

PCOS & PhysPAG Community Discussion

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PCOS Chief Scientist

HEAD
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PCOS Chief Scientist enables ground-breaking science from space by working at the interfaces between missions and studies, technology, the community, and NASA HQ.

Current PCOS Science Goals and Priorities:

- Ensure a more successful **Decadal survey** by supporting community preparations and HQ activities, spanning the range of inputs: from science to missions, technology, and state of the profession, which all impact our ability to do ground-breaking science
- Ensure more **successful missions** by supporting on-going mission studies and pre-projects, eg LISA, Lynx, Athena; through technology efforts, eg SAT; and by coordinating with current missions
- **Engage the community** to support a successful APD portfolio.

PhysPAG

Physics of the Cosmos Program Analysis Group

- Purpose:

- provide input to NASA relevant to PCOS
- help NASA inform interested parties about PCOS doings

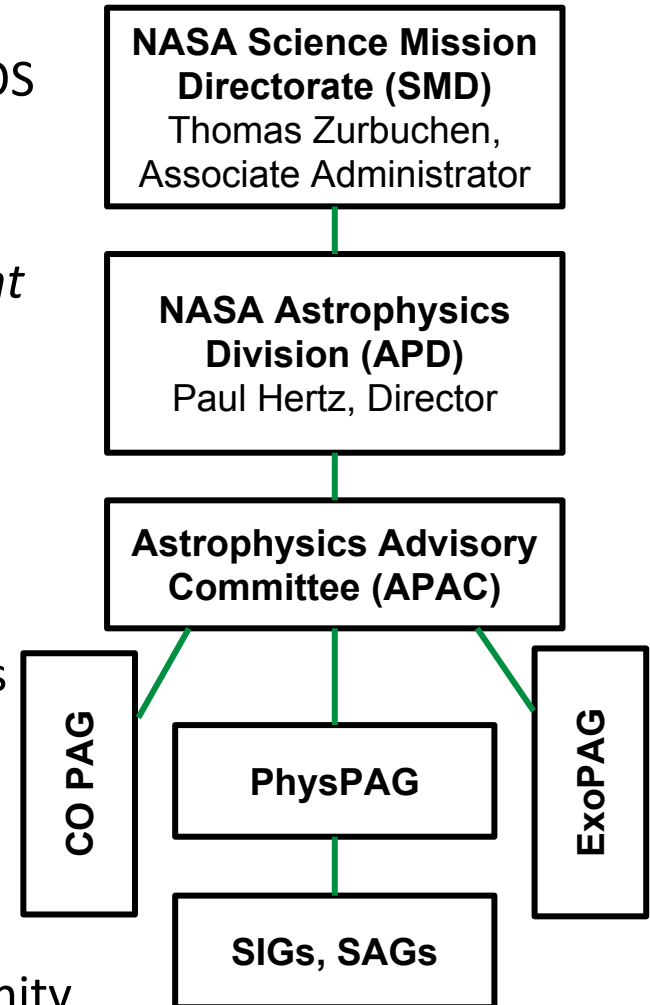
- Membership: *You!*

Anyone interested in providing input to NASA relevant to its Physics of the Cosmos Program

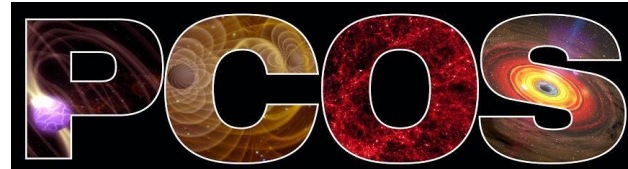
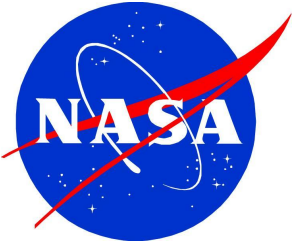
- Leadership:

- **Executive Committee (EC):**
 - Chair: John Conklin
 - Vice Chair: Graça Rocha
- 12 EC members chair 6 Science Interest Groups (**SIGs**): longer-standing discipline-specific fora
- support formation of Science Analysis Groups (**SAGs**): group created to analyze a specific science question
- facilitate **info flow** between NASA and community

Communication Network:



For more info: <https://pcos.gsfc.nasa.gov/physpag/physpag-ec.php>

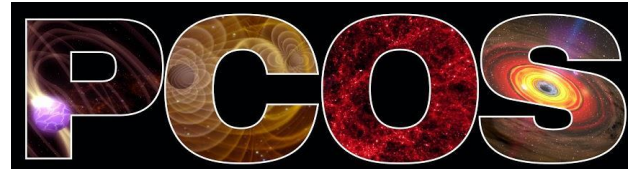
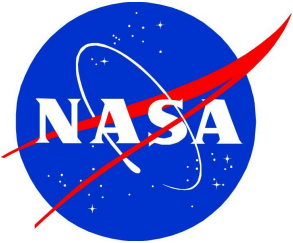


Discussion

Sparks

- What have you found useful?
 - SIGs? SAG?
 - professional exchange of ideas?
 - white paper preparations?
 - Strategic Astrophysics Technology (SAT) program?
 - ?
- What would you like to see more of? or less of?
 - more community leadership?
 - ?
- What do you need from NASA?
- What are you concerned about?





Conclusions

Come talk with us!

- At HEAD, APS, Landscape 2020, ...
- Have an idea where we could collaborate to enable better science?
Let us know! (t.j.brandt@nasa.gov)

Sign up for our mailing list!

<https://pcos.gsfc.nasa.gov/pcosnews-mailing-list.php>



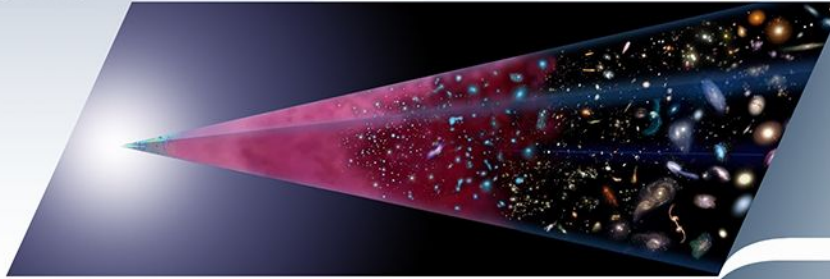
Backup

Why Astrophysics?

Astrophysics is humankind's scientific endeavor to understand the universe and our place in it.



How did our universe begin and evolve?



Physics of the Cosmos (PCOS)



How did galaxies, stars, and planets come to be?



Cosmic Origins (COR)

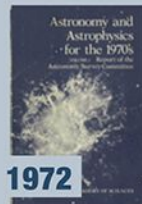


Are we alone?



Exoplanet Exploration (ExEP)

Enduring National Strategic Drivers



Program Office Themes



Physics of the Cosmos Program Office Purpose:

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.

Physics of the Cosmos spans the fields of high-energy astrophysics, cosmology, and fundamental physics, and includes a wide range of science goals. These include the following:

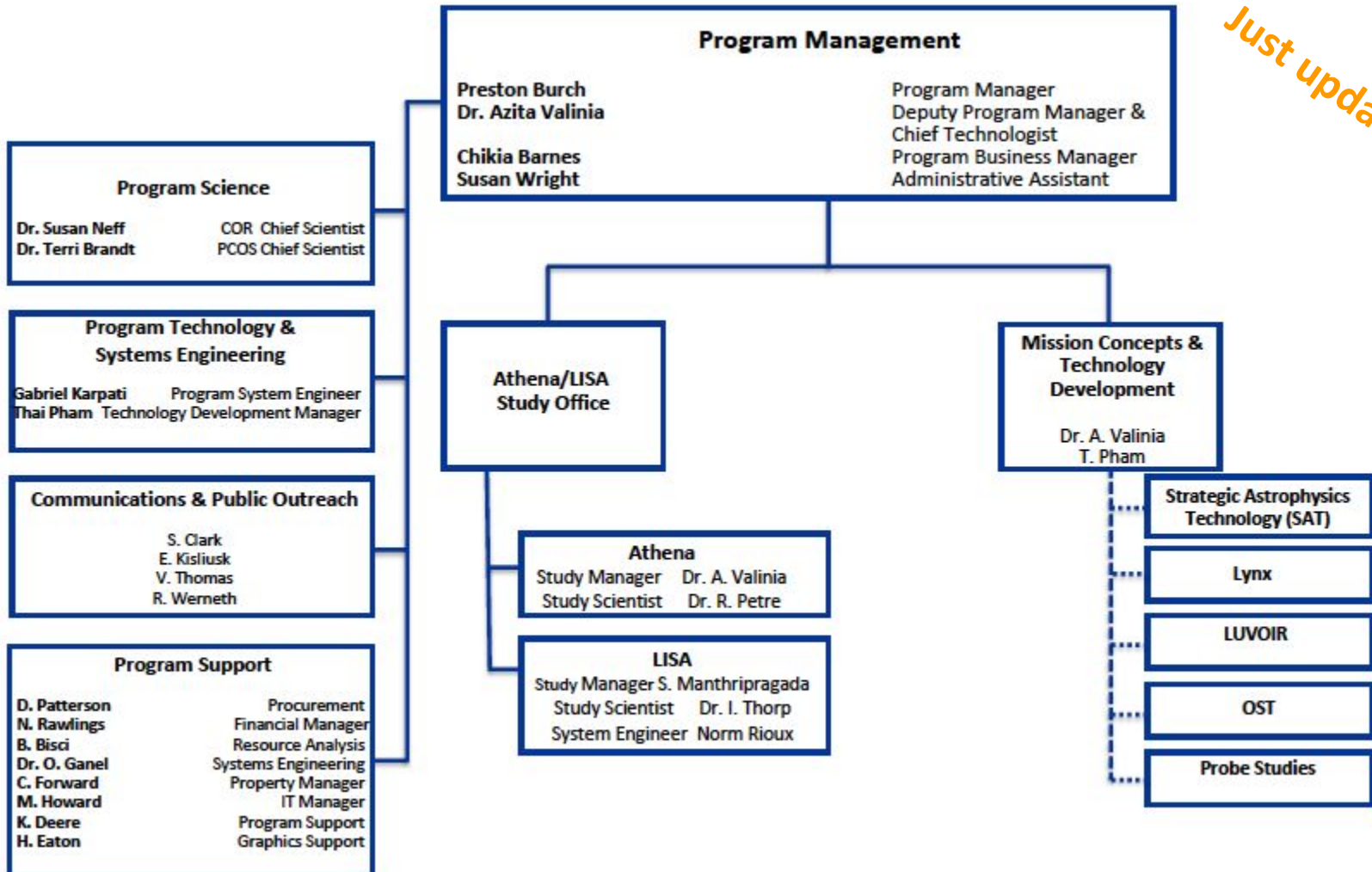
- General Relativity and the Nature of Spacetime
- Massive Black Holes and the Evolution of Galaxies
- Matter and Energy in the Most Extreme Environments
- Dark Energy
- Big Bang and the Evolution of the Universe

More resources: <https://pcos.gsfc.nasa.gov>



PCOS/COR Program Office (PO) authority flows from Astrophysics Division Director Paul Hertz to his HQ staff and to the PCOS/COR PO.

Just updated!





Activities supporting PCOS goals and priorities:

- Managed by the PCOS/COR Program Office at NASA's Goddard Space Flight Center and reported to NASA Headquarters.
- Include:
 - **Mission studies** and pre-project mission oversight, insight, and support
 - **Strategic technology (SAT)** maturation oversight, insight, and support
 - **Community engagement**, including via the Physics of the Cosmos Program Analysis Group (PhysPAG)
 - Maintaining **science cognizance** to enable more successful NASA strategic planning

The PCOS Program Office hosts

- Athena Study Office
- LISA Study Office

and oversees

- science and
- technology activities

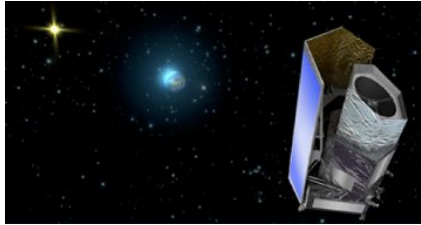
for NASA's contribution to these ESA-led and other strategic missions.

Missions



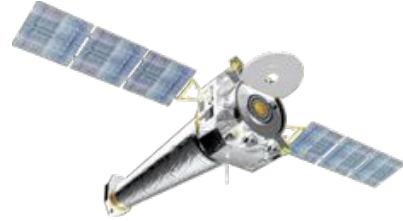
Operating Missions:

Euclid ~2022
ESA-led Mission



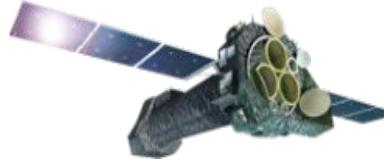
NASA supplying the NISP
Sensor Chip System (SCS)

Chandra 1999
NASA Strategic Mission



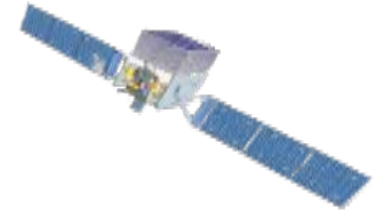
Chandra X-ray Observatory

XMM-Newton 1999
ESA-led Mission



X-ray Multi Mirror
- Newton

Fermi 2008
NASA Strategic Mission



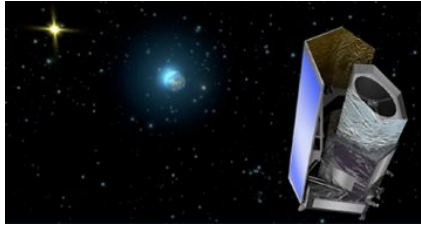
Fermi Gamma-ray
Space Telescope

Missions



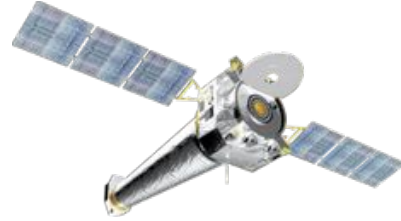
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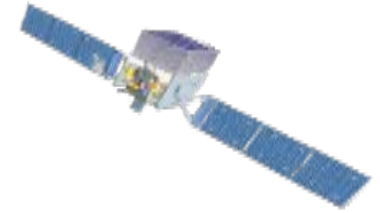
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Fermi Gamma-ray
Space Telescope

And,

- Particle astrophysics
- Gamma-ray (MeV+)
- X-ray
- Inflation probe
- Cosmic Structure
- Gravitational waves

From all platforms!

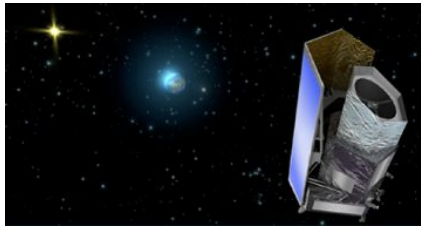
- Satellites,
- the ISS,
- Balloons,
- Sounding rockets,

Missions



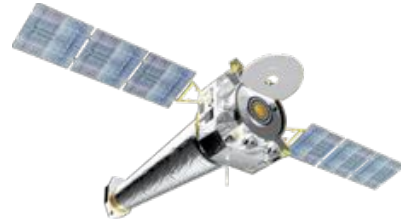
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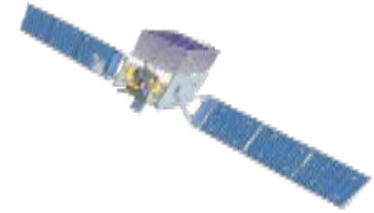
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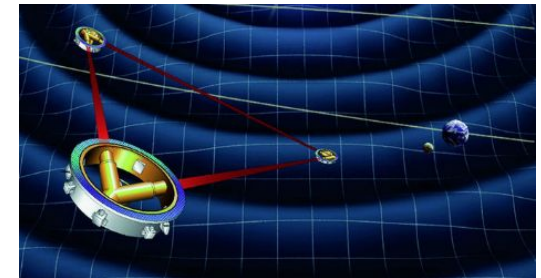
Missions in Pre-formulation:

Athena Early 2030s
ESA-led Mission



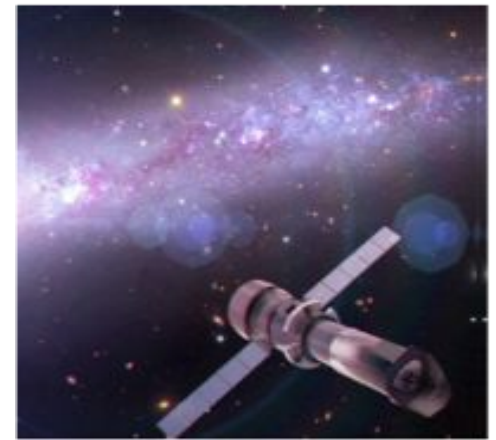
NASA is supplying elements for
both instruments
Science team members

LISA Mid 2030s
ESA-led Mission



NASA is developing technology for
both the payload and the mission
NASA LISA Study Team

Athena



- Athena is an ESA flagship X-ray mission slated for launch in the early 2030s
- Two instruments provided by member states:
 - calorimeter (X-IFU) and
 - wide-field imager (WFI)
- NASA is currently planning contributions to both X-IFU and WFI and is discussing observatory contributions.
- Athena is currently in phase A: ESA is finalizing the preliminary design in collaboration with
 - instrument teams and
 - several industry spacecraft prime contractors.
- **Get involved! Join an Athena Science Working Group**, organized by theme: Hot Universe, Energetic Universe, and Observatory

For more info: <http://www.the-athena-x-ray-observatory.eu/>



LISA

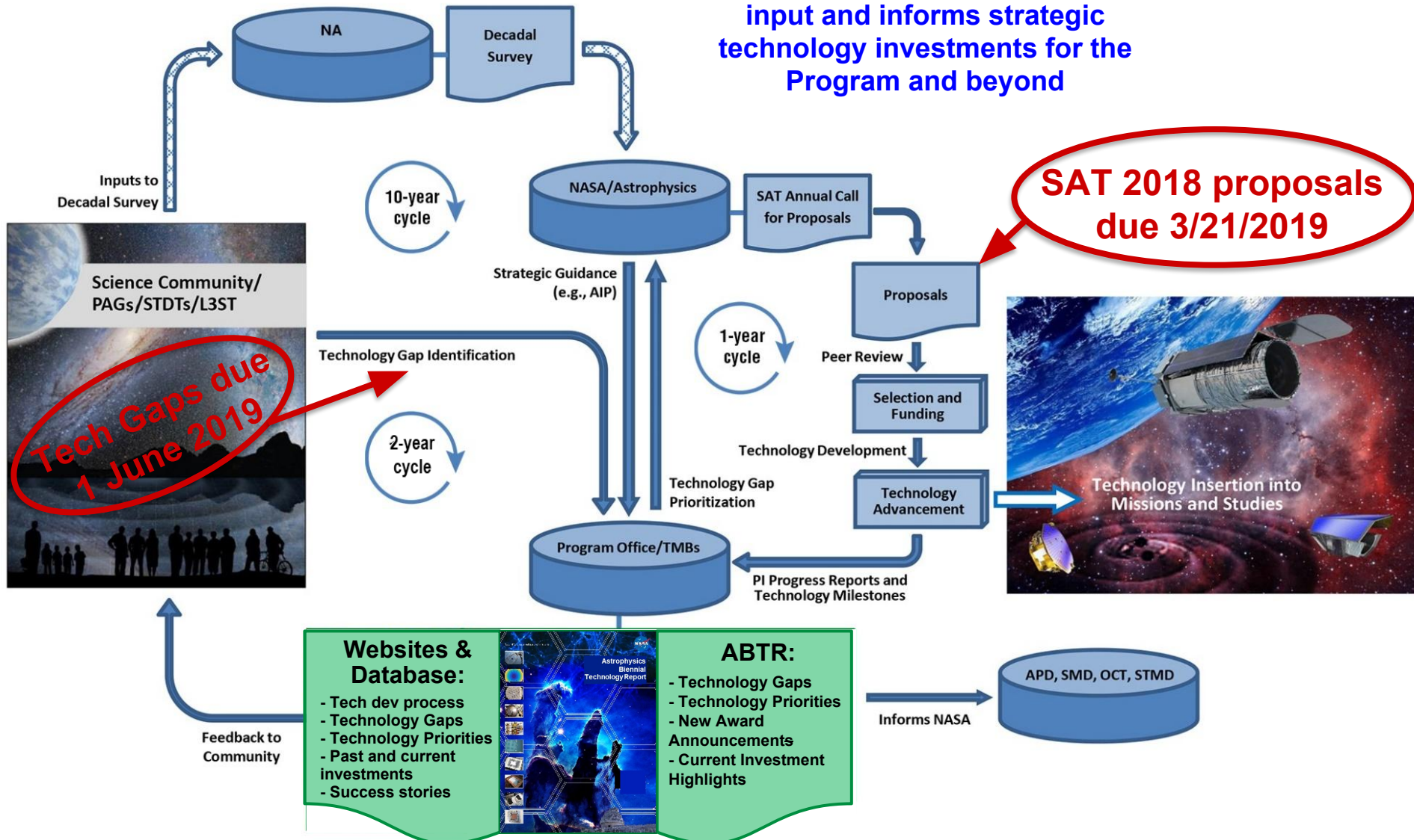


- LISA is an ESA-led space gravitational wave observatory.
- NASA is a junior partner w possible technology contributions under development including:
 - Laser
 - Telescope
 - Phasemeter
 - Microthrusters
 - Charge management system
- NASA LISA Study Team (Kelly Holley-Bockelmann, Chair) is preparing science white papers for the Decadal Survey.
 - ***Broader astrophysics community involvement is welcome!***

For more info: <https://lisa.nasa.gov/L3Study.html>

Strategic Technology Development Process

Process is responsive to community input and informs strategic technology investments for the Program and beyond



PhysPAG Science Interest Groups

- PhysPAG Executive Committee members chair 6 Science Interest Groups
 - X-ray SIG** (XR SIG)
 - Gamma-ray SIG** (GR SIG)
 - Cosmic Ray SIG** (CR SIG)
 - Gravitational Wave SIG** (GW SIG)
 - Cosmic Structure SIG** (CoS SIG)
 - Inflation Probe SIG** (IP SIG)
- SIGs serve as **forums for soliciting, discussing, and coordinating community input.**
- Come talk w us at **HEAD, APS April, Space Astrophysics Landscape 2020s, ...**



We're listening!

For more info: <https://pcos.gsfc.nasa.gov/physpag/physpag-sigs.php>

PhysPAG SIGs' Decadal Activities

Gravitational Wave SIG (GW SIG)

- Chairs: Kelly Holley-Bockelmann, Nico Yunes, John Conklin
- Working with GW community, like *You!*, and NASA LISA Science Team to develop science white papers in coordination with ESA LISA mission
- Contact chairs to contribute! (<https://pcos.gsfc.nasa.gov/sigs/gwsig.php>)
- **April APS meeting**

Cosmic Ray SIG (CR SIG)

- Chairs: Jim Beatty, Marcos Santander, and Abigail Vieregge
- Assisting community with white paper organization
- Input welcome! Contact SIG chairs: <https://pcos.gsfc.nasa.gov/sigs/crsig.php>
- **April APS meeting**

Gamma-ray SIG (GR SIG)

- Chairs: Sylvain Guiriec and John Tomsick
- Organizing community science white papers, coordinated with mission white papers
- Input welcome! Contact SIG chairs: <https://pcos.gsfc.nasa.gov/sigs/grsig.php>
- **March HEAD, April APS meetings**

PhysPAG SIGs' Decadal Activities

Inflation Probe SIG (IP SIG)

- Chairs: Kevin Huffenberger, Graça Rocha, and Abigail Vieregg
- Assisting community with white paper organization, coordination w CMB-S4, Probe
- Input welcome! Contact SIG chairs: <https://pcos.gsfc.nasa.gov/sigs/ipsig.php>

Cosmic Structure SIG (CoS SIG)

- Chairs: Kevin Huffenberger, James Rhoads, and Graça Rocha
- Coordinating w community efforts
- Input welcome! Contact SIG chairs: <https://pcos.gsfc.nasa.gov/sigs/cossig.php>

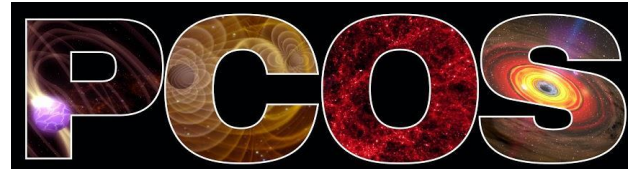
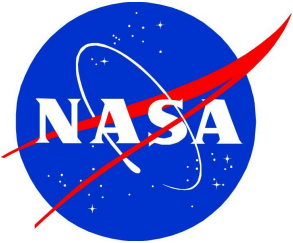
X-ray SIG (XR SIG)

- Chairs: Ryan Hickox, John Tomsick
- Assisting community in organizing white papers
- Input welcome! Contact SIG chairs: <https://pcos.gsfc.nasa.gov/sigs/xrsig.php>
- **March HEAD meeting**

MMA SAG

Multimessenger Astrophysics Science Analysis Group (MMA SAG)

- **Chairs:** John Conklin, John Tomsick, Suvi Gezari
- **Charge:** Analyze the potential scientific benefits of multimessenger observations made possible by NASA observatories in the 2020 decade and beyond, working in conjunction with each other or with other ground and space-based instruments.
- **Currently:** coordinating and facilitating ~10 MMA science white papers
- **Next up:** discussion of MMA opportunities and needs in the 2020s for final report
- Join and contribute! Mailing list, slack connection, etc:
<https://pcos.gsfc.nasa.gov/sags/mmasag.php>
- **March HEAD meeting**



Get Involved!

Participate

- In a **SIG**
- In the **MMA SAG**
- At HEAD, APS, Landscape 2020, ...
 - Know somewhere collaboration could enable better science?
Let us know! (t.j.brandt@nasa.gov)

Contribute

- To Lynx via the existing SWGs, OWG, and IWG
- To a probe mission study by contacting the PI
- To a **science white paper!** Due Mar 11.
- To an **activities, projects, and state of the profession white paper!** Nol: Mar 20. White paper: ~July 1.
- To a **Decadal Town Hall:** starting late March

Sign up for our mailing list!

<https://pcos.gsfc.nasa.gov/pcosnews-mailing-list.php>

