

PAG Activities in Response to the Charge: Input into the 2020 Decadal Survey and Large Mission Studies

NAC Astrophysics Subcommittee Meeting

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NASA's Charge to the PAGs.

“I am charging the Astrophysics PAGs to solicit community input for the purpose of commenting on the small set [of large mission concepts to study], including adding or subtracting large mission concepts.”

Detailed Charge, Part 1.

1. Each PAG, under the leadership of its Executive Committee, shall broadly solicit the astronomy and astrophysics community for input to the report in an open and inclusive manner.
 - To accomplish this, each PAG is empowered to envision and use its own process.
2. Each PAG will consider what set of mission concepts should be studied to advance astrophysics as a whole; there is no desire for mission concepts to be identified as “belonging” to a specific Program or PAG.
 - Each PAG shall keep the number of large mission concepts in the set as small as possible.
 - Each PAG is specifically charged to consider modifications and subtractions from the small set, and not just additions.
3. Each PAG shall produce a report, where it shall comment on all large mission concepts in its small set of large missions, including those in the initial small set and those added or subtracted.
 - The PAGs may choose to work together and submit coordinated or joint reports.
 - Where there is existing analysis to support it, PAGs are encouraged to comment on the cost range anticipated large mission concepts (>\$1B? Maximum?)

Detailed Charge, Part 2.

4. Each PAG may choose to have a face-to-face meeting or workshop in developing its report; said meeting may be scheduled in proximity to an existing community meeting or conference.
5. Although there is no page limit for the report, each PAG shall strive to be succinct.
6. Each PAG shall submit its report in writing no later than two weeks prior to the Fall 2015 meeting of the NAC Astrophysics Subcommittee (meeting schedule not yet known).

Suggested Report Format.

- Process followed by the PAG to solicit input.
- Brief description of the community response.
- Procedure and criteria used for PAG analysis of community response.
- Outcome of the analysis and final small set of mission concepts ... every mission concept that is retained, added or subtracted must be accompanied by a short rationale.
- And additional considerations for NASA.
 - If desired, information regarding potential probe-class missions, to inform any future process for considering probe-class mission studies.

Constraints.

- Missions are to follow JWST and WFIRST.
- NASA's plans for realizing a space-based GW observatory is focused on partnering with ESA's L3 (LISA)
 - Study participation.
 - Technology development.
- CMB Polarization Surveyor is a probe-class mission.
- Basically: assume 2010 Decadal Priorities as a constraint.

Initial list of missions.

Taken from NASA Roadmap (Surveyors)
and Decadal Survey (HabEx)

- Far IR Surveyor
- Habitable–Exoplanet Imaging Mission
- UV/Optical/IR Surveyor
- X–ray Surveyor

What is *not* in our charge.

1. Detailed science goals or requirements.
2. Detailed architectures or technology requirements.
3. Advocacy or Advice (rather: “Analysis”)
4. Prioritization of the suggested missions.
5. “Ownership” of any mission concept by any individual PAGs
6. Don’t attempt to prepopulate the STDTs (Note: these are likely to be competitively selected).

Charge of the STDTs.

- Define science objectives and a strawman payload concept.
- Identify technology development requirements
- Develop a design reference mission.
- Conduct a cost assessment, with the possibility of iteration.
- *Goal: to maximize the potential of all of these missions.*

Timeline for STDTs.

- 2015:
 - Identify a small set of candidate large missions to study
 - PAG reports due by October 2015 APS meeting.
- 2016–2019:
 - Initiate studies.
 - Conduct studies.
 - Identify technology requirements
 - Deliver results to decadal survey.

Timeline/Meetings for Hertz Charge (completed).

- *January 2014: Initial discussion at ExoPAG 9.
- March 2014: APS approves SIG #1.
- June 2014: Brainstorming session at ExoPAG 10.
- January 2015: Brainstorming session at ExoPAG 11, Paul's charge.
- February 2015: First dedicated SIG #1 Meeting, brainstorming & consensus building.
- March 10 COPAG Virtual Town Hall
- March 19, 2015: Joint PAG EC meeting.
- April 11–14 2015, Am. Phys. Soc. (Baltimore) – PhysPAG
 - SIGs and PCOS mini-symposium
- June 2, 2015: ExoPAG Virtual Meeting
- June 3–5, 2015: Far-IR Workshop (Caltech) – COPAG
- June 13–14, 2015: ExoPAG #12 (Chicago) – ExoPAG
 - Half to full day to be spent on charge (2nd day)
- June 25–26, 2015: UV/Vis SIG Meeting, Greenbelt, MD – COPAG
- July 1, 2015: panel discussion during the HEAD meeting (Chicago) – PhysPAG
- July 3, 2015: joint PAG EC Chair telecon.
- July 13, 2015: joint PAG EC Chair telecon with Paul Hertz
- July 14, 2015 – ExoPAG Virtual Meeting

Timeline/Meetings for Hertz Charge (future).

- August 2015 – COPAG Virtual Town Hall
- August 7, Joint PAG Splinter Session at IAU, 1–5pm
- August 18, 2015 – ExoPAG Virtual Meeting
- July–September 2015: writing, circulating, finalizing report(s?).
- October 2015: Deliver report to Hertz (two weeks before the APS)

ExoPAG's Response to Paul's Large Mission Charge.

- Talks, brainstorming, and discussion at ExoPAGs 9, 10, 11, 12, one stand-alone meeting, and two virtual meetings.
- NASA Astrophysics Roadmap.
- Solicited (and unsolicited) input from a several dozen members of the community.
- COPAG White Papers



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ExoPAG Input into the 2020 Decadal Survey and Large Mission Studies

[Virtual Meetings](#) | [Face-to-Face Meetings](#) | [Science Division Documents](#) | [Supporting Documents](#) | [Links](#)

Paul Hertz (NASA Astrophysics Division Director) has charged the three Astrophysics Program Analysis Groups (PAGs) with reviewing a small set of candidate large mission concepts, and suggesting addition, subtraction, and other useful summary. The results of this review will be reported at the NASA Advisory Council Subcommittee meeting in October in the form of a report. This page provides information on the charge and the ExoPAG's plans for responding to this charge and creating this report.

The ExoPAG will respond to this charge in the context of its Science Interest Group #1 activities, as described in the following charter:

SIG #1: [Toward a Near-Term Exoplanet Community Plan](#).

The ExoPAG is soliciting input from the community through three primary methods:

- Direct input to the SIG #1 chair Scott Gaudi: gaudi.1@osu.edu.
- [Virtual Meetings](#)
- [Face-to-Face Meetings](#)

The COPAG is also soliciting white papers and are happy to receive white papers from the ExoPAG community: <http://cor.gsfc.nasa.gov/copag/rfi/>

Reference Material.

- <http://cor.gsfc.nasa.gov/copag/rfi/>
- <https://exep.jpl.nasa.gov/exopag/decadal/>
- <http://pcos.gsfc.nasa.gov/physpag/>

Cross-PAGs Topics of Discussion.

- Joint PAG Reports?
 - Joint summary.
 - Joint table.
- Should we add any missions?
- Should we subtract/merge any missions?
- The Astrophysics Division's goal is to identify a set of missions that 'advances astrophysics as a whole". Are there major gaps not addressed by this set of missions?
- How should we organize the STDTs for these missions?
- Paul Hertz has asked the PAGs for 'other useful commentary' about the set of missions for put forward for study. What commentary would you include?
- What do we say about probes?

Backup Slides

Far-IR Surveyor

- Wavelength coverage: 25–500 μm in 6–8 log-spaced bands with $R \sim 500$
- Monolithic telescope - diameter ~ 5 m.
- Telescope actively cooled to < 4 K, instruments cooled to < 100 mK.
- Field of View = 1 deg at 500 μm
- Mission: 5 years + at Earth-Sun L2
- High-resolution (heterodyne) spectroscopy also compelling, possibly for warm phase.

Habitable-Exoplanet Imaging Mission

- Likely $< \sim 8\text{m}$, monolithic or segmented primary
- Optimized for exoplanet direct imaging.
- ExoEarth detection and characterization:
 - Needs $\sim 10^{-10}$ contrast
 - Coronagraph and/or starshade
 - Camera
 - Optical and near-IR wavelength sensitivity for planet characterization
 - IFU, $R > 70$ spectrum of 30 mag exoplanet
 - 1" FOV
- Potential for an instrument for spectroscopic characterization of transiting planets.
- UV-capable telescope/instrument suite would constrain the high-energy radiation environment of planets, and enable a broad range of compelling COR science.
- L2 orbit or Earth-trailing

Large UVOIR Surveyor

- ~8–16m
 - likely segmented, obscured primary.
- Cosmic origins science
 - HST-like wavelength sensitivity (FUV to Near-IR)
 - Suite of imagers/spectrographs
- ExoEarth detection and characterization:
 - Needs $\sim 10^{-10}$ contrast
 - Coronagraph (likely), perhaps with a starshade
 - Camera
 - Optical and near-IR for planet characterization.
 - IFU, $R > 70$ spectrum of 30 mag exoplanet
 - 1" FOV
- L2 Orbit

X-ray Surveyor

per Astrophysics Visionary Roadmap

- Effective area $\sim 3 \text{ m}^2$
- Sub-arcsecond angular resolution
- High-resolution spectroscopy ($R \sim \text{few} \times 10^3$) over broad band via micro-calorimeter & grating spectrometer instrumentats
- FOV $\gtrsim 5'$
- Energy range $\sim 0.1\text{--}10 \text{ keV}$