Physics of the Cosmos Program Analysis Group

Justin Finke

Chair, PhysPAG Executive Committee

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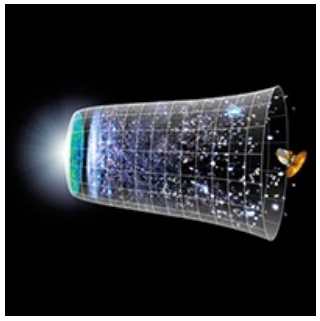
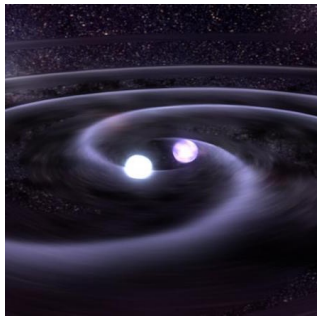
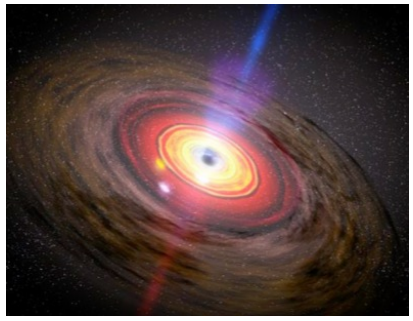
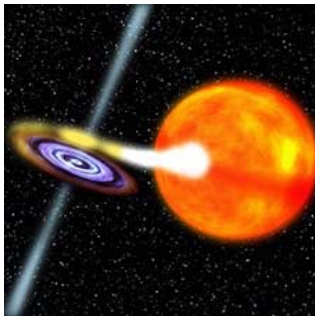
HEAD Meeting, 30 March 2023

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

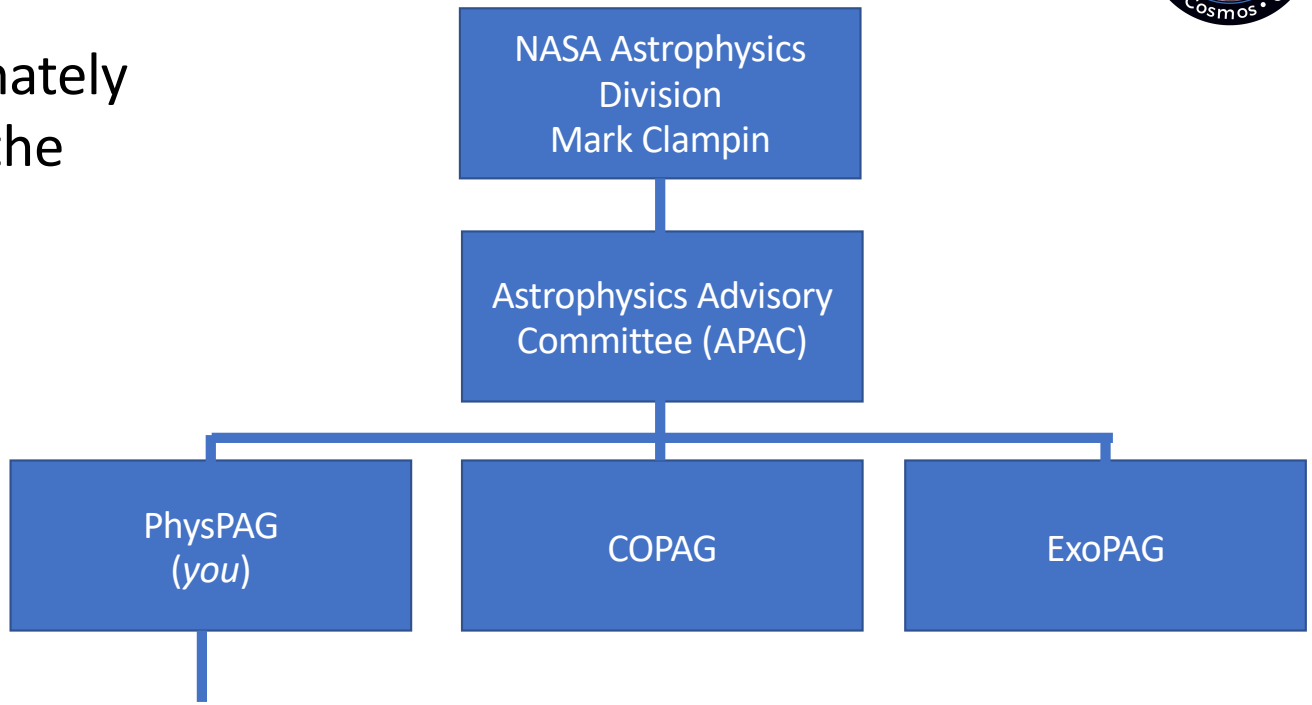


Physics of the Cosmos Program Analysis Group (PhysPAG)

Provide APAC and ultimately NASA with input from the scientific community.

Membership: ***you!***

Represented by ***Executive Committee***



Science Interest Groups (SIGs) – permanent discipline-specific groups
Science Analysis Groups (SAGs) – created to analyze specific question. Last about a year and deliver a report.

PhysPAG Executive Committee

Rotated off:
Jillian Bellovary
Ryan Hickox
Sean McWilliams
Bindu Rani

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
Roger O'Brient	JPL	IP SIG	Feb 2023	Dec 2025
Rebekah Hounsell	UMBC/GSFC	CoS SIG	Feb 2023	Dec 2025
Manel Errando	Washington U. St. Louis	GR 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) – ***new!***

Sign up for a SIG mailing list!
https://pcos.gsfc.nasa.gov/physpag/sigs-sags.php

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

9:15 AM HT - 9:30 AM HT
Program Number: 101.01
Fermi GBM Analysis of GRB 221009A
S. Lesage, University of Alabama in Huntsville; P. Veres, University of Alabama in Huntsville; E. Bissaldi, Politecnico ...

9:30 AM HT - 9:45 AM HT
Program Number: 101.02
Swift and MAXI Observations of GRB 221009A
M. Williams, Pennsylvania State University; Neil Gehrels Swift Observatory, NASA; Monitor of All-sky X-ray Image, JAXA...

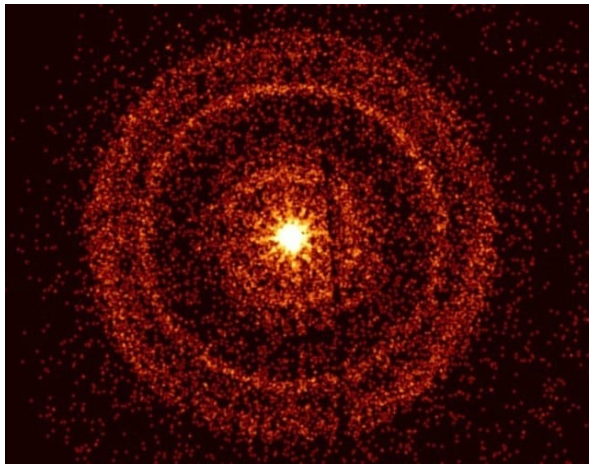
9:45 AM HT - 10:00 AM HT
Program Number: 101.03
The GeV View of the Brightest GRB Ever Detected
N. Omodei, Stanford University; E. Bissaldi, Dipartimento Interateneo di Fisica dell'Università e Politecnico di Bari an...

10:00 AM HT - 10:15 AM HT
Program Number: 101.04
The IXPE view of GRB 221009A
M. Negro, NASA Goddard Space Flight Center; on behalf of the IXPE Collaboration, NASA/MSFC, ASI and partners.

10:15 AM HT - 10:30 AM HT
Program Number: 101.05
Searches for Neutrino Emission from GRB 221009A using the Ic...
M. Larson, University of Maryland.

10:30 AM HT - 10:45 AM HT
Program Number: 101.06
The Afterglow of GRB 221009A: Radio Observations and Multi-w...
T. Laskar, University of Utah; K. Alexander, University of Arizona; R. Margutti, UC Berkeley; E. Berger, Harvard Univers...

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



Vasilopoulos et al. 2023
Tiengo et al. 2023

X-ray SIG

- Chaired by Grant Tremblay, David Pooley, Kristin Madsen, Chien-Ting Chen
- Session at this meeting (Sunday)!

3:00pm–3:20pm	Introduction & PhysCOS Informercial	Kristin Madsen & Francesca Civano	
3:20pm–4:10pm	Athena Update & Discussion, NAST Information	Andy Ptak & Laura Brenneman	
4:10pm–4:30pm	XRISM Update & Discussion	Brian Williams	

TDAMM SIG

- Chaired by Eric Burns
- CrossPAG with other PAGs
- Session at this meeting (Sunday)!

3:00pm-3:20pm	Introduction	Eric Burns	
3:20pm-3:40pm	Presentation	Valerie Connaughton	
3:40pm-4:30pm	Community Discussion		

- Importance of Tech gaps
- TDAMM science in a funding-constrained environment

Gravitational Wave SIG

- Chaired by Chiara Mingarelli, Alessandra Corsi, Eric Burns

- Talk on LISA coming up (Sean McWilliams)!

Science Analysis Groups

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)

TDAMM Communications 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, Meredith MacGregor, John O'Meara, Jessie Christansen, Amanda Hendrix
- Inspired by science provided by original Great Observatories operating contemporaneously
- Focusing on science that can be accomplished by having three great observatories (HWO, X-ray, far-IR) operating simultaneously
- 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 on science enabled by IPN

TDAMM Communications SAG

- 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

Summary

- Exciting time for astronomy and the PhysPAG
  - NASA needs input from the community for implementing Astro2020

- Get involved!
  - PhysPAG EC members want to hear your input!
  - Join a SAG (AWESOM, GTN SAG, NGO SAG, TCOM SAG) or suggest a new one!
  - Consider joining the EC!

NASA Probe Announcement of Opportunity

- Expected July 2023!

- Mission themes based on Astro2020
  - A far infrared imaging or spectroscopy mission
  - An X-ray probe ~~to complement ESA's Athena Observatory~~

- 2-step competitive process
- Launch likely in 2032