

Cosmic Origins Program Analysis Group

Astrophysics Subcommittee Meeting

November 14, 2014

Kenneth Sembach

Current COPAG Executive Committee Membership

| Name | Institution | Term Expiration |
|---------------------|------------------|---------------------|
| Ken Sembach - Chair | STScI | Mar 2016 |
| Lynne Hillenbrand | Caltech | Oct 2014 (Oct 2015) |
| Julianne Dalcanton | U. Washington | Oct 2014 |
| David Leisawitz | NASA GSFC | Oct 2014 (Feb 2015) |
| Paul Scowen | Arizona St U. | Dec 2014 |
| James Lowenthal | Smith College | Mar 2015 |
| Daniela Calzetti | U. Mass. Amherst | Jan 2017 |
| Dennis Ebbets | Ball Aerospace | Jan 2017 |
| James Green | U. Colorado | Jan 2017 |
| Sally Heap | NASA GSFC | Jan 2017 |

10 members + ex-officio (S. Neff & D. Padgett in COR office, M. Perez & M. Garcia at HQ)

*Rotating off *Term extended

COPAG Executive Committee Replacements

- Five members (half of the EC) are scheduled to rotate off by Spring 2015.
 - Three members were slated to rotate off in October 2014, one in December 2014, and one in March 2015.
- Extend the term of two members (Lynne Hillenbrand and David Leisawitz) who were scheduled to rotate off in October 2014, until October 2015 and February 2015, respectively.
- Add three new members for the terms November 2014 – October 2017, with an additional fourth member start deferred until February 2015 to satisfy the ≤ 2 person per institution limit on EC membership.
- No additional NASA center EC members other than those in this round for the next 3 years in order to maintain institutional diversity.

New COPAG Executive Committee Membership

| | Name | Institution | Term Expiration |
|-----|---------------------|------------------------|-----------------|
| | Ken Sembach - Chair | STScI | Mar 2016 |
| | David Leisawitz | NASA GSFC | Feb 2015 |
| | James Lowenthal | Smith College | Mar 2015 |
| | Lynne Hillenbrand | Caltech | Oct 2015 |
| | Daniela Calzetti | U. Mass. Amherst | Jan 2017 |
| | Dennis Ebbets | Ball Aerospace | Jan 2017 |
| | James Green | U. Colorado | Jan 2017 |
| | Sally Heap | NASA GSFC | Jan 2017 |
| New | Pamela Marcum | NASA ARC | Oct 2017 |
| New | Mary Beth Kaiser | Johns Hopkins U. | Oct 2017 |
| New | Joseph Lazio | NASA JPL | Oct 2017 |
| | | After February 1, 2015 | |
| New | Matthew Greenhouse | NASA GSFC | Jan 2018 |

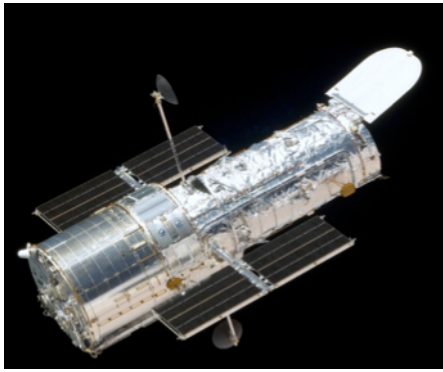
Status of Science Analysis Groups

- SAG #6: Cosmic Origins Science Enabled by the WFIRST-AFTA Coronagraph
 - COPAG Lead: Dennis Ebbets
 - Work complete, summary provided on following pages
 - Report ready for ApS, submitted for approval (see attached documents)
- SAG #7: Cosmic Origins Science Enabled by Operations Overlap of the Hubble Space Telescope and the James Webb Space Telescope
 - COPAG Lead: James Green
 - Work complete, summary provided on following pages
 - Report ready for ApS, submitted for approval (see attached documents)
- SAG #8: Cosmic Origins Science Enabled by the WFIRST-AFTA Data Archive
 - COPAG Lead: Sally Heap
 - Work in progress, report expected in mid-2015
- SAG #9: Science Enabled by Spitzer Observations Prior to JWST
 - COPAG Lead: Daniela Calzetti
 - Approved by ApS at August 2014 meeting, report expected in Spring 2015

SAG #6 Summary

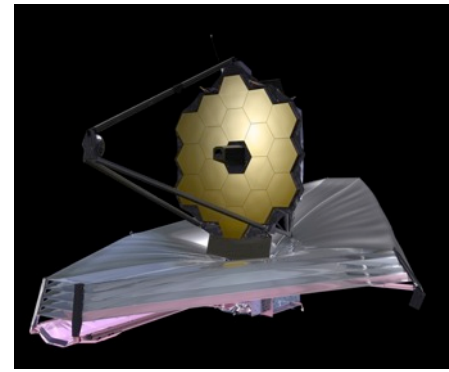
(Cosmic Origins Science Enabled by the WFIRST-AFTA Coronagraph)

- Many examples of important Cosmic Origins Science will be enabled by the AFTA coronagraph. Investigations involving quasars, super massive black holes and gravitational lenses would benefit from the coronagraph.
- The AFTA coronagraph will be a very powerful instrument with its planned baseline capabilities. A few additional features would also be useful.
- Cosmic Origins science targets and their measurement requirements differ in important respects from the host stars of exoplanets.
 - Many investigations will not require maximum contrast being implemented for exoplanet science. Efficient ways to achieve less extreme contrast would be valuable.
 - Not all targets will be point sources. Effective means of suppressing the glare of slightly extended objects would be useful.
 - Narrow-band filters would enhance observations of nebular emission features.
 - An Integral Field Spectrograph would be a very powerful tool for Cosmic Origins studies. Spectral resolution equating to a velocity of 100 km s^{-1} would be widely applicable.
- Some of the most important objects of interest to Cosmic Origins are rare, in some cases with only a handful currently known. Surveys with the Wide Field Imager will discover many new examples.



SAG #7 Summary

Cosmic Origins Science Enabled by Operations Overlap of HST and JWST



- The rationale for maintaining HST operations in the future is very strong, *regardless of any scientific efforts coordinated with or for other missions*. The limited number of large programs identified by this analysis group should not be taken as an indication that the scientific value of continued HST operations is in any way lessened.
- Many examples of particular targets that would benefit from JWST and HST observations were suggested; however, the size and scope of these observations could be accommodated by the current time allocation process and be awarded HST observing time at the discretion of the HST Time Allocation Committee (TAC). No change to the current process is required to enable these observations.

SAG #7 Summary (con't)

- While significant enthusiasm existed for maintaining an overlap period for HST/JWST amongst all scientists polled, only two precursor surveys were identified that match the criteria described in the charter.
 - A deep UV survey of the CANDELS fields with Wide-Field Camera 3 to quantify star-formation rates in these fields
 - A multi-band survey of EUCLID fields to calibrate the color-shape relationship of galaxies at redshifts relevant to the EUCLID survey
- No compelling cases for simultaneous HST/JWST observations were submitted. This does not preclude the possibility that such cases exist, only that none were brought to the attention of this SAG.

STScI Planning (under discussion)

- 1) Engage community in selecting JWST early-release science program, which may benefit from follow-up observations with HST
- 2) New HST proposal category for JWST preparatory observations
- 3) Reciprocal HST/JWST observing agreement (like that for Chandra, Spitzer, XMM, NRAO)

Request to start SIG #2: Ultraviolet-Visible Cosmic Origins Space-Based Science and Technology Development

- Provide a community forum for discussion of Cosmic Origins science objectives requiring UV/visible space-based observations.
- Help the community update the technology development roadmaps for missions of different scales (PATR Technology Gaps).
- Facilitate communication to merge the needs of the science community with the plans/achievements of the technology community.
- SIG activities are expected to occur over an extended period of time.
 - Results reported at periodic intervals (quarterly or semi-annually) to the COPAG Executive Committee and the Astrophysics Subcommittee.
 - Similar activities being done with the Far-IR community in COPAG SIG #1.
 - Chaired by Paul Scowen (external). COPAG EC lead will be chosen once new members join.
 - SIG charter is given on the next page.

SIG #2: Ultraviolet-Visible Cosmic Origins Space-Based Science and Technology Development

The ultraviolet (92-320nm) and visible (320-1000nm) (UVV) regions of the spectrum contain a vital suite of diagnostic lines that can be used to study diverse astronomical objects and phenomena that shape and energize the interstellar medium. It is a critical spectral range for tracing the physics of interstellar and intergalactic gas, the ionization of nebulae, the properties of shocks, the atmospheres and winds of hot stars, energy transfer between galaxies and their surrounding environments, and the engines of active galactic nuclei. This spectral range contains diagnostics that measure gas density, electron temperature, and energy balance between various modes of cooling. It is an unfortunate truth that many, if not most, of these diagnostics can only be observed outside the Earth's atmosphere, requiring facilities in space. Space-based observations also provide access to diffraction-limited optical performance to achieve high spatial resolution - in the ultraviolet and visible bands the Rayleigh criterion yields resolutions unavailable even to JWST for moderate sized apertures. Such spatial resolutions cannot currently be achieved from the ground over wide fields, a capability that many science programs need for sampling and survey work.

In order to provide continuing access in the future, new space-based missions will be needed to provide the core imaging and spectroscopic information in this important part of the electromagnetic spectrum. The technology that enables such access has been a high priority in technology development plans that have been developed by both the Cosmic Origins Program Office and Astrophysics Division at NASA, but a holistic approach to considering what is needed for a long-term technology roadmap has not yet been discussed widely within the community.

This UVV Science Interest Group [SIG #2] will work with the COPAG to collect community input and define long-term Cosmic Origins science objectives of the UVV astronomy community that can be addressed by space-based observations. A primary goal for the SIG will be to identify a compelling suite of science cases to provide programmatic focal points that would justify and energize the community to support investment in next generation UVV missions or facilities. Through the SIG, the community will update the existing community-based roadmap for technology development for missions of different scales. The SIG will facilitate communication that will merge the needs and desires of the science community with the achievements and plans of the technology community. The SIG activities are expected to occur over an extended period of time, with results reported at periodic intervals (quarterly or semi-annually) to the COPAG Executive Committee and the Astrophysics Subcommittee. The SIG is open to any interested members of the community and we welcome any and all input.

Upcoming Activities

- January 2015 AAS Meeting in Seattle
 - SAG and SIG splinter sessions followed by joint PAG session (Sunday, January 4)
 - PAG special session (Wednesday, January 7)



- November 2014 WFIRST Science Workshop in Pasadena
 - SAG #6 (coronagraph) - Dennis Ebbets
 - SAG #8 (archive) - Sally Heap



ApS Approval Request

- Approval of the 4 new COPAG Executive Committee members
- Approval of the new UV-visible Science Interest Group (SIG #2)
- Approval of reports for SAG #6 and SAG #7