

Updates from the 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

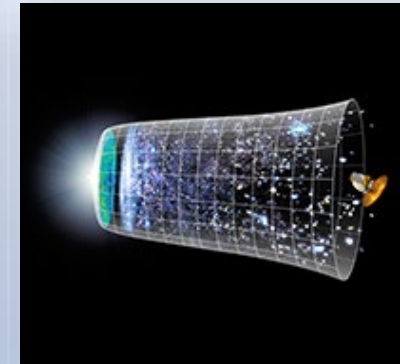
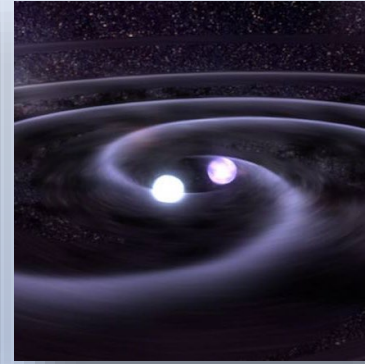
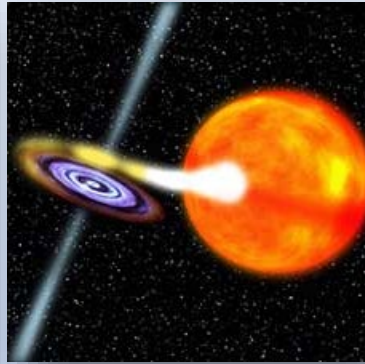
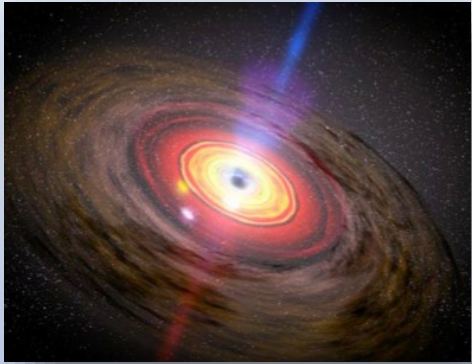
ameli@ncat.edu

21st Meeting of The High Energy Astrophysics Division

Horseshoe Bay Resort, Texas 7 – 12 April 2024

April 9, 2024

Physics of the Cosmos Science Objectives

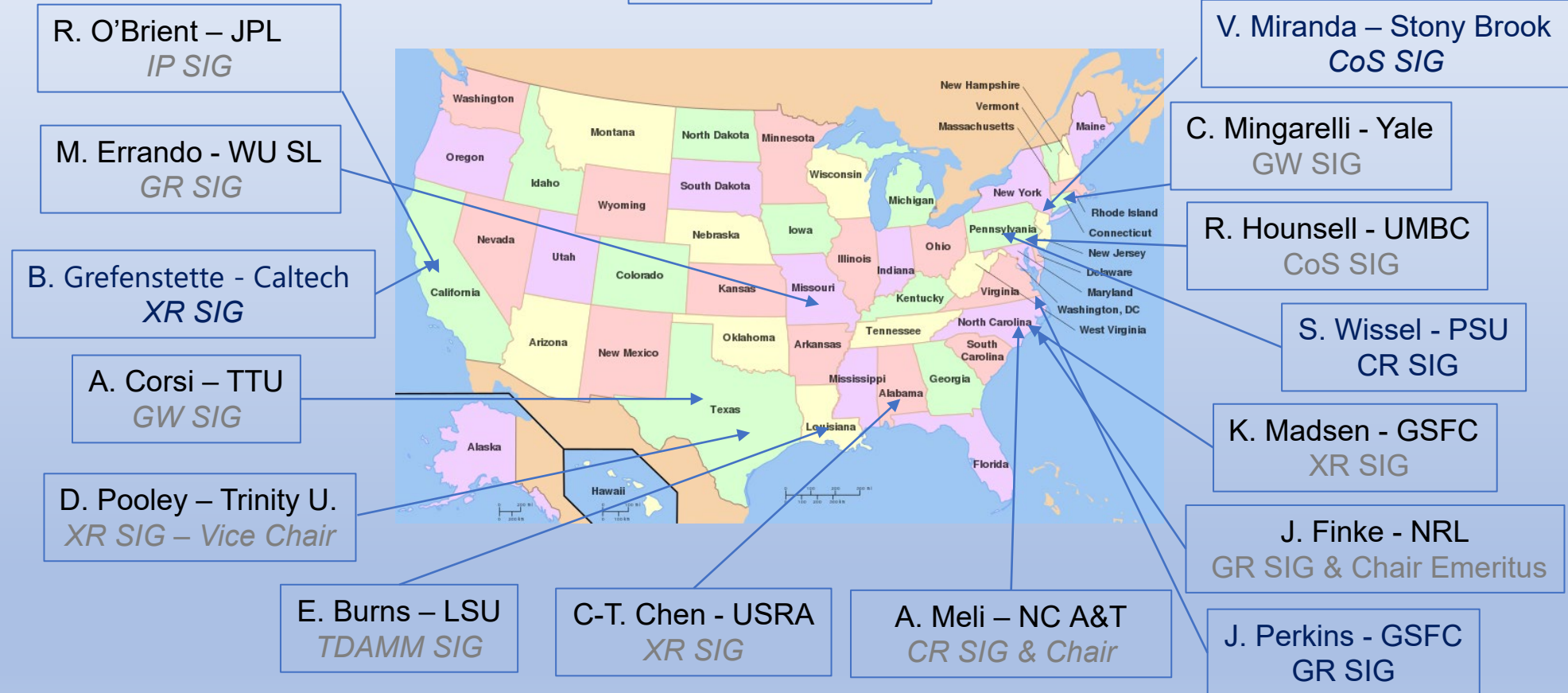


- **Dark Energy**
- **Big Bang and the Evolution of the Universe**
- **Dark Matter and Cosmic Structure**
- **General Relativity and the Nature of Spacetime**
- **Massive Black Holes and the Evolution of Galaxies**
- **Matter and Energy in the Most Extreme Environments**

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



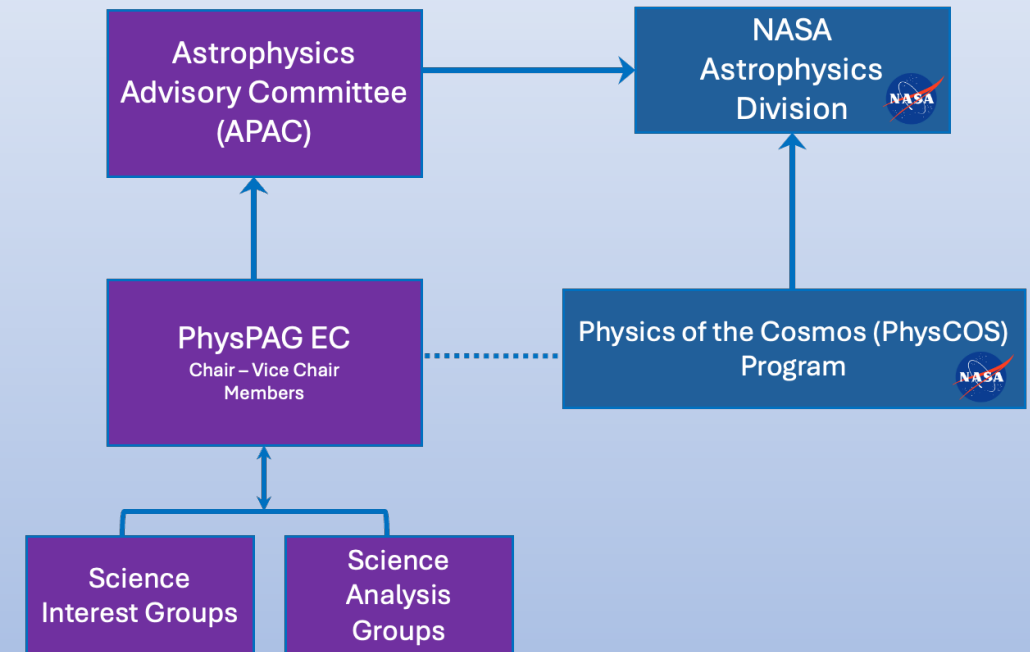
Dr. Brian Humensky
Physics of the Cosmos
Chief Scientist



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

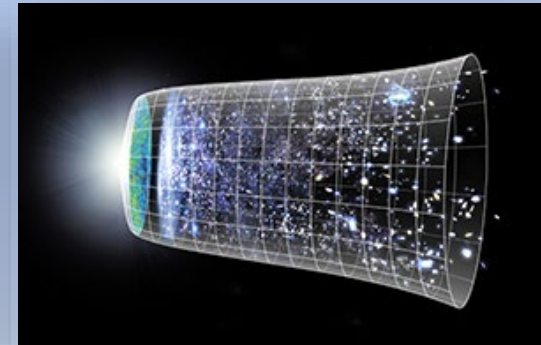
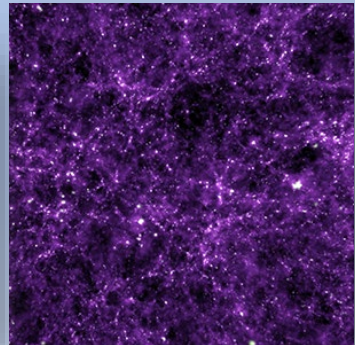
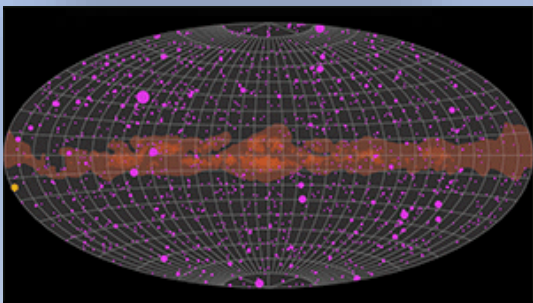
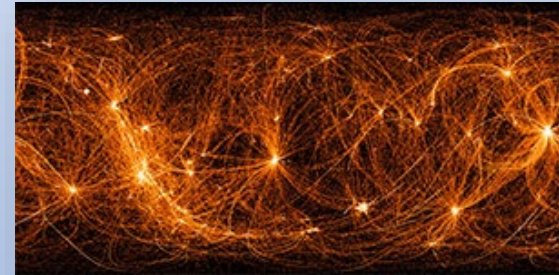
Science Interest Groups & Science Analysis Groups

- **Science Interest Groups** are community-led affinity groups focused on a particular area that are long-term.
 - Meet regularly to discuss science and technology developments, concerns in field
- **Science Analysis Groups** are stood up for a short term (1-2 years) to analyze a specific issue and deliver a report to APAC & Astrophysics Division.
 - Proposed by SIGs or requested by HQ
 - Membership open to any one interested



Science Interest Groups (SIGs)

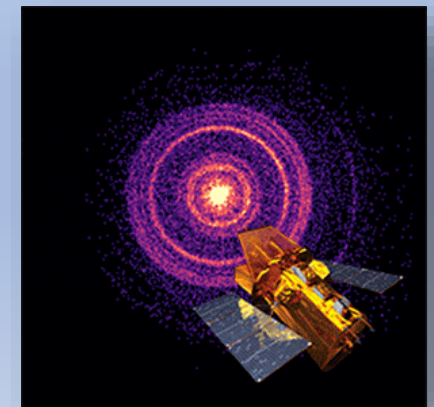
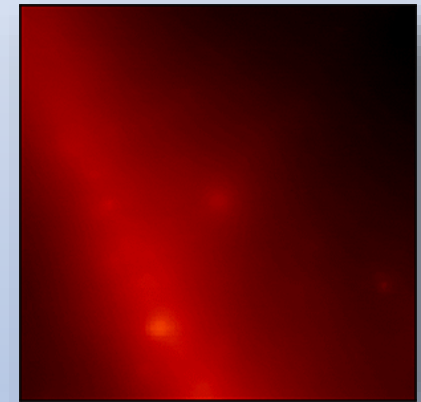
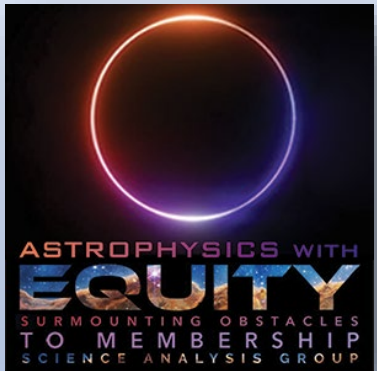
- Inflation Probe Science Interest Group (IP SIG)
- Cosmic Structure Science Interest Group (CoS SIG)
- Cosmic Ray Science Interest Group (CR SIG)
- Gamma-ray Science Interest Group (GR SIG)
- Gravitational Wave Science Interest Group (GW SIG)
- X-ray Science Interest Group (XR SIG)
- Time domain and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

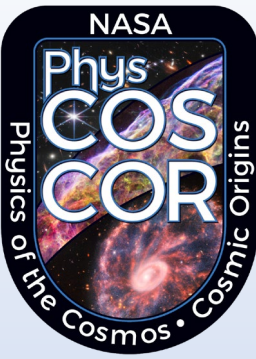


Science Analysis Groups (SAGs)



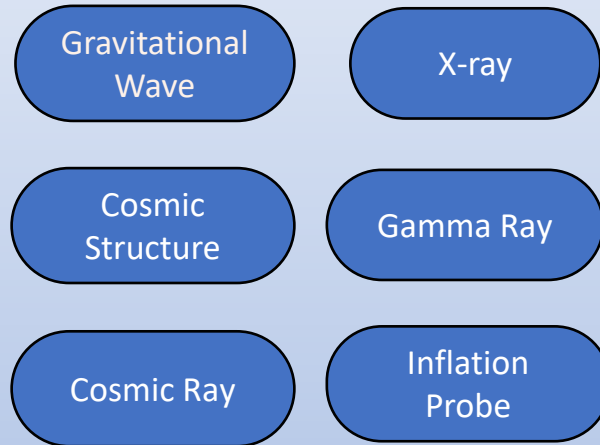
- New Great Observatories (NGO) SAG (cross-PAG)
- Astrophysics with Equity, Surmounting Obstacles to Membership: AWESOM SAG (cross-PAG)
- Time-domain and Multi-Messenger Communications (TDAMMCOM) SAG
- Future Innovations in Gamma-ray Science (FIGS) SAG (*new*)
- The Gamma-ray Transient Network Science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





SIGs & SAGs

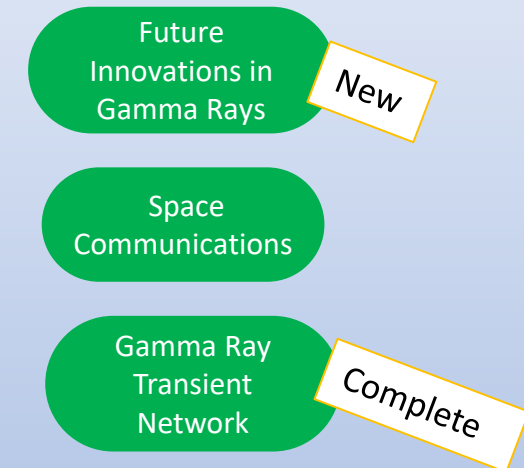
SIGs



Cross-PAG



SAGs



- **New Time Domain and Multi-Messenger Astrophysics SIG**
- **Science Analysis Groups**
 - Future Innovations in Gamma Rays SAG has started
 - Space Communications SAG is drafting their report
 - Gamma-ray Transient Network SAG delivered report to HQ & APAC

SIGs - Community Engagement



>30% increase

SIG Subscribers		
	2023	2024
CR	78	138
CoS	71	169
GR	242	309
GW	396	514
IP	122	151
XR	189	268
TDAMM	15	119

**Are you in a SIG list?
Please join - we need your input!**

Mailing List
QR Code:



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

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

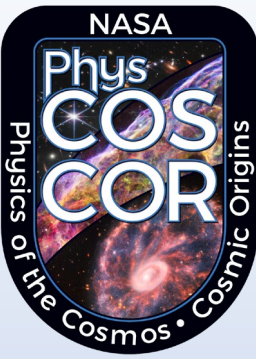
Knoxville, Tennessee
9 – 12 November 2023

»» [PhysCOS Welcome](#)

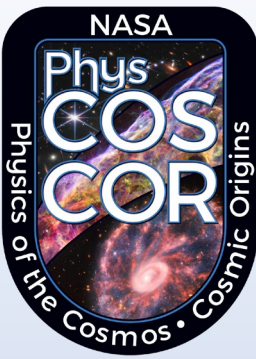
SACNAS National Diversity in STEM Conference

Portland, Oregon
26 – 28 October 2023

»» [PhysCOS Welcome](#)



GW-SIG update



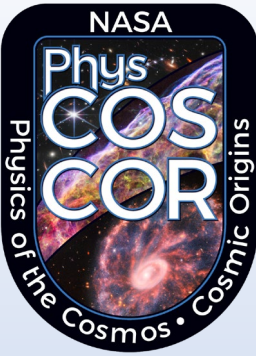
Co-chairs: Chiara Mingarelli, Alessandra Corsi

Presence at the January AAS meeting:

- Welcome and overview (Chiara Mingarelli)
- 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)**
- **2024 April APS meeting:**
 - April 4th: Overview by Alessandra Corsi - *"The GW SIG group of the NASA PhysCOS"*, discussions, 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.**

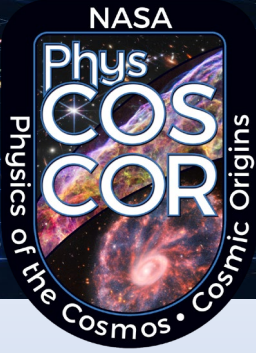


Gamma-ray SIG update

- **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 in April APS meeting:**
 - April 4th talk by Jeremy Perkins: *“Community efforts in Gamma-Ray astrophysics: Insights from the GR SIC”*
- **HEAD 21 Splinter: Gamma-Ray Science Interest Group Session (tomorrow) April 10th 12: 05 pm – 1:35 pm, Travertine**
 - Talks: magnetar flares, neutrino-gamma-ray connection, FIG SAG update
- **Science Gaps**
 - 17 science gaps related to GR SIG submitted

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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"*
- **Virtual Meeting March:** talk by Dr. Maria Vincenzi - *"The DES 5 years results"*

CR – SIG update



- **Co-chairs: Athina Meli, *Stephanie Wissel (welcome)***

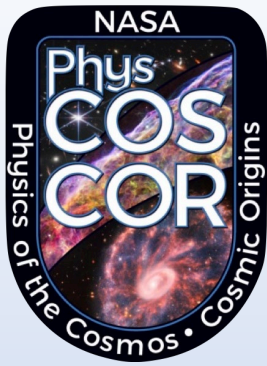
Plans:

- **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.
- **Organizing 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 relevant for Astro2030?
- **Plan a session at the ICRC 2025 (Geneva)**



Future In Gamma-rays (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 APS April Meeting, April 4th :** talk by Tiffany Lewis - *“Future Innovations in Gamma-rays: A new Science Analysis Group”*
- **HEAD 21 Splinter:** Gamma-Ray Science Interest Group Session (tomorrow) April 10th 12: 05 pm – 1:35 pm, Travertine



- **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.**
- **HEAD21 Splinter: NASA X-Ray Science Interest Group, 12:05 pm – 1:35 pm (earlier today) Travertine**
 - CfA director Lisa Kewley addressed the HEAD community in support for Chandra
 - Determine community interest in a SAG to address post-Chandra era
 - X-ray science talks for early career scientists or non-probe mission concepts



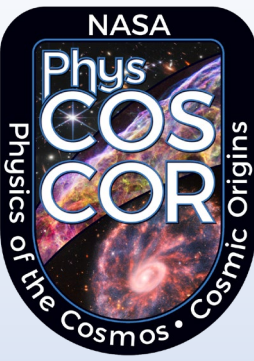
PhysPAG EC Strategic Retreat Meeting 2024

Date: May 15th and 16th

Location: Goddard Space Flight Center

- 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

PhysPAG EC future activities



- **Plans for a yearly “PhysCOS Workshop” targeting:**
 - Young researchers and investigators
 - HBCUs/MSIs
 - Focus on building connections between the diverse areas of PhysCOS science and community wide-ranging interests and goals <-> commonalities
- **Next year’s PhysPAG retreat to be hosted in NCA&T or Trinity University for a wider community outreach**