



# Physics of the Cosmos Program Analysis Group



Exploring fundamental questions regarding the physical forces of the universe

**Athina Meli**

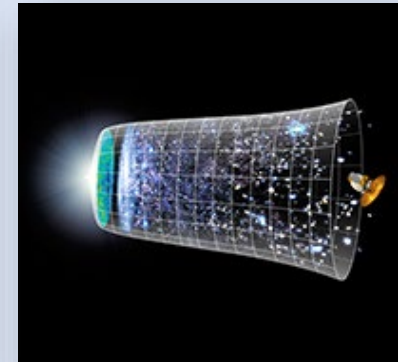
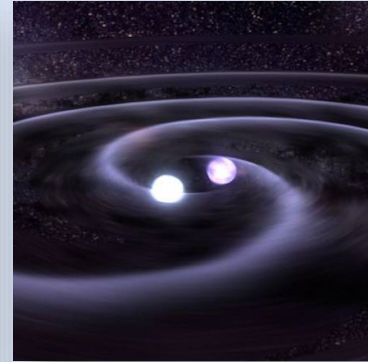
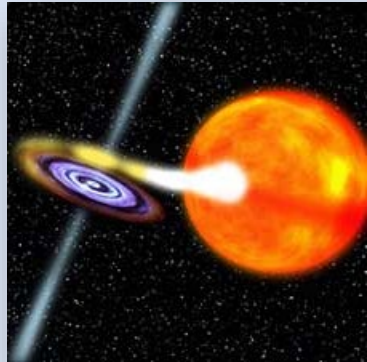
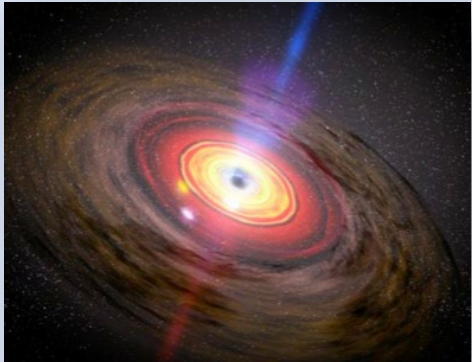
North Carolina A&T State University, Greensboro

*Chair of Physics of the Cosmos Program Analysis Group Executive Committee*

[ameli@ncat.edu](mailto:ameli@ncat.edu)

*APAC Meeting March 20, 2024*

# Physics of the Cosmos Science Objectives

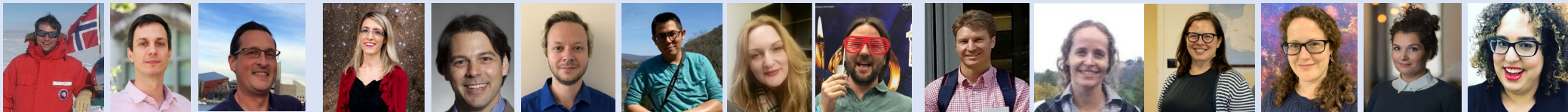
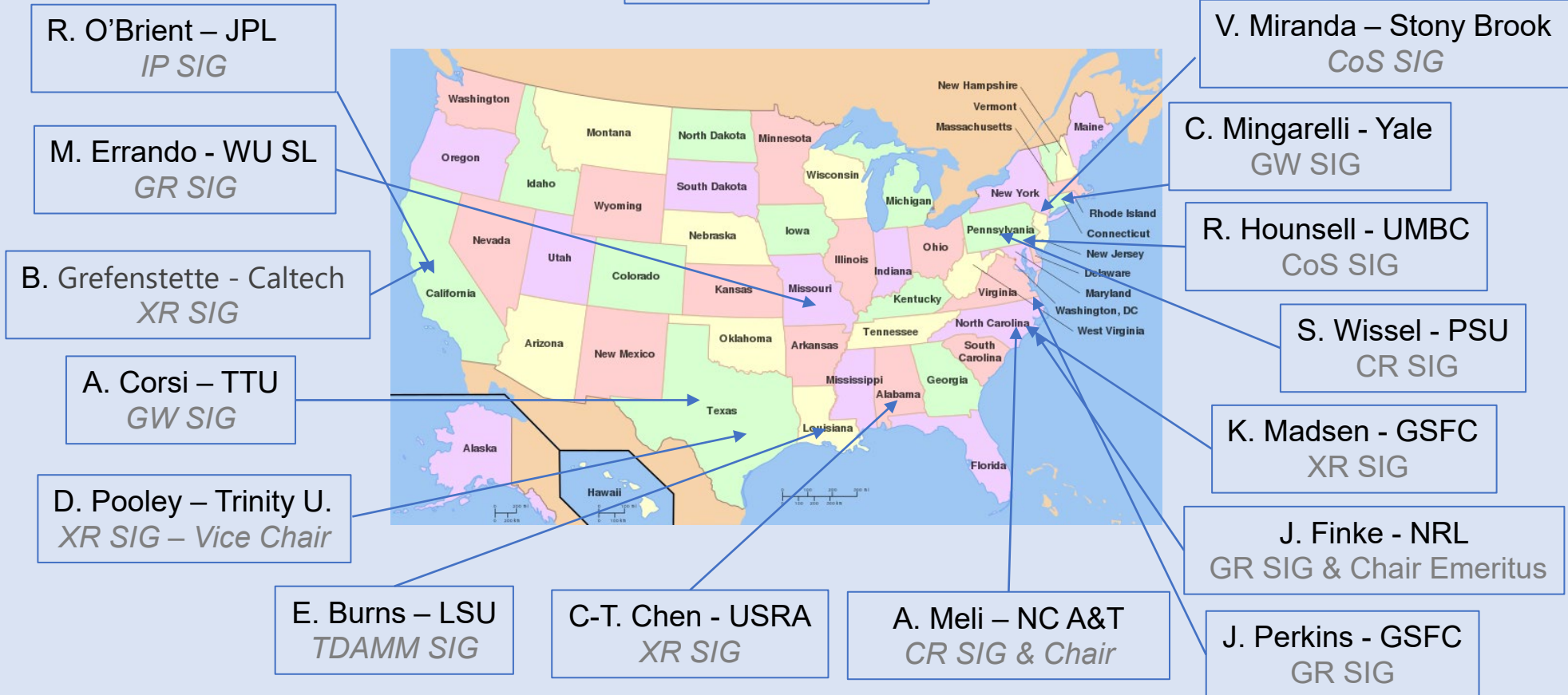


- **Dark Energy**
- **Big Bang and the Evolution of the Universe**
- **Dark Matter and Cosmic Structure**
- **General Relativity and the Nature of Spacetime**
- **Massive Black Holes and the Evolution of Galaxies**
- **Matter and Energy in the Most Extreme Environments**

# PhysPAG Executive Committee - 2024



## Fifteen Members



# PhysPAG Executive Committee - 2024



Name	Institution	Expertise	Term
Justin Finke (Chair Emeritus)	Naval Research Laboratory	GR SIG	Dec 2020 – Dec 2024
Athina Meli (Chair)	North Carolina A&T	CR SIG	Dec 2021 – Dec 2024
David Pooley (Vice Chair)	Trinity University	XR SIG	Dec 2021 – Dec 2024
Eric Burns	Louisiana State University	TDAMM SIG	Dec 2021 – Dec 2024
Kristin Madsen	NASA / GSFC	XR SIG	Dec 2021 – Dec 2024
Chiara Mingarelli	U Connecticut	GW SIG	Feb 2023 – Dec 2025
Alessandra Corsi	Texas Tech	GW SIG	Feb 2023 – Dec 2025
Chien-Ting Chen	USRA / MSFC	XR SIG	Feb 2023 – Dec 2025
Roger O'Brient	JPL	IP SIG	Feb 2023 – Dec 2025
Rebekah Hounsell	UMBC / GSFC	CoS SIG / TDAMM	Feb 2023 – Dec 2025
Manel Errando	Washington U. St. Louis	GR SIG	Feb 2023 – Dec 2025
Brian Grefenstette	Caltech	XR SIG / HWO	Jan 2024 – Dec 2026
Vivian Miranda	Stony Brook	CoS SIG	Jan 2024 – Dec 2026
Jeremy Perkins	NASA / GSFC	GR SIG	Jan 2024 – Dec 2026
Stephanie Wissel	Penn State	CR SIG	Jan 2024 – Dec 2026





# PhysCOS Scientists

- **PhysCOS Chief Scientists: Francesca Civano, Brian Humensky**
- **PhysCOS Support Scientist: Bernard Kelly**
- **Project Support Specialist: Stephanie Clark**
- **Headquarters: Valerie Connaughton, Sanaz Vahidinia**



Dr. Francesca M. Civano  
Physics of the Cosmos  
Chief Scientist



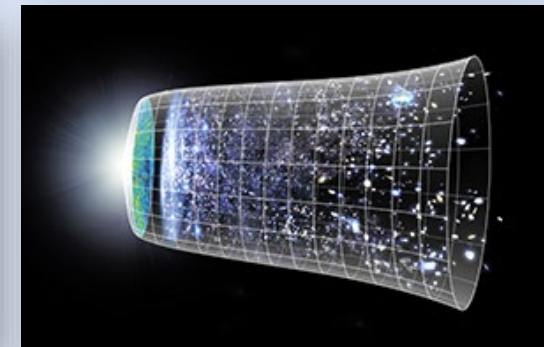
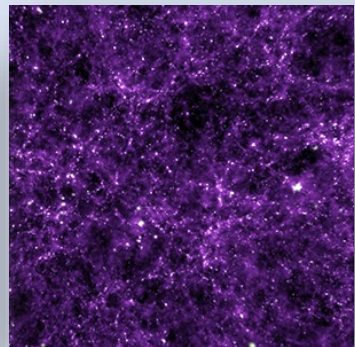
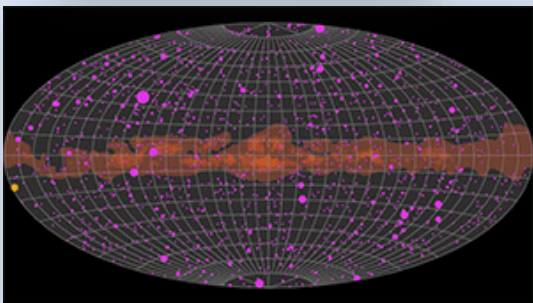
Dr. Brian Humensky  
Physics of the Cosmos  
Chief Scientist



Dr. Bernard J. Kelly  
Physics of the Cosmos  
Support Scientist

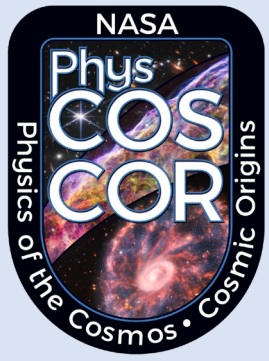
# Science Interest Groups (SIGs)

- Inflation Probe Science Interest Group (IP SIG)
- Cosmic Structure Science Interest Group (CoS SIG)
- Cosmic Ray Science Interest Group (CR SIG)
- Gamma-ray Science Interest Group (GR SIG)
- Gravitational Wave Science Interest Group (GW SIG)
- X-ray Science Interest Group (XR SIG)
- Time domain and Multi-Messenger Science Interest Group (TDAMM SIG)

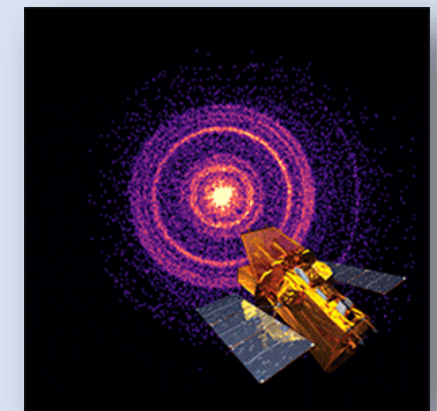
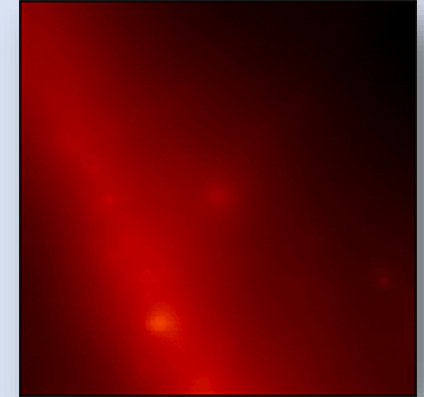
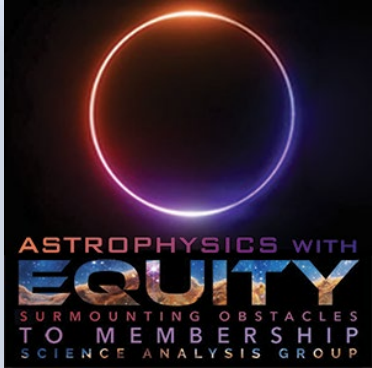




# Science Analysis Groups (SAGs)

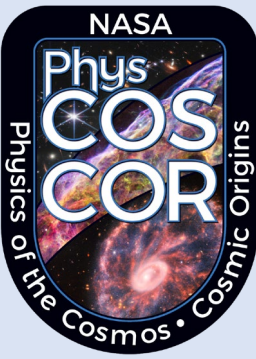


- New Great Observatories (NGO) SAG (cross-PAG)
- Astrophysics with Equity, Surmounting Obstacles to Membership: AWESOM SAG (cross-PAG)
- Time-domain and Multi-Messenger Communications (TDAMMCOM) SAG
- Future Innovations in Gamma-ray Science (FIGS) SAG
- The Gamma-ray Transient Network Science Analysis Group (GTN SAG) (*Completed*)



# Physics of the Cosmos

Exploring fundamental questions regarding the physical forces



## Physics of the Cosmos Program Analysis Group (PhysPAG)

### Meetings

*APS Meeting April 2024*

Sacramento, California & Virtual

3 – 6 April 2024

*HEAD 21 21st Meeting of the High Energy Astrophysics Division*

Horseshoe Bay Resort, Horseshoe Bay, Texas

7 – 12 April 2024

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### Recent Meetings

*243rd Meeting of the American Astronomical Society*

New Orleans, Louisiana

7 – 11 January 2024

»» [PhysCOS & PhysPAG Meeting Schedule](#)

*National Society of Black Physicists (NSBP) Conference*

Knoxville, Tennessee

9 – 12 November 2023

»» [PhysCOS Welcome](#)

*SACNAS National Diversity in STEM Conference*

Portland, Oregon

26 – 28 October 2023

»» [PhysCOS Welcome](#)

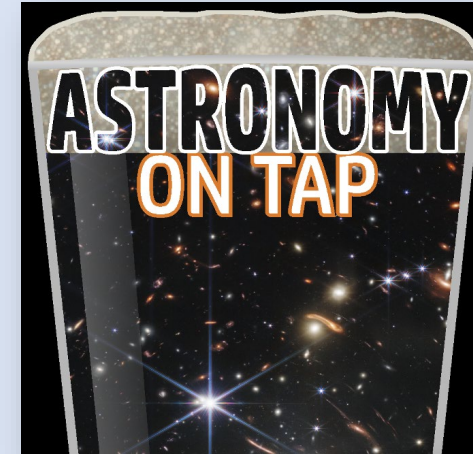


# 243<sup>rd</sup> AAS Meeting New Orleans 7-11 January 2024



- Astronomy on Tap event at the Howlin' Wolf to open AAS.
- PhysPAG session: all day event with science presentations (~70 attendees)
- Joint PAG town hall
- Splinter sessions for Gamma-Ray & Gravitational Wave SIGs: well attended with science presentations and young audience.



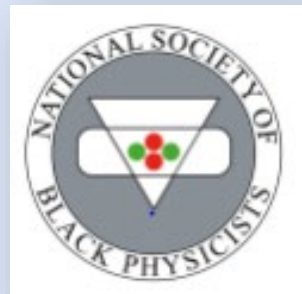


**AAS 243 - NOLA 2024**

**Kick-off AAS - Astronomy on Tap event**



# 2023 NSBP Annual Conference Knoxville Tennessee 9-12 November 2023



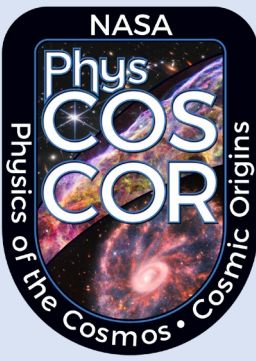


# SACNAS National Diversity in STEM Conference Portland, Oregon 26 – 28 October 2023



NASA Science at SACNAS 2023

# GW-SIG update



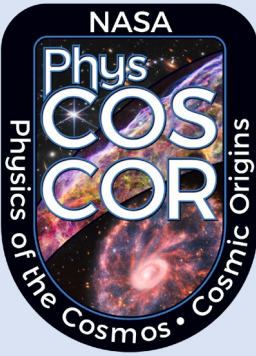
**Co-chairs: Chiara Mingarelli, Alessandra Corsi**

## **Presence at the January AAS meeting:**

- Welcome and overview from Chiara Mingarelli, GW SIG co-chair
- Neil Cornish, “Links between LIGO and LISA science”
- Magda Siwek, “Signatures of Circumbinary Disk Physics in Massive Black Hole Binaries”
- Joe Simon, “Astrophysics with the NANOGrav 15 year data”

## **Currently planning discussion on:**

- **Topics of common interests covered by TDAMM SIG (and potentially GR-SIG)**
- **How to structure our talk at the 2024 April APS meeting:**
  - Nominally an overview by co-chair Alessandra Corsi, but they would like to make it an opportunity for discussing new funding opportunities at NSF; LISA science (in view of LISA adoption) and LISA Preparatory Science (ROSES-2024); LIGO upcoming O4b run; results from the NSF panel on the next-generation GW detector concepts.



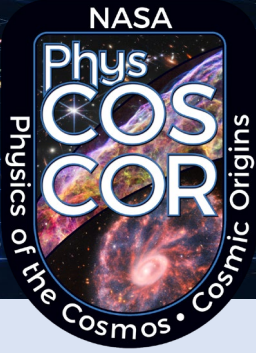
# TDAMM SIG update

- **Co-chairs:** Eric Burns, Rebekah Hounsell, Brad Cenko (COPAG), Ian Crossfield (EXOPAG)
- **Cross-PAG SIG, currently 147 members on mailing list**
- **First in-person meeting at the Winter AAS meeting**
- **First virtual meeting (Mar. 1) with 72 attendees**
  - **Opening talk by Fiona Harrison on the Decadal and TDAMM**
  - **Broad discussion between Fiona and members**
    - Identified the key need for NASA to build the Decadal-recommended standing committee to provide TDAMM priority recommendations this decade
    - Emphasis on the Decadal priorities, with TDAMM as the top sustaining activity (noting the separate recommendation pipe for GOMAP and (what is now) HWO)
- **Working through next steps and plans for future meetings.**



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# CoS SIG update



- **Co-chairs:** Rebekah Hounsell, *Vivian Miranda (welcome)*
- **Last Virtual Meeting:** January 4th with Dr. Leonidas Moustakas - “A Euclid Dark Energy Mission Overview”
- **In person meeting at AAS 243 - 3 speakers:**
  - Jordan Mirocha: Astrophysics and cosmology with SPHEREx
  - Remy Gerras: Updates on Simons Observatory
  - Dan Scolnic: Cosmological Measurements with Roman from Type Ia Supernovae
- **Next Virtual Meeting:** Planned for March with a talk by Dr. Maria Vincenzi about the DES 5 years results.

# Gamma-ray SIG update



- **Co-chairs:** Manel Errando, Justin Finke, *Jeremy Perkins (welcome)*
- **Continue regular webinar series (Nov 17, Feb 16).**
  - Discussed Fermi as a gravitational wave detector, PhysPAG science gaps, FIG SAG updates
- **Session planned at HEAD meeting in April**
  - Talks on magnetar flares, neutrino-gamma-ray connection, FIG SAG update
- **Science Gaps**
  - 17 science gaps related to GR SIG submitted

# CR – SIG update



- **Co-chairs: Athina Meli, *Stephanie Wissel (welcome)***
- **Chairs meet regularly (with the PhysCOS staff)**

## → Immediate plans

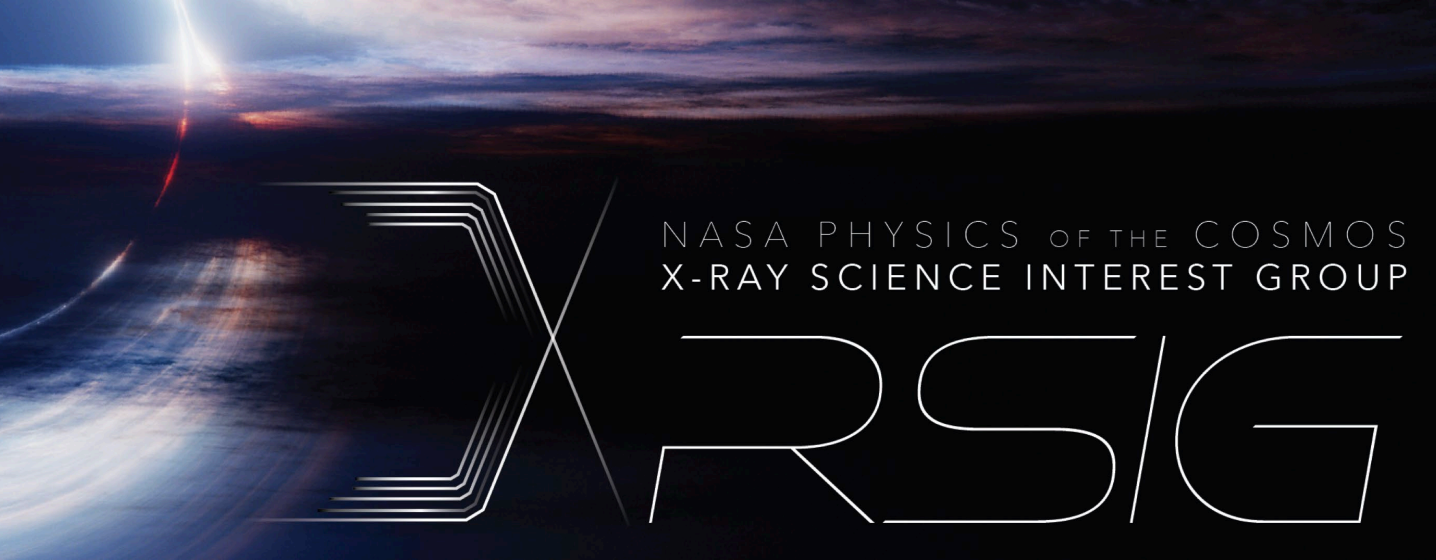
- **Collect and expand members of the CR Sig list (140 members currently).**
  - Email leaders of relevant collaborations - invite them to invite their members to join the email list.
- **Organize more virtual meetings of the CR SIG (Sept 2024 AMS/Helix)**
  - Include a programmatic overview and discussion session on the overall goals of the SIG including where the field is going in the next 5-10 years, the next topics in CRs and neutrinos
  - Determine the goal / mandate of the CR SIG collectively within the different groups
  - Plan the science drivers for Astro2030
  - Would there be a probe study to begin now relevant for Astro2030?
- **Aiming to plan a session at the ICRC 2025 (Geneva)**
- **Co-Chair/EC chair (Meli) to attend and present at 2024 HEAD Meeting**





# Future In Gamma-rays SIG (FIG SAG) update

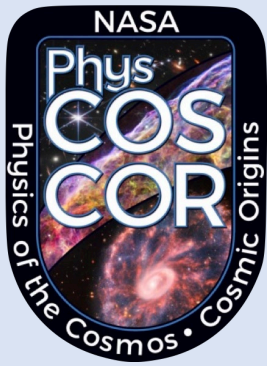
- **Co-chairs: Chris Fryer (co-lead), Michelle Hui (co-lead), Paolo Coppi, Milena Crnogorčević, Tiffany Lewis, Marcos Santander, and Zorawar Wadiasingh**
- **Focused on answering question:** *what science has not or cannot be done with existing or funded space-based gamma-ray instrumentation?*
- **Kickoff meeting at January 2024 AAS**
- **First virtual meeting February 29 > 100 attendees from astrophysics and particle physics communities**
- **Session at HEAD meeting in April**

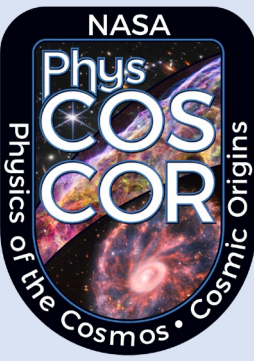


- **Co-chairs: Chien-Ting Chen, Kristin Madsen, David Pooley, *Brian Grefenstette (welcome)***
- **Late 2023: Online townhall for the Precursor Science Gap discussion**
- **AAS 243: XRSIG session included XRISM and Athena updates, and a Precursor Science Gap discussion.**
- **Upcoming 21<sup>st</sup> HEAD meeting XRSIG Session:**
  - CfA director Lisa Kewley to address the HEAD community in support for Chandra
  - Determine community interest in a SAG to address post-Chandra era
  - Soliciting X-ray science talks for early career scientists or non-probe mission concepts

# Existential threat to X-ray Astronomy

- Chandra GO budget cut by 30% this year.
- This comes after 24 years of no increases in GO funds.
- The X-ray community has been struggling, and now it is in danger. Chandra GO is one of the main sources of support for X-ray astronomy in the US.
- The proposed FY25 and beyond cuts to Chandra will reduce funding to the X-ray community to a level that will make it nearly impossible to attract new members to the field.
- The community feels strongly that the Chandra GO program must be restored to previous levels.





# PhysPAG future activities

- **Recently the EC Chair suggested the idea of establishing a yearly “PhysCOS Workshop” targeting**
  - young researchers
  - HBCUs
  - Focus on building connections between the diverse areas of PhysCOS science (wide-ranging interests and goals <-> commonalities)
- ➔ Working through next steps and plans
- **Next year’s PhysPAG retreat to be hosted in NCA&T or Trinity University for a wider community outreach**





# PhysPAG EC Strategic Retreat Meeting 2024

**Date: May 15<sup>th</sup> and 16<sup>th</sup>**

**Location: Goddard HQ**

- **Goals**
  - Planning SIG and PAG activities for the year, including a new workshop
  - Discussing ideas for SAGs that would be useful
  - Building connections between PhysPAG and Roman
  - Building connections between EC members