

The New Great Observatories Science Analysis Group

A Cross-PAG SAG on scientific advances enabled by a fleet of future Great Observatories

The [2020 Decadal Survey in Astronomy & Astrophysics](#) (Astro2020) has placed pursuit of a new constellation of [Great Observatories](#) as the top national priority for the future of space astrophysics. The report envisions a new strategy for the development of these large missions in the form of the *Great Observatories Mission & Technology Maturation Program* (GOMaP), whose first entrants are to be a ~6m IR/O/UV Observatory optimized for imaging and spectral characterization observations of exoplanets as well as general astrophysics, followed (with equal priority) by a high spatial and spectral resolution X-ray Great Observatory, and a Far-Infrared Great Observatory. These future Great Observatories will follow *JWST* and *Roman*, the next Great Observatories.

In motivating this visionary recommendation, Astro2020 cited the [2019 Report from the Great Observatories Science Analysis Group \(SAG-10\)](#), a [cross-PAG initiative charged](#) with analyzing the scientific benefits of simultaneity and panchromatic coverage enabled by contemporaneous flight of NASA's first Great Observatories (*Hubble*, *Compton*, *Chandra*, and *Spitzer*). Astro2020 specifically notes that “*overlapping or near-simultaneous wavelength coverage is particularly impactful*”, and that the GOMaP is partly intended to “*ensure the needed cadence for panchromatic capabilities*”¹.

In response to Astro2020's prioritization of the GOMaP and its first mission entrants, NASA will create new precursor science programs to lower risk and inform science & architecture trades, fund maturation of enabling technologies, and conduct analyses of alternative architectures prior to any formal start of mission pre-formulation². Meanwhile, NASA's *Physics of the Cosmos*, *Cosmic Origins*, and *Exoplanet Exploration Program Analysis Groups* (the PhysPAG, COPAG, and ExoPAG, respectively) are charged with fostering critically-needed community interaction with all stages of this process.

To that end, several cross-PAG initiatives specifically related to the GOMaP and the IR/O/UV, X-ray, and FIR Great Observatories are being proposed. The first of these is the **New Great Observatories Science Analysis Group**. The goals of this proposed cross-PAG SAG are to analyze and answer the following questions:

- To what degree can the Key Science Questions from Astro2020 be advanced by *contemporaneous* flight of current, imminent, and future IR/O/UV, X-ray, and FIR Great Observatories? In particular, what discoveries in the Astro2020 Priority Areas might be *uniquely* made possible by coordinated use of X-ray through FIR space observatories using powerful and varied instruments? What gaps require *contemporaneous* flight of

¹ Direct quotes from the [Astro2020 Report](#), page 1-18.

² See e.g. slides 29-31 of [this document](#) for more details on NASA's initial planning for the GOMaP.

several or even all of these observatories, and to what degree is asynchronous panchromatic coverage sufficient? How might gaps be closed by the notional future multi-scale multiwavelength mission portfolio, including future explorers and probes?

- In the scenario that any or all of these missions not be launched, or should their missions see minimal overlap, what are the corresponding scientific impacts with regards to loss of discovery space or inability of the community to address the priority areas of Astro2020?

The SAG will aim to provide a report to NASA by late 2023 or early 2024. The audience of the Report is intended to be the astronomical community as a whole, GOMaP and Science Leadership at NASA Headquarters and Centers, and indeed stakeholders and policymakers, including in Congress.

We are now soliciting members of the astronomy and aerospace engineering communities who are interested in participating in this SAG. In alignment with NASA's core value of inclusion, the SAG will be committed to fostering an inclusive environment for all participants, and will invite candidates from all backgrounds to contribute fully, including in SAG-wide leadership roles. If interested, please fill out this form *[add link]* by **DATE TBD**. Questions may be addressed to the PhysPAG, COPAG, and ExoPAG Chairs (Grant Tremblay: grant.tremblay@cfa.harvard.edu; Janice Lee: janice.lee@noirlab.edu; Ilaria Pascucci: pascucci@arizona.edu, respectively).