Physics of the Cosmos Program Analysis Group

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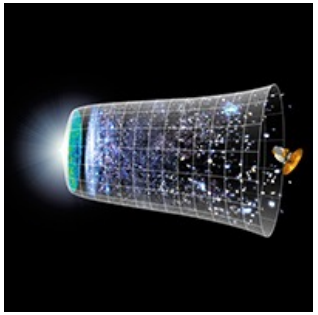
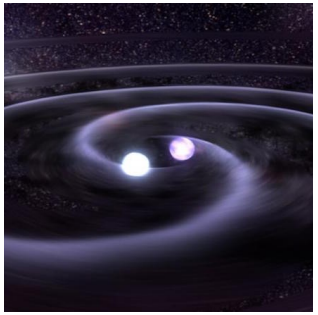
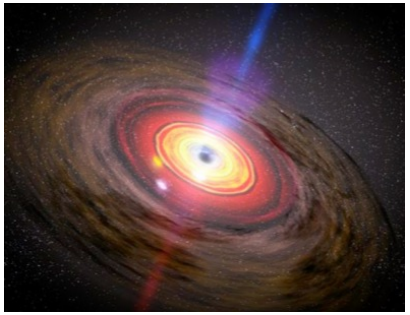
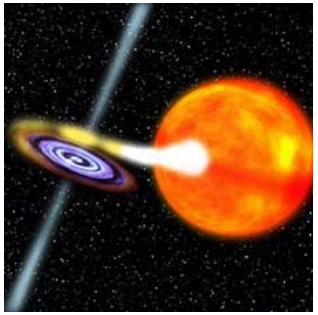
Physics of the Cosmos (PhysCOS) Objectives

- 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

Name	Institution	Expertise	Term	
			Start	End
Grant Tremblay (Chair Emeritus)	Smithsonian Astrophysical Observatory	XR SIG	Dec 2019	Dec 2023
Justin Finke (Chair)	Naval Research Laboratory	GR SIG	Dec 2020	Dec 2023
Vera Gluscevic	Univ. of Southern California	CoS SIG	Dec 2020	Dec 2023
Andrew Romero-Wolf	JPL	CR SIG	Dec 2020	Dec 2023
David Pooley	Trinity University	XR SIG	Dec 2021	Dec 2024
Athina Meli (Vice Chair)	North Carolina A&T	CR SIG	Dec 2021	Dec 2024
Eric Burns	Louisiana State University	GR SIG	Dec 2021	Dec 2024
Kristin Madsen	NASA/GSFC	XR SIG	Dec 2021	Dec 2024
Chiara Mingarelli	Univ. of Connecticut	GW SIG	Feb 2023	Dec 2025
Chien-Ting Chen	USRA/MSFC	XR SIG	Feb 2023	Dec 2025
Alessandra Corsi	Texas Tech	GW SIG	Feb 2023	Dec 2025
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New Members!

Science Interest Groups

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) – ***Coming soon!*** Cross-PAG SIG with COPAG and ExoPAG.

- Recommended by APAC
- Terms of reference being drafted
- Session at upcoming HEAD meeting

Cosmic ray Science Interest Group

- Chaired by Andrew Romero-Wolf and Athina Meli
- CR SIG chairs in the process of formulating a SAG on the origin of heavy elements, focusing on multi-messenger aspects and including ultra-heavy cosmic rays
- CR SIG organized and hosted a virtual forum on PeVatrons on 27 January 2023 - 33 participants

Agenda

Speakers	Topic
Henrike Fleishhack	PeVatrons - the Galaxy's most powerful accelerators
Takahiro Sudo	Where are Milky Way's Hadronic PeVatrons?
Sajan Kumar	"Searching for TeV emission from Galactic PeVatrons with VERITAS"
Kelly Anne Malone	The search for PeVatrons with HAWC
Qinrui Liu	Search for Galactic Sources of High-energy Neutrinos

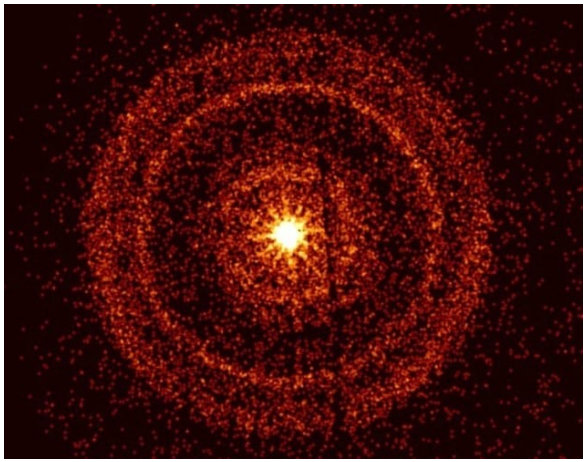
Gamma-ray Science Interest Group

- Chaired by Eric Burns, Manel Errando, and Justin Finke
- emphasis on successful practices for mission proposals and avenues for technology advancement

Gamma Ray Science Interest Group (GR SIG)

Tuesday, 10 January 2023
Room: 303
| 9:00am–11:00am Pacific | 10:00am–12:00pm Mountain | 11:00am–1:00pm Central | 12:00pm–2:00pm Eastern |

Speaker	Title	Duration
Eric Burns	Introduction	5 minutes
Mark McConnell	LEAP	(remotely) 15+5
Michelle Hui	MoonBEAM	15+5
Carolyn Kierans	Wallops Flight Facility	15+5
Discussion		



- Monthly virtual sessions, likely starting in May
- ***Science highlight!*** GRB 221009A: Brightest of All Time (BOAT).

X-ray SIG

- Session at AAS meeting

Time PST	Topic	Speaker	
2:00–2:05pm (5 min)	Brief Welcome from XRSIG Co-Chairs	Ryan Hickox, Grant Tremblay, Kristin Madsen, Dave Pooley	[PDF]
2:05–2:20pm (12 + 3min)	STAR-X MIDEX Phase A	Ann Hornschemeier	[PDF]
2:20–2:35pm (12 + 3min)	LEM Probe Concept	Ralph Kraft	[PDF]
2:35–2:50pm (12 + 3min)	AXIS Probe Concept	Chris Reynolds or Erin Kara	[PDF]
2:50–3:05pm (12 + 3min)	HEX-P Probe Concept	Kristin Madsen or Daniel Stern	[PDF]
3:05–3:20pm (12 + 3min)	Arcus Probe Concept	Laura Brenneman or Randall Smith	[PDF]
3:20–3:35pm (12 + 3min)	STROBE-X Probe Concept	Paul Ray	[PDF]

Gravitational Wave SIG

- Session at AAS meeting

Presentation	Speaker	
Introduction	Co-chairs: Sean McWilliams (WVU), Eric Burns (LSU)	[PDF]
LISA Science Talk	Ira Thorpe	[PDF]
LISA Programmatic Talk	Kelly Holley-Bocklemann	[PDF]
NANOGrav Update Talk	Michael Lam	[PDF]

Science Analysis Groups

Previously approved SAGs:

Astrophysics With Equity: Surmounting Obstacles to Membership (AWESOM)

New Great Observatories Science Analysis Group (NGO SAG)

Gamma-ray Transient Network Science Analysis Group (GTN SAG)

AWESOM SAG

- Cross-PAG between PhysPAG, COPAG, and ExoPAG
- Chaired by Ryan Hickox
- Related to Astro2020 Sec. N.6.5, “Inequities in career advancement and access to the tools of the Profession must be addressed so that the entire workforce is engaged.”
- Focusing on expanding institutions and members who contribute to NASA astrophysics, and increasing engagement with research and training programs
- “The goal . . . is to analyze how existing NASA programs and potential new initiatives can increase engagement with research and training programs, and to make available opportunities clearer, more consistent, and easier to access”
- Session at AAS
- Had first virtual meeting, 22 attendees
- Plan on finishing report by November 2023

New Great Observatories SAG

- Cross-PAG between PhysPAG, COPAG, and ExoPAG
- Co-chaired by Grant Tremblay, Janice Lee, and Ilaria Pascucci
- Inspired by science provided by original Great Observatories operating contemporaneously
- Focusing on science that can be accomplished by having three great observatories (IROUV, X-ray, far-IR) operating contemporaneously
- Session at AAS

Gamma-ray Transient Network SAG

- Co-Chaired by Eric Burns and Michael Coughlin
- Kevin Hurley's passing has put future of IPN in doubt
- Focusing on updating, improving, and extending the gamma-ray Interplanetary Network (IPN)
  - What TDAMM sources rely on IPN?
  - Where can IPN be improved?
  - Are there benefits to extending IPN beyond current instruments?
- Had session at AAS
- Had 2 virtual meetings, ~20-25 attendees
- Document has about 6 pages written. Science enabled by IPN drafted

TDAMM Communications SAG

- New SAG for your consideration; see Valerie Connaughton or me for Terms of Reference
- Led by Jamie Kennea and Judy Racusin
- NASA's Tracking and Data Relay System (TDRSS) will be replaced circa 2030 by a commercial service
- SAG will explore requirements of a future communication system based on TDAMM science drivers

Recent Meetings

- Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) National Diversity in STEM (NDiSTEM) Conference – October 2022
  - PhysCOS session – exploring the universe with NASA astrophysics
  - PhysCOS booth
- National Society of Black Physicists (NSBP) Conference – November 2022
  - NASA astrophysics session – Ron Gamble
  - PhysCOS booth
- AAS Meeting – January 2023
  - 1 Joint PAG session, 1 PhysPAG session
  - 3 SIG sessions, 2 SAG sessions

AAS Meeting January 2023

First in-person Winter AAS Meeting since before the pandemic!
Second AAS Meeting since the pandemic!

Session	In-person attendees	On-line attendees
Joint-PAG	150	36
PhysPAG	38	16
GW SIG	35	5
GR SIG	20	13
XR SIG	84	28
AWESOM	15	2
NGO SAG	80	26

Recording of most PhysPAG sessions at AAS here:
https://pcos.gsfc.nasa.gov/physpag/meetings/AAS_Jan2023/AAS2023-agenda.php

Upcoming Meetings

- HEAD meeting
  - PhysPAG session
  - XRSIG session
  - TDAMMSIG session

- APS Meeting
  - PhysPAG Mini-symposium. Summary talks for many SIG and SAGs

Science and Technology gaps

- Next Technology Gaps call will be Fall 2023

- Exploring possibility of *Science Gaps* list. Similar to ExEp Science Gaps. Science needed to inform future missions (Great Observatories, Probes, future TDAMM mission)
  - Call for community input
  - review by PhysPAG EC
  - Updated every few years

Summary

- Previously recommended cross-PAG TDAMM SIG moving forward
- Previously approved SAGs (AWESOM, GTN SAG, NGO SAG) moving forward
- New TDAMM Communications SAG for your consideration