Gravitational Wave Science Interest Group
April APS Splinter Meeting

Neil Cornish, John W. Conklin*
*jwconklin@ufl.edu

Thanks: Antara Basu-Zych & Ann Hornschemeier

Email list: http://pcos.gsfc.nasa.gov/sags/gwsag/gwsag-maillist.php
Preparing for the 2020 Decadal

From Paul Hertz charge to the PAGs (January 2015):

- The 2020 Decadal Survey will prioritize large space missions to follow JWST and WFIRST

- Part A: Identify small set of candidate large missions
  - Community input from the PAGS (now)
  - Paul Hertz’s initial list [2010 Decadal, 2014 Visionary Roadmap]
    1. Habitable-Exoplanet Imaging Mission
    2. UV/Optical/IP Surveyor
    3. Far IR Surveyor
    4. X-ray Surveyor

- Part B: Science and Technology Definition Team (STDT) studies
  - Identify technology needs and fund them through existing programs
  - Present to 2020 Decadal committee
LISA excluded from Short-list

- **Hertz justification:**
  - LISA is highest ranking large mission after WFIRST in the 2010 Decadal
  - NASA is planning to partner with ESA on L3
  - NASA will participate with ESA in preparatory studies (including the GOAT) that will lead to the L3 GW observatory
  - NASA will also study participation in L3 at various levels to identify proper role in L3
  - NASA will conduct the necessary technology development that will lead toward L3
Input requested from GWSIG

1. **Short-list of 4 large candidate missions**
   - Which missions should be studied to advance astrophysics as a whole (not just GW missions)
   - Additions/subtractions to/from the list
   - Paul will select 3-4 large missions to study

2. **Commentary regarding exclusion of GW Surveyor from the list**

3. **Comments regarding Probes also accepted**
Timeline (2015)

- January: Charge presented by Hertz

- February - March
  - SIGs start collecting community input
  - Develop list of questions and issues the PhysPAG wants to address

- 19 March: Joint-PAG meeting @ STScI
  - Initial input from PAGs
  - Discussion of possible joint-PAG report

- April - June
  - Continue collecting input (April APS + GWSIG email list)
  - Parallel work on PhysPAG report outline + parallel joint PAG meetings

- July – September
  - Write PhysPAG report & (possibly) coordinate with other PAGs

- PAG reports delivered to ApS before Fall meeting
The missions: HabEx and LUVOIR

1. HabEx
   - 4-8 m monolithic primary
   - Occulter: free-flying starshade (or coronagraph) with $10^{-10}$ contrast
   - 1” FOV
   - Optimized for exoplanets, but other uses of instruments possible
   - L2 or Earth-trailing orbiting

2. LUVOIR
   - 8-16 m likely segmented, obscured primary
   - HST-like bandpass (91 nm to ~2000 nm)
   - Suite of imagers/spectrographs
   - Need $10^{-10}$ contrast for planet imaging with coronagraph (or starshade)
The missions: X-ray & Far-IR Surveyors

3. X-ray Surveyor

- <1” angular resolution
- 3 m² effective area
- High-resolution spectroscopy (few thousand) over a broad band
- ~5’ FOV
- Wavelength: ~0.1-10 keV

4. Far-IR Surveyor (architecture TBD)

A. 4-6 m filled aperture, single-dish, cold
B. ≥ 10 m segmented
C. ≥ 10 m equivalent interferometric system
- Imagers, spectrographs
Initial questions/reactions from PhysPAG

• **X-ray Surveyor**
  - How are X-ray Surveyor’s science goals related to those of Athena?

• **Gravitational-Wave L3 Mission**
  - Given that LISA is the highest priority unfinished business from the last decadal and does not appear on the list, how should strong and timely support for a GW mission be achieved?
  - The GW community requests that an implementation study for L3 be conducted concurrently with the other decadal studies

• **Inflation Probe**
  - Community generally agrees this is a probe-class mission, however
  - Mission development needs to be supported for 2020 Decadal survey preparation
  - Technology program needs to be supported and re-evaluated by mid-decadal panel

• **Probe Mission Line**: Strong interest

*Cornish, Conklin, GWSIG meeting, 11 April 2015, Baltimore*
Initial GWSIG feedback to PhysPAG

- LISA is the highest priority large mission of the PCOS program and the highest ranked large mission of the Astrophysics Division after WFIRST [2010 Decadal].
- NASA unable to initiate a new start for LISA in the 2010 decade; financial support for LISA has fallen well below any reasonable expectation.
- Paul Hertz excluded the GW Surveyor from list, because NASA is initiating talks with ESA regarding L3.
- GW community acknowledges that NASA partnership on L3 represents one opportunity to realize a LISA-like mission.
- However, the community feels strongly (and unanimously) that a viable partnership with ESA needs immediate action from NASA.
- NASA participation in L3 requires strong recommendation in the 2020 Decadal.
- NASA must implement a plan now to assess the science, hardware contributions, tech development, costs, risks of range of participation levels.
- Without visible actions, many in the GW community feel a NASA-led GW mission should be considered by the 2020 Decadal.

Cornish, Conklin, GWSIG meeting, 11 April 2015, Baltimore
Future Meetings

- Early May, Virtual Town Hall – COPAG
- May/June, Joint-PAG Virtual Town Hall (2 hours), TBD
- June 3-5, Far-IR Workshop (Caltech) – COPAG
- Late June, UV/Optical Workshop (TBD) – COPAG
- June 13-14, ExoPAG #12 (Chicago) - ExoPAG
  - Half to full day to be spent on charge (2nd day)
- June 29-July 1, 2015, HEAD meeting: L & M Space Missions
  - X-Ray and Gamma-Ray SIG discussions planned
  - Last venue for community input
- August 2015, IAU-AAS meeting in Honolulu
  - Joint PAG meeting (chairs + overview)?
- August, Virtual Town Hall – Joint PAG
  - Chance to present overview of report to community
Questions we need to address

1. What is the value of each of the 4 missions to the GW community?
2. Should any missions be added or cut?
3. How should we respond to the GW Surveyor being excluded?
4. How best do we advance a space-based GW observatory?
5. What type of NASA study is needed for a future GW mission?
6. Should we request that a SAG be formed to study such a study?
7. Do we need an additional GWSIG meeting (e.g. HEAD in Chicago), or is email sufficient?