PhysCOS Program Analysis Group (PhysPAG)

David Pooley (Trinity University)
PhysPAG EC Chair

APS 2025

- community-based, interdisciplinary forum
- solicits community input through public meetings (in person and virtual) and listservs
- coordinates the analysis and implications of community input
- supports architecture planning and activity prioritization
- provides findings to the NASA Astrophysics Division Director
- all members of the community who participate in meetings (like this session) are considered members of the PhysPAG
- Executive Committee (EC) organizes the PhysPAG activities within various groups

Groups within PhysPAG

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PhysPAG EC Chair

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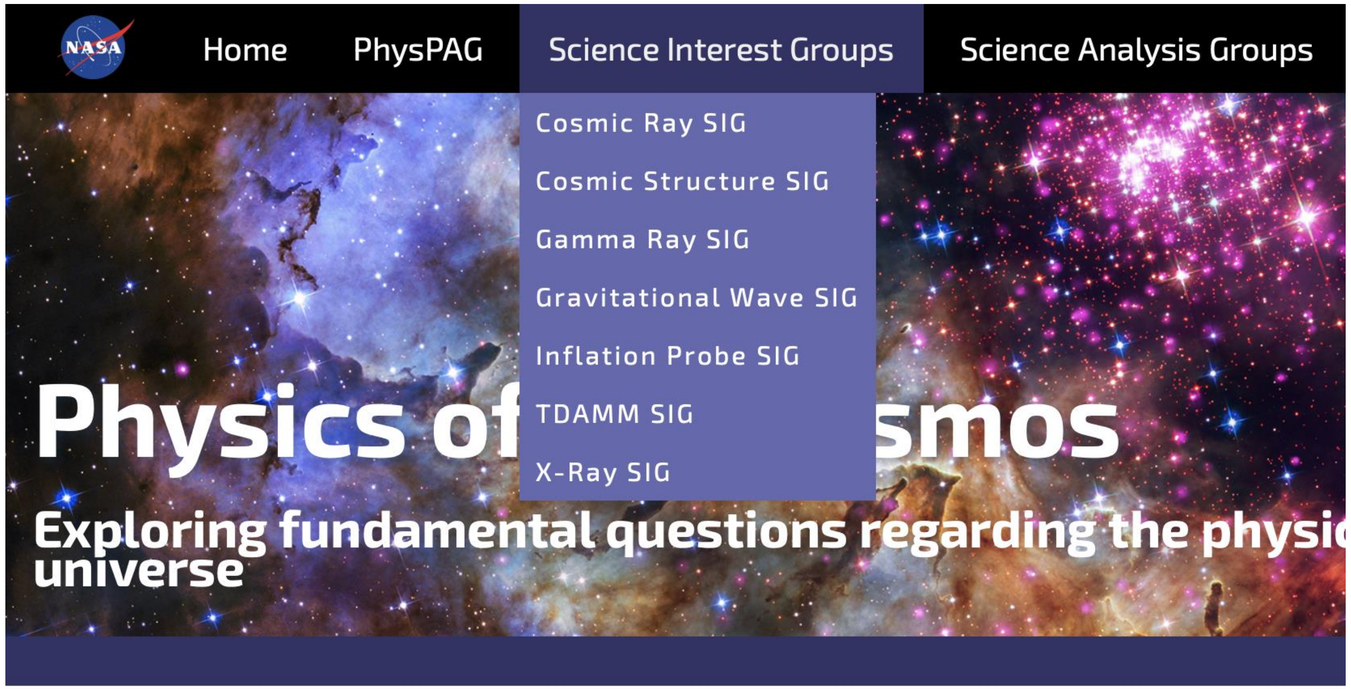
There are many standing groups of scientists that are organized either by waveband or science topic.

"Science Interest Groups" (SIGs)

There are also single purpose, limited term groups whose goal is to address a specific question and produce one or more reports at the end of its term for the NASA Astrophysics Division Director.

"Science Analysis Groups" (SAGs)



About Physics of the Cosmos

The Physics of the Cosmos (PhysCOS) Program is one of three focused programs contained within NASA's Astrophysics Division (APD), together with Cosmic Origins (COR) and the Exoplanet Exploration Program (ExEP). PhysCOS lies at the intersection of physics and astronomy. Its purpose is to explore some of the most fundamental questions regarding the physical forces and laws of the universe: the validity of Einstein's General Theory of Relativity and the nature of spacetime, the behavior of matter and energy in extreme environments, the cosmological parameters governing inflation and the evolution of the universe, and the nature of dark matter and dark energy.

Go to https://pcos.gsfc.nasa.gov/

Cosmic Ray and Neutrino Science Interest Group (CRN SIG)

Co-chairs: Tsuguo Aramaki (Northeastern University),
Athina Meli (NC A&T State University),
Stephanie Wissel (Penn State University)

The goals of the Cosmic Ray and Neutrino Science Interest Group (CRN SIG) are to provide quantitative metrics and assessments to NASA in regard to current and future needs of the cosmic-ray astrophysics community and to act as a focal point and forum for the cosmic ray community.

CRN SIG will work towards producing a white paper covering:

- the major open science questions
- a brief survey of the current and planned, US and International, space and ground-based projects — their energy coverage (from about 10^8 eV to 10^2 eV), sky coverage, and particle type coverage (electrons, positrons, nucleons, anti-nucleons, nuclei, anti-nuclei, neutrinos, and new particles)
- a survey of the state-of-the-art capabilities, the next generation technology needs, and potential science return from new technologies and capabilities
- a vision for the future of cosmic ray science in space

Image: Jelly Fish Nebula (IC 443) source of cosmic rays. Credit: NASA / DOE / Fermi LAT Collaboration, NOAO / AURA / NSF, JPL-Caltech/UCLA

email: CosmicSAG-join@lists.nasa.gov
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Cosmic Structure Science Interest Group (CoS SIG)

Co-chairs: Rebekah Hounsell (UMBC/GSFC),
Johannes U. Lange (American University),
Vivian Miranda (Stony Brook University)

The goal of the Cosmic Structure Science Interest Group (CoS SIG) is to serve communities interested in utilizing measures of cosmic structure based on 3-dimensional spectroscopic and photometric surveys of galaxies, galaxy clusters, supernovae, and gravitational lensing. Science drivers for the SIG include understanding the nature of dark energy, dark matter, neutrinos, and tests of inflation, as well as astrophysical galaxy evolution, amongst others.

The CoS SIG will provide a way to collect, discuss and communicate to NASA community inputs on future missions including quantitative metrics and assessments and new issues as we move up to the 2030 Decadal. This includes:

- Review and update mission science goals following current developments in the field,
- Review and update information about and requirements on potential foreground contaminants and their removal,
- Review and update requirements on and developments in control of systematic errors, and
- Assess necessary technology developments and prioritize areas for increased technical emphasis.

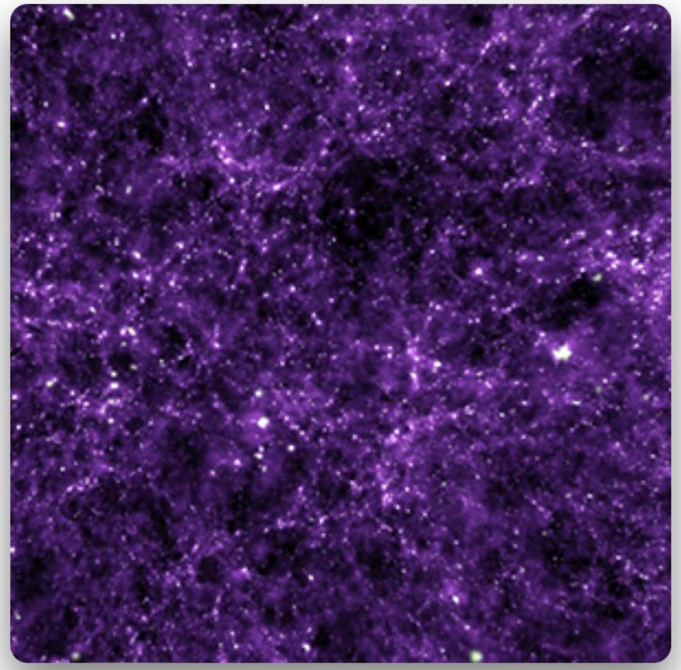

Image: Cosmic Web. Credit: NASA/NCSA University of Illinois Visualization by Frank Summers, Space Telescope Science Institute, Simulation by Martin White and Lars Hernquist, Harvard University.

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Gamma Ray Science Interest Group (GR SIG)

Co-chairs: Manel Errando (Washington University St. Louis),
Cori Fletcher (MSFC),
Sylvain Guiriec (George Washington University),
Jeremy Perkins (GSFC)

The goal of the Gamma Ray Science Interest Group (GR SIG) is to provide quantitative metrics and assessments to NASA in regard to current and future needs of hard X-ray and gamma-ray astrophysics community. Specifically, the activities of the GR SIG include:

- Act as a focal point and forum for the hard X-ray and gamma ray communities.
- Organize bi-weekly telecons to discuss recent science results, and current and future missions.
- Maintain a list of technology needs for future hard X-ray and gamma-ray missions.
- Produce suggestions to help support the specific needs of this unique community: organizational, scientific, funding.

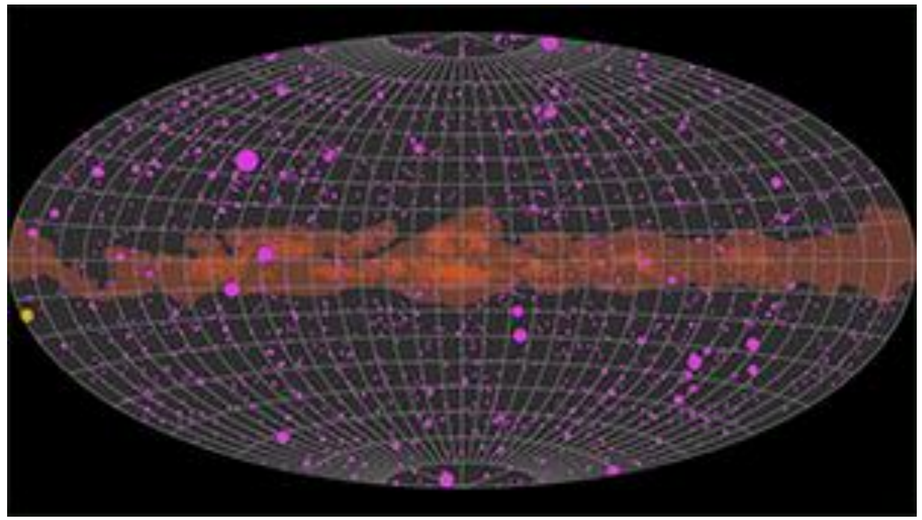

Image: Fermi Captures Dynamic Gamma-ray Sky. Credit: NASA Goddard Space Flight Center.

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Gravitational Wave Science Interest Group (GW SIG)

Co-chairs: Alessandra Corsi (Johns Hopkins University),
Chiara Mingarelli (Yale University)

The goal of the Gravitational Wave Science Interest Group (GW SIG) is to provide quantitative metrics and assessments to NASA in preparation for a future gravitational wave mission. Specifically, the GW SIG will:

- Track and analyze evolving science goals and requirements, especially as our understanding of three standard sources of gravitational waves (supermassive black hole binaries, extreme mass ratio inspirals, galactic binaries) continues to improve.
- Support mission studies and concept development for future space-based gravitational wave observatories, including when cost savings are sought, or new classes of sources are under consideration (such as the stochastic gravitational wave background from the inflationary epoch).
- Aid efforts to analyze technology development and prioritization plans as science goals are defined and mission concepts evolve within the PhysPAG portfolio.
- Advocate for the brand new field of gravitational wave astronomy, build a vibrant community of gravitational wave astronomers, and promote the discovery space in this new field to the wider scientific community and to the public.

Image: Gravitational Waves Detected 100 Years After Einstein's Prediction.. Credit: The SXS (Simulating eXtreme Spacetimes) Project

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Inflation Probe Science Interest Group (IP SIG)

Co-chairs: Abigail T. Crites (Cornell University),
Roger O'Brient (JPL)

The goal of the Inflation Probe Science Interest Group (IP SIG) is to provide quantitative metrics and assessments to NASA in regard to a future Inflation Probe mission. Specifically, the IP SIG will:

- Review and update mission science goals following current developments in the field (e.g., Planck, sub-orbital measurements),
- Review and update information about and requirements on potential foreground contaminants and their removal,
- Review and update requirements on and developments in control of systematic errors,
- Assess necessary technology developments and prioritize areas for increased technical emphasis.

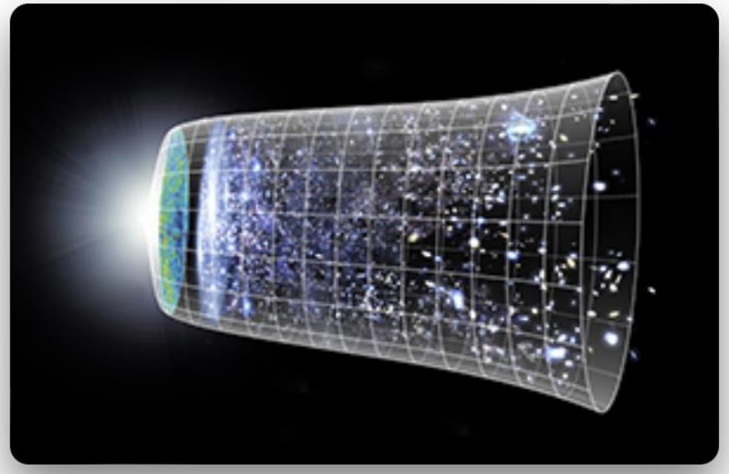

Image: Timeline of the Universe. Credit: NASA / WMAP Science Team

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Time Domain and Multi-Messenger Astrophysics Science Interest Group (TDAMM SIG)

Co-chairs: Brad Cenko (NASA/GSFC),
Brian Grefenstette (Caltech),
Rebekah Hounsell (UMBC/GSFC)

The Astro2020 Decadal Survey recommended an investment in Time Domain and Multi-Messenger Astrophysics (TDAMM) as the top-priority sustaining activity in space for the coming decade. This relatively new field burst onto the scene with the detection of neutrinos and photons from SN 1987A, and entered a new era in 2017, with the first detection of a binary neutron star merger, GW 170817 / GRB 170817A, in both gravitational waves and across the electromagnetic spectrum, and the second strong association between an astrophysical neutrino, IceCube-170922A, and a known source, the blazar TXS 0506+056. The field's potential continues to grow as searches for electromagnetic counterparts to GW events continue and with the high-significance detection of neutrino emission from the galaxy NGC 1068.

TDAMM observations cover a wide range of time-varying and multi-messenger phenomena that, expanding on the examples mentioned above, include characterization of exoplanet host stars, variable stars, fast radio bursts, and the regions closely surrounding supermassive black holes, to mention just a few.

Image: Time Domain and Multi-Messenger Astrophysics Science Interest Group (TDAMM SIG)

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X-Ray Science Interest Group (XR SIG)

Co-chairs: Breanna Binder (Cal Poly Pomona),
Chien-Ting Chen (USRA/MSFC),
Steven Ehlert (MSFC),
Fabio Pacucci (CfA — Harvard & Smithsonian),
David Pooley (Trinity University)

The goal of the X-ray Science Interest Group (XR SIG) is to provide quantitative metrics and assessments to NASA in regard to future X-ray observatories. Specifically, the XR SIG will:

- Track and analyze evolving science goals and requirements in X-ray astronomy, especially as current "hot" topics evolve.
- Provide an active communication forum for X-ray astrophysics (e.g., via town hall meetings at venues such as AAS and APS meetings).
- Support mission studies and concept development for future X-ray observatories.
- Analyze technology development and prioritization plans with respect to redefined science goals and the evolution of mission concepts (i.e., the XR SIG will aid the PhysPAG in analyzing technology needs).

Image: NICER's Night Moves Trace the X-ray Sky. Credit: NASA / NICER

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SIGs looking for new chairs:

Cosmic Structure Science Interest Group (CoS SIG)

Gravitational Wave Science Interest Group (GW SIG)

Time Domain and Multi-Messenger Astrophysics Science Interest Group (TDAMM SIG)

If interested, please contact Chief Scientists:

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Brian Humensky
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