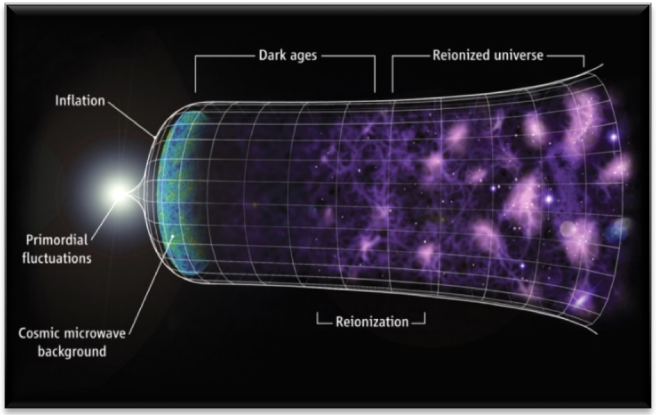
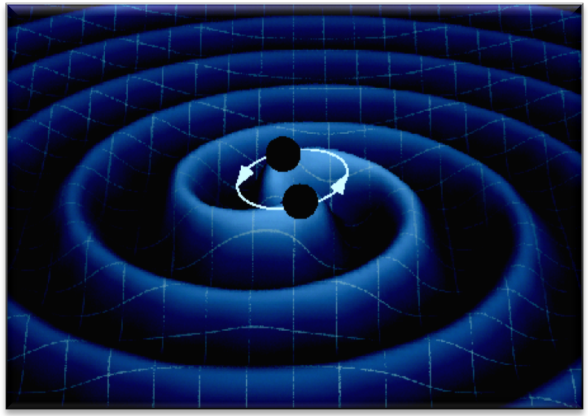
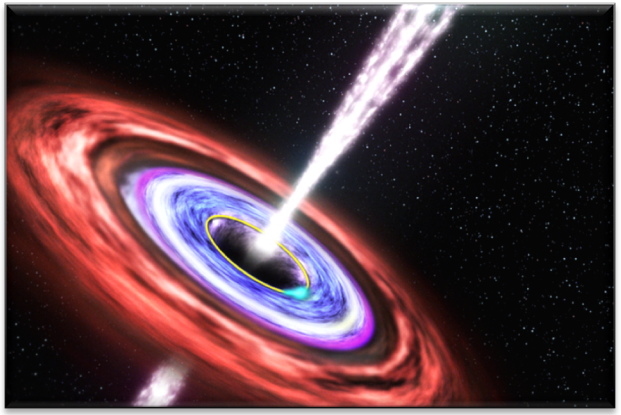
Physics of the Cosmos Program Analysis Group Report







Graça Rocha

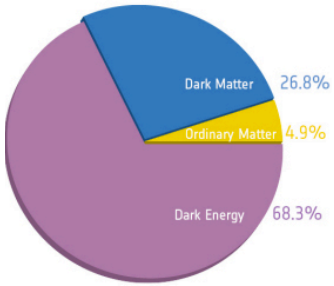
Jet Propulsion Laboratory/Caltech
Chair, Physics of the Cosmos Program Analysis Group, PhysPAG
graca.m.rocha@jpl.nasa.gov; graca@caltech.edu

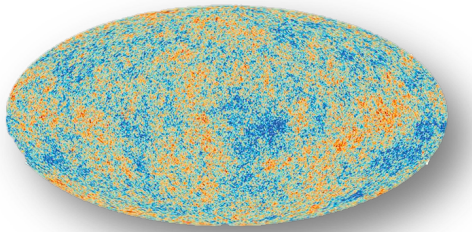
Advisory Committee, APAC, Meeting, 23rd June 2020

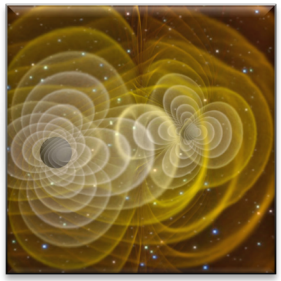
Outline

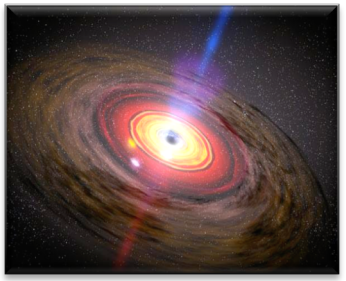
- Introduction to PhysPAG (reminder)
- SIG Highlights, Activities and Goals
- PhysPAG EC Activities and Goals

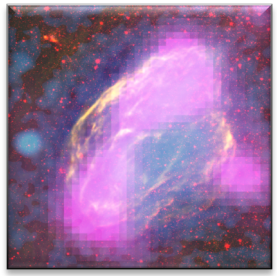
Physics of the Cosmos Science Objectives





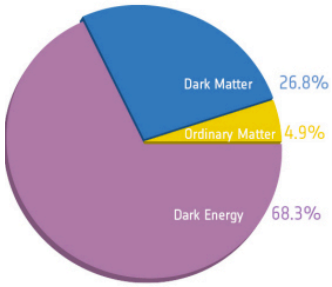


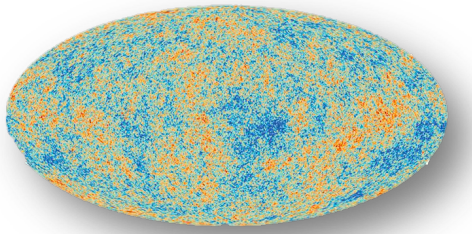


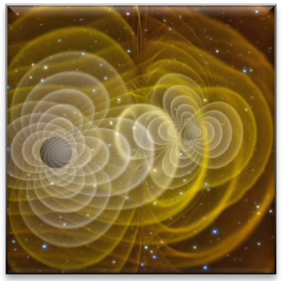


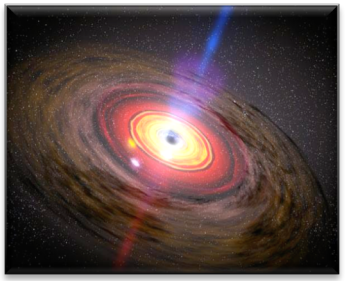
- Increase our knowledge of dark energy
- Precisely measure cosmological parameters governing evolution of the universe and test inflation hypothesis of Big Bang
- Test validity of Einstein's General Theory of Relativity and investigate nature of spacetime
- Understand formation and growth of massive black holes and their role in evolution of galaxies
- Explore behavior of matter and energy in its most extreme environments

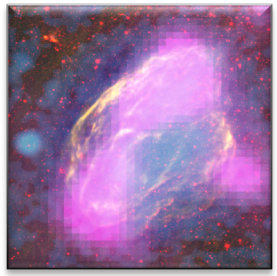
Physics of the Cosmos Program Analysis Group











❑ Six Science Interest Groups (SIGs)

- Cosmic Ray (CR SIG)
- Cosmic Structure (CoS SIG)
- Gamma Ray (GR SIG)
- Gravitational Wave (GW SIG)
- Inflation Probe (IP SIG)
- X-ray (XR SIG)

Want go get involved?
Go to:
https://pcos.gsfc.nasa.gov/physpag/sigs-sags.php
and subscribe to the relevant SIG emailing list

Annual call again this fall !

PhysPAG EC Membership

Name	Affiliation	Area of Expertise	Term Ends
John Conklin (Chair Emeritus)	Univ. of Florida	GW SIG	Dec 2020
Graça Rocha (Chair)	JPL/Caltech	IP SIG/CoS SIG	Dec 2020
Sylvain Guiriec	George Washington Univ.	GR SIG	Dec 2020
Kevin Huffenberger	Florida State Univ.	CoS SIG/IP SIG	Dec 2020
James Rhoads	GSFC	CoS SIG	Dec 2020
Abigail Vieregg	Univ. of Chicago	IP SIG / CR SIG	Dec 2020
Nicolas Yunes	Montana State Univ.	GW SIG	Dec 2020
Ryan Hickox (Vice Chair)	Dartmouth College	XR SIG	Dec 2021
Marcos Santander	Univ. of Alabama	CR SIG / GR SIG	Dec 2021
Jillian Bellovary	Queensborough Comm Coll.	GW SIG / XR SIG	Dec 2022
Sean McWilliams	WVU	GW SIG	Dec 2022
Bindu Rani	SURA, GSFC	GR SIG	Dec 2022
Grant Tremblay	SAO	XR SIG	Dec 2022

*New Roles

*New members as of January 2020

Cosmic Ray Science Interest Group highlights

❑ CR SIG

- Interested in expanding its science topics to increase their focus on high-energy neutrinos, given their deep interconnection with cosmic-ray studies

- Plan to organize and sponsor cosmic-ray sessions in future meetings and conferences, such as APS, ICRC, and COSPAR

- In order to understand the needs of the community, the CR SIG will request input from members to help plan additional activities and future workshops

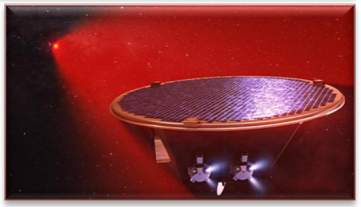
Gamma Ray Science Interest Group highlights and updates

❑ GR SIG

- Plan to organize special sessions at the future HEAD, AAS and APS meetings
- Will continue holding telecon meetings
- Plan to organize workshops, hackathons, and similar activities
  - On instrument design, data analysis and analysis tools, and statistical methods, among others
  - These workshops will be organized at universities and possibly at times and places corresponding to major conferences to limit the cost

Gravitational Wave Science Interest Group highlights

❑ GW SIG



- The GW community in partnership with the LISA consortium and the Gravitational Wave International Committee (GWIC) is organizing the 13th International LISA Symposium

- The meeting will be held online 1-3 September 2020 and all are welcome to participate

- Contact John Conklin (LISA XIII meeting SOC Co-Chair) for details

jwconklin@ufl.edu

Inflation Probe Science Interest Group highlights

Inflation Probe SIG Minisymposium

Saturday, 18 April 2020, 6:30 P.M.–7:59 P.M. (EDT)
Chair: Graça Rocha

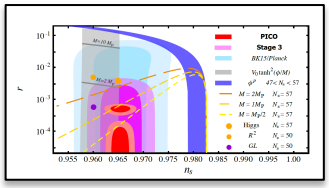
APS: IP SIG Session

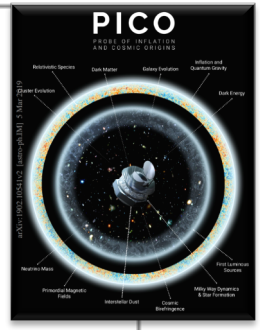
~ 50 participants

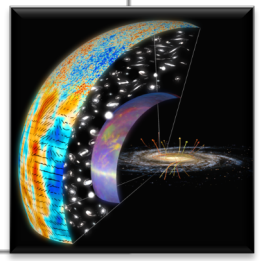
https://pcos.gsfc.nasa.gov/physpag/meetings/APS_2020/APS2020-agenda.php

Agenda

6:30 PM–6:45 PM	**IPSIG Update** [PDF]	Graça Rocha
6:45 PM–7:00 PM	**PICO Update** [PDF]	Shaul Hanany
7:00 PM–7:15 PM	**Complementarity of Space and Ground-Based CMB Experiments** [PDF]	Alan Kogut
7:15 PM–7:30 PM	**Interplay of Foregrounds and Systematics: The Case for Low-Frequency Observations** [PDF]	Krzysztof Gorski
7:45 PM–8:00 PM	**Data Analysis - Do We Have All The Necessary Tools?** [PDF]	Reijo Keskitalo







X-ray Science Interest Group highlights

X-Ray SIG Minisymposium

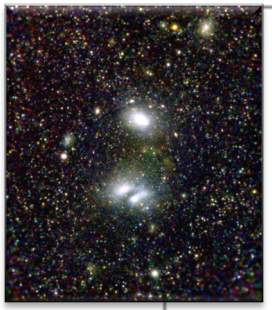
Sunday, 19 April 2020, 6:30 P.M.–7:49 P.M. (EDT)
Chair: Ryan Hickox

APS: XR SIG Session

~ 50 participants

https://pcos.gsfc.nasa.gov/physpag/meetings/APS_2020/APS2020-agenda.php

Agenda



6:30 PM–6:45 PM	**Overview of X-Ray Astrophysics Missions and Astro2020, and Discussion** [PDF]	Ryan Hickox
6:45 PM–7:10 PM	**The X-Ray Imaging Spectroscopy Mission (XRISM)** [PDF]	Brian Williams
7:10 PM–7:35 PM	**Progress on Silicon Metashell High-Resolution X-Ray Optics** [PDF]	Will Zhang
7:35 PM–7:50 PM	**Science with The Lynx X-Ray Mission Concept** [PDF]	Ryan Hickox

Despite challenges due to COVID-19 XRISM development is continuing with remote collaboration between scientists in the US and Japan, and is still on schedule for launch in 2022.

PhysPAG EC activities

- **April APS Virtual, April 2020, (Washington, DC)**
  - PCOS/PhysPAG session, and
  - SIG sessions:
    - IP SIG and XR SIG sessions
    - GR SIG and GW SIG cancelled due to COVID19 pandemic

https://pcos.gsfc.nasa.gov/physpag/meetings/APS_2020/APS2020-agenda.php

These virtual sessions were very successful with an average of approximately 50 participants!

PhysPAG EC activities
APS: PCOS/PhysPAG session

Physics of the Cosmos & PCOS Program Analysis Group Town Hall

Saturday 18 April 2020, 1:30 P.M.–3:17 P.M. (EDT)
Chair: Ryan Hickox

https://pcos.gsfc.nasa.gov/physpag/meetings/APS_2020/APS2020-agenda.php

Agenda

1:30 PM–1:42 PM	**PCOS Update** [PDF]	Paul Hertz
1:42 PM–1:54 PM	**PhysPAG Update** [PDF]	Graça Rocha
1:54 PM–2:30 PM	**How will Astro2020 Affect PCOS Science and Missions?** [PDF]	Fiona Harrison
2:30 PM–2:42 PM	**GW-EM Follow-Up Final Report** [PDF]	Daniel Kocevski
2:42 PM–2:54 PM	**MMA SAG Final Report** [PDF]	John Conklin
2:54 PM–3:17 PM	**IXPE Mission Overview and Exciting Science** [PDF]	Herman Marshall

PhysPAG EC activities

- Monthly Telecons to discuss goals and plans of action such as:
  - Improve access for (researchers at) under-resourced institutions
  - Assess Usability/Accessibility of data analysis tools and data representation
  - Preparation for Decadal outcomes
  - Discuss suggestions from last APAC meeting March 2020

These discussions have been impacted by the current crisis

PhysPAG EC activities
current goals (under discussion)

- Improve access for (researchers at) under-resourced institutions

  Discussing the 'How': how to ascertain the needs of under-resourced institutions and how to proceed to improve . EC is still coalescing its thinking, this is what we've thought of so far:

Goals:

1. What are the needs of under-resourced institutions (once identified e.g. Minority Serving Institutions listed here: https://cmsi.gse.rutgers.edu/sites/default/files/MSI%20List.pdf, etc.)?
2. What are the needs of undergraduates at under-resourced institutions, what programs already exists to meet those needs (e.g NASA opportunities such as: MUREP: https://www.nasa.gov/stem/murep/home/index.html, MIRO: https://www.nasa.gov/stem/murep/projects/miro.html), and, if needed, what can be done to improve these programs, is there more we can do to specifically target/help those students?
3. What are the needs of faculty of under-resourced institutions, is there more we can do to help them engaging in such initiatives or even participating in other research funding opportunities?
4. There are already opportunities for MSIs and NASA centers partnerships (e.g. MUREP/MIRO), are there equivalent partnerships between MSIs and other academic Institutions or under the auspices of other funding agencies e.g. NSF? Do these need to be improved? If so how?
5. Demographics of PhysPAG members – in fact of all PAGS - this could be a **cross-PAG activity**

PhysPAG EC activities
current goals (under discussion)

- Improve access for (researchers at) under-resourced institutions

- How to carry on this study: Create a SAG, or set up a survey ?

- What is the deliverable?
  - If we create a SAG provide report to APAC
  - If we opt for a survey present results at a APAC meeting
  - White Paper

PhysPAG EC activities
current goals (under discussion)

- Assess Usability/Accessibility of data analysis tools and data representation
  - Assess the need for implementation as an integral part of technology development

- Preparation for Decadal outcomes:
  - Look into and analyze complementarities of flagships - with other flagships, and/or other potential future missions
  - Look at what other agencies are doing
  - Look into gaps in submitted science in APC white papers
  - Answer the question: *'Where do you think your community is least well prepared for an outcome of the Decadal?'*

- Circulated the COPAG survey on the impact of COVID-19 amongst PCOS PhysPAG community - email sent out to PCOS-News email list by Terri Brandt on 19th of May and on 15th of June on behalf of the PhysPAG Chair and Co-Chair

PhysPAG EC activities
current goals (under discussion)

- Discuss suggestions from last APAC meeting March 2020

1. We were asked to consider reorganizing our SIGs to be science-driven rather than wavelength/spectrum driver.

SIGs conclude that they would rather continue organized as is.

The EC agreed that the current SIG organization is well-suited to achieve the PhysPAG's objectives:

- Soliciting and Coordinating community analysis and input on PCOS objectives and
- Planning of future missions and activities.

PhysPAG EC activities
current goals (under discussion)

Some details of the specific SIGs are:

XR SIG – community is communicative & collegial with good attendance. This SIG is serving a purpose not available elsewhere, as it covers a number of interconnected PCOS topics utilizing X-rays, while other meetings are science-focused or cover all of X-ray astronomy

GW SIG – makes sense as-is; unique as dealing with non-photon messengers. GW people used to banding together to advocate for any space-based mission.

IP SIG – is already organized around a science theme/question, though around a mission type (probe). CMB (both space & ground-based missions) community is well self-organized and used to come together to advocate for any space-based mission.

etc….

PhysPAG EC activities
current goals (under discussion)

- Discuss suggestions from last APAC meeting March 2020

2. More formal organization for the entire day before the first day of the winter AAS meeting, including cross-PAG activities and technology development.

PhysPAG chair emailed COPAG, EXOPAG chairs and the PCOS, COR, and ExEP Program Scientists to express the willingness to coordinate sessions and technology development at the winter AAS meeting

PhysPAG/SIG Meetings and Activities

- **April APS, April 2020, Washington, DC - Virtual Meeting**
  - PCOS/PhysPAG (this) session
  - **IP SIG session Saturday 6:30 pm– 8:00 pm (ET)**
  - **XR SIG session Sunday 6:30 pm – 8:00 pm (ET)**
  - GW SIG and GR SIG **cancelled** due to COVID-19 pandemic

  https://pcos.gsfc.nasa.gov/physpag/meetings/APS_2020/APS2020-agenda.php

- **AAS meeting 1-3 June – PCOS Table**

- **AAS HEAD, September 2020:** in-person meeting has been cancelled

  Planning begun – we are preparing to have:
  - PCOS & PhysPAG Town Hall and SIG sessions
  - likely including X-ray and Gamma Ray SIG sessions

- **AAS Winter 2021**