Program Scientist

Chief Scientist, COR

Sabrina Stierwalt, Ph.D.

Vice-chair, COPAG EC

Swara Ravindranath, Ph.D.

Deputy Chief Scientist, COR

Framework

•Our•Strategic•Framework¶

Our Mission X

We connect the astrophysics community with NASA through inclusive engagement and analyses of science, technology, and workforce interests in the pursuit of discovery of our cosmic origins.

Our Goals X

- 1. COPAG establishes the science and technology scope of Cosmic Origins
- 2.→COPAG is critical to achieving NASA astrophysics strategic goals¶
- 3. COPAG works effectively through close cooperation with the Cosmic Origins Program Office and HQ
- 4.→COPAG fosters a more diverse and inclusive community¶
- 5. COPAG empowers and engages a diverse astrophysics community
- 6. COPAG and the Cosmic Origins Program Office ensure transparent and timely communication with the astrophysics community

Our-Vision¤

We have empowered and engaged a diverse community to discover our cosmic origins and realize NASA's vision to explore the secrets of the universe for the benefit of all.











Visionary | Inclusivity | Integrity | Excellence

Our Core Values x

Sample Strategic Objectives & Assignments

Goal 3: COPAG works effectively through close cooperation with the Cosmic O Program Office and HQ

Business Results: Collaboration; clearly defined relationships	
Strategic Objectives	Target Date
 A clear streamlined communication structure between the COPAG, the Program Office, and HQ 	Aug 2023
 Management plan defining the relationships between COPAG – Program Office – NASA HQ 	Aug 2023
3. Every COPAG EC members has an assigned objective (e.g., strategic plan)	Aug 2023
a. Onboarding process for new EC members	
b. Assign new COPAG EC members with individual objectives	
4. Engagement plan for in-person and virtual events with EC and with HQ	Sep 2023
5. Operations manual for COPAG events and presentations and SIG activities (e.g., booths at conferences)	Mar 2024
a. Best practices for engaging APAC and HQ	

Sample Community Engagement Activities Ongoing and in Planning

2024 Winter AAS

- Splinter sessions planned
- Joint PAG participation—Proposed a new format to/with other PAG
 Chairs to potentially to have more community engagement
 - Cross PAG short presentations
 - Panel with APD Director and PAG EC Chairs
 - Open Q&A
- Participating in the booths to engage the community

Community Townhall

Planning a virtual Town Hall to share information with and hear from the community

Workshops

Working on a series of Cross PAG Workshop toward working with astrophysics community toward HWO





COSMIC ORIGINS Program Analysis Group EXECUTIVE COMMITTEE:

Objective

To make progress in bringing together the COR community and the Exoplanet community to discuss common goals, desired capabilities in HWO, identify progress and challenges

COR –Exo Mini workshop Keck Think Tank, Pasadena, CA

Who Attended

COPAG –EC members COPAG SIG and STIG leads/members

COR CS and DCS; Exo CS

COR PS

COR/PhysCOS PM; ExEP PM

COR-UV WG Lead; ExEP WG Lead

JPL Astrophysics CS, PIV

*Keck INSTITUTE FOR SPACE STUDIES

May 10, 2023



- Introduction and Welcome—Peter Kurczynski and Shouleh Nikzad
- A word from sponsors Barb Grofic and Gary Blackwood
- Science Questions from Decadal and their mapping to missions—David Ardila (EXOPAG Member)
- Exoplanet Science Gaps with Karl Stapelfeldt (EXEP Chief Scientist)
- UV Short wavelength cutoff, science justification, technology requirement, and status—Stephan McCandliss
- Coronagraph requirements for exoplanet science—Bertrand Mennessen (EXOPAG Member)
- Coatings technology: description and status—John Hennessy (UV WG)
- Outline the next steps



Other Community Engagement Activities

Ron Gamble has been working toward creating opportunities for students involvement

Black Space Week, White House, June 20, 2023
The Artemis Generation Round Table

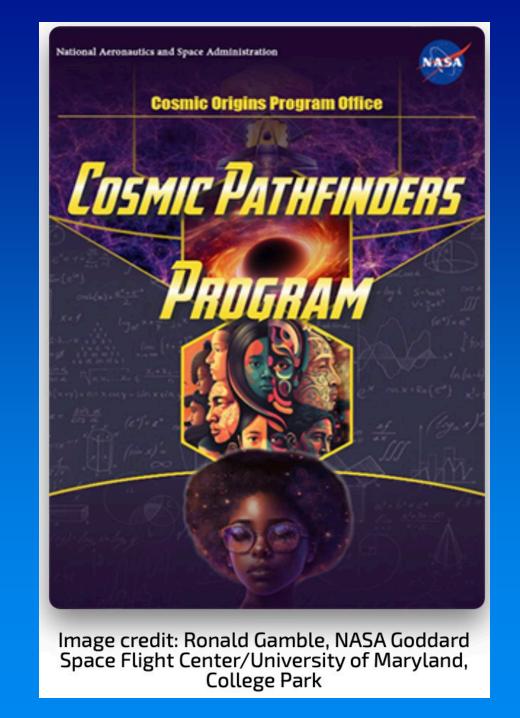


Cosmic Pathfinders Program

Cosmic Pathfinders is a student-focused program of online events and in-person gatherings that provides an interface to NASA astrophysics. It is motivated by an immediate need to develop the next generation of the STEM workforce in space-related fields. The program includes an ongoing series of virtual colloquia, called *Cosmic Chatter*, that addresses astrophysics research and professional development topics. The program also includes virtual hack-a-thons that offer instruction for analyzing NASA mission and archival datasets. Finally, the program sponsors in-person sessions at professional society meetings and opportunities for engagement with NASA astrophysics Program Analysis Groups.

Cosmic Pathfinders Program Goals

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https://cor.gsfc.nasa.gov/copag/program/cosmic-pathfinders.php

UV Working Group: Science and Technology White Paper

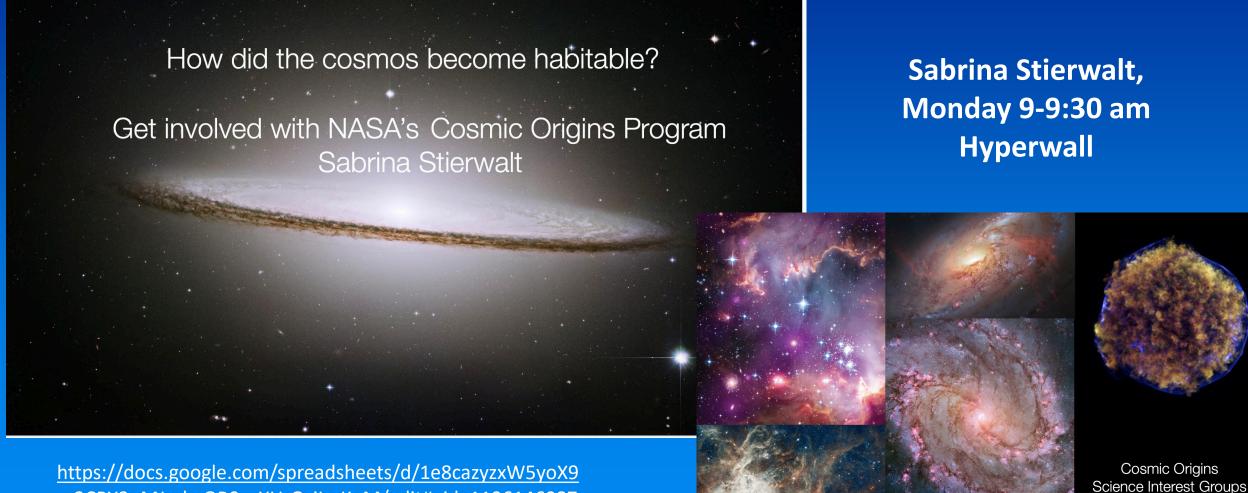
Co-Chairs: Sarah Tuttle (UW, Seattle) & Mark Matsamura (GSFC)

Goal: Create a foundational document to capture UV driving science, current status of UV technology crucial to HWO development, and specify areas needed to focus development to reach notional requirements. Capture key technical advancements in one location to encourage broad engagement in pathfinding missions

- Working Group initiated in July
- Meeting Participation
 - Exoplanet/UV Science Mini Workshop in March 2023
 - July 2023 Science w/HWO Meeting at STSci multiple presentations & Tech Day Participation
 - Presentation at CGM meeting in September 2023
- See Presentation by Sarah Tuttle: Up next in this session and in the UVSTIG/Mind the Gap splinter on Tuesday

Hyperwall Talks

"How did the cosmos become habitable? Get involved with NASA's Cosmic Origins Program"



https://docs.google.com/spreadsheets/d/1e8cazyzxW5yoX9 m2CBX2nMJmhvOR0xyXUrOsil-eKnM/edit#gid=1196146087

Astronomy on Tap

https://astronomyontap.org/event/aot-all-stars-krewe-at-aas-243/

AoT All-Stars Krewe at AAS 243

January 9 @ 7:00 PM - 10:00 PM CST FREE



Celebrate stars of all kinds at a very special event during AAS 243 in New Orleans, LA at Republic NOLA!

The worldwide phenomenon of <u>Astronomy on Tap</u> is coming to New Orleans for this first time and what could be their biggest event ever! Experience space like never before with accessible, engaging presentations directly from the scientists who research it, along with music, trivia, prizes, giveaways, and more! There is always lots of time to ask questions and interact with the presenters and other scientists who inevitably tag along for the fun. Doors & food trucks at 6 pm, show starts at 7 pm.

Learn about stars and planets, black holes, distant galaxies, the most exciting astronomy news, and more, and interact with hundreds of scientists in town for the "Super Bowl" of astronomy, the 243rd meeting of the American Astronomical Society.

Presenters include:

- <u>Dr. Ronald S. Gamble, Jr, Ph.D.</u>, theoretical astrophysicist at <u>NASA's Goddard Space Flight Center</u> and University of Maryland at College Park
- Prof. Natalie Hinkel, Ph.D., planetary astrophysicist and assistant professor at Louisiana State University
- Prof. Emily Rice, Ph.D., co-founder of Astronomy on Tap and lead of its worldwide HQ
- Host Stars past, present, and future from AoT satellites around the world!

Attendees must <u>register for FREE tickets on Eventbrite</u> and acknowledge that the AAS disclaims all responsibility and liability for the event.

Food trucks will be parked outside the venue starting at 6 pm!

UVSTIG/Mind the Gap

The Mind the Gap Organizing Committee &

Ultraviolet/Visual Science Interest Group of the Cosmic Origins Program Analysis Group (UVSTIG - COPAG) invite you to attend joint Splinter Sessions on at the 243 meeting of the AAS in New Orleans on Tuesday 09 January 2024

Morning Session (09:30 - 11:30) and Afternoon Session (13:30 - 15:30) (currently scheduled) in room R07 (2nd floor) of the Ernest N. Morial Convention Center

There will be a 10-20 year gap between the end of the Hubble Space Telescope (HST) mission and the beginning of a new flagship mission with ultraviolet spectroscopic capabilities. In the interim, what science should potential small- and modest-sized missions focus on as precursor efforts that advance conceptual and technical readiness and foster core-excellence in early career scientists who will go on to be mainstream uses of future flagship missions.

The sessions are organized around 3 topics:

- 1) Science goals that define UV spectroscopy and/or spectropolarimetry at various resolving powers and spatial resolution, that might be achievable in the next 10-15 years in preparation for HWO.
- 2) Current status of UV optical components, detectors and future technology developments
- 3) Description of missions under implementation that seek to leverage technology states of the art to address high priority science

This meeting is an opportunity for the astronomers interested in UV observations and researchers focused in improving UV observational tools (including detectors, mirror coatings and other new technologies) to gather and discuss science goals, current technical readiness and potential future technology capabilities needed to meet these science goals.

Virtual Attendance will be available (no AAS registration necessary). See program speakers and abstracts in pdf attachment slides 2 - 5; Convention Center Map, slides 6, 7

NASA COPAG AAS243 activities can be found at https://cor.gsfc.nasa.gov/news/2023/COPAG_Session_at_AAS_Winter.php

Mind the Gap Organizing Committee:

Joy Nichols - Harvard & Smithsonian CfA Carol Grady - Eureka Scientific Ted Gull - NASA/GSFC (Emeritus) & STSci Erika Hamden - University of Arizona Keri Hoadley - University of Iowa Al Holm - Retired; STSci Operations Geraldine Peters - USC Paul Scowen - GSFC/NASA

Chris Shrader - GSFC NASA Sarah Tuttle - University of Washington

UVSTIG Leadership Committee:

Stephan McCandliss - Johns Hopkins University
Jason Tumlinson - STScI
Sarah Tuttle - University of Washington
Camden Ertley - SWRI
Derek Buzasi - Florida Gulf Coast University
Kevin France - University of Colorado, Boulder
Allison Youngblood - GSFC
John Hennessy - JPL
Erika Hamden - University of Arizona
Emily Witt - University of Colorado, Boulder
Keri Hoadley - University of Iowa, Iowa City
Shouleh Nikzad - JPL

Upcoming UV Science and Spectroscopy Workshop

When: Late Spring

Where: JPL, Pasadena

Who: You

More information Coming soon!

How can I get involved?

Visit the Cosmic Origins website

https://cor.gsfc.nasa.gov

https://cor.gsfc.nasa.gov/copag/

Join the Cosmic Origins email distribution list

COR-News-join@lists.nasa.gov with Subject="join"

Join a Science Interest Group

https://cor.gsfc.nasa.gov/sigs/sigs.php'

Cosmic Origins

About Cosmic Origins

Community

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About Cosmic Origins

How did we get here?

Answering this question is one of the key goals in NASA's Astrophysics Division, and is the main objective of its Cosmic Origins (COR) Program.

Here are some of the topics our work focuses on:

- Stellar lifecycles and the evolution of the elements
- Early formation and evolution of planetary systems
- Archaeology of the Milky Way and its neighbors
- History and evolution of galaxies and supermassive black holes
- First light and reionization

No one mission or observatory can provide all the answers. The Cosmic Origins Program includes telescopes that together operate across much of the electromagnetic spectrum. From the iconic Hubble Space Telescope's groundbreaking science to the future discoveries awaiting us with the James Webb Space Telescope and more to come, Cosmic Origin's facilities help us in our search for answers to the biggest questions about our universe and its origins.

American Astronomical Society Meeting, 8–12 January 2023

Join us at the 241st meeting of the American Astronomical Society in Seattle, Washington, 8–12 January 2023! The January AAS meeting is the largest yearly gathering of astronomers in North America. The Cosmic Origins Program Office supports a number of sessions and an exhibit booth at this meeting!

For information on Cosmic Origins Program related sessions at the AAS meeting, click here.

If you're at the meeting, stop by the NASA Exhibit Booth and say "Hi!"

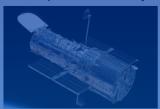
Here are some other ways you can get involved with Cosmic Origins:

How you can get involved

- Join a Science Interest Group: https://cor.gsfc.nasa.gov/copag/
- Sign up for newsletter: https://cor.gsfc.nasa.gov/cor-news-mailing-list.php



NASA, SpaceX to Study Hubble Telescope Reboost Possibility



NASA and SpaceX have signed a Space Act Agreement to study the feasibility of a SpaceX idea to boost Hubble into a higher orbit with the Dragon spacecraft, at no cost to the government. Read more.

COR News and Events

See our new Events Calendar

Current and Upcoming Events

Continuing Call for Nominations to the Cosmic Origins Program Analysis Group (COPAG) Executive Committee. »
Details.

8-12 January 2023

241st meeting of the American
Astronomical Society, Seattle, Washington

Join the COR News Email Lis

Program News and Announcements

2 December 2022

Join the New Great Observatories Science
Analysis Group » Details.

17 November 2022

JWST/Cosmic Origins Science Presented to US Congress! » Details.

31 October 2022

Cosmic Origins Program Analysis Group Executive Committee Nominations »

9 September 202

How can I get involved? Habitable Worlds Observatory

https://submissions.mirasmart.com/AAS243/Itinerary/EventDetail.aspx?evt=246

AAS 243 Winter Meeting 1/4/24, 3:39 PM

Wednesday, January 10, 2024 | 12:45 PM CT - 3:30 PM CT

Session Title

The Habitable Worlds Observatory: Current Status and Opportunities for Engagement

Session Type

Splinters

Room

R08 / R09

Summary

Through the new Great Observatory Mission & Technology Maturation Program (GOMAP), NASA is preparing for the upcoming Habitable Worlds Observatory (HWO), a large UV/optical/IR space telescope recommended by the 2020 Decadal Survey on Astronomy and Astrophysics. HWO will conduct a variety of transformative astrophysics observations, including examination of the lifecycle of galaxies, studying the diversity of worlds in and beyond our Solar System, and searching for signs of life by directly imaging and obtaining spectra of roughly 25 habitable zone planets. At this splinter session, we will review the goals and progress of the recently formed Science, Technology, Architecture Review Team (START) and Technical Assessment Group (TAG), highlighting opportunities for community members to contribute to the project via working group membership, meeting attendance, papers, proposals, and other activities. We will also invite any other HWO teams or groups to share their progress/results, including technology roadmap teams, Science Assessment Groups, and research teams funded to conduct HWO-relevant work. The session will also feature an extended discussion session.

Where can I learn more? How to spend my time at the AAS?

Meeting Schedule

Saturday, 6 January 2024

Astronomy on Tap at AAS 243

▼ Schedule

Event	Time	Location
Physics of the Cosmos & Cosmic Origins + Astronomy on Tap event [Flyer PDF]	7:00pm – 9:00 pm CT	The Den @ the Howlin' Wolf, 907 S. Peters St., New Orleans

- Ryan Hickox (Dartmouth College): Supermassive Black Holes: Monsters of the Universe
- Trivia Game: Challenge your cosmic knowledge and participate in our interactive trivia game. Prizes await those who showcase their astronomical prowess.
- Rachael Beaton (STScI): From the Big Bang to Biosignatures: Revealing the ~14 Billion Year Story of How the Cosmos Became Habitable with NASA

Ernest N. Morial Convention Center

Sunday, 7 January 2024

▼ Schedule

Meeting	Time	Location
Cosmic Origins Program Analysis Group (COPAG) [Agenda]	9:00am – 1:00 pm CT	Room: 244 / 245
TDAMM SIG Session [Agenda]	2:00pm – 3:00pm CT	Room: 244 / 245
NASA Joint Program Analysis Group (Joint PAG) [Agenda]	3:00pm – 5:00 pm CT	Room: 244 / 245

Monday, 8 January 2024

▼ Schedule

Meeting	Time	Location
NASA Town Hall	12:45pm – 1:45pm CT	Great Hall A
NASA's Cosmic Pathfinders Program [Agenda]	1:00pm – 2:30pm CT	Room: 219

Monday, 8 January through Wednesday, 10 January 2024

▼ Schedule

Event	Time	Location
Five Minute Formulation Activity	9:00am – 6:30 pm CT	NASA Booth, AAS Exhibit Hall

Tuesday, 9 January 2024

▼ Schedule

Meeting	Time	Location
Infrared Science & Technology Integration Group (IR STIG) [Agenda]	9:00am – 10:30am CT	Room: 242
UV STIG Mind the GAP Morning Sessions [Agenda] [Flyer PDF]	9:30am – 11:30am CT	Room: R07
UV STIG Mind the Gap Afternoon Sessions [Agenda] [Flyer PDF]	1:30pm – 3:30pm CT	Room: R07

Question?