COPAG
Technical Interest Group

AAS 231

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Agenda

- Review TIG charter
- Support to COR Program Office in preparing PATR
  - COR technology gap review
- Proposed Task
  - Develop Mission vs. technology matrix for past and future missions
  - Tease out subtleties of TRL assessments

Charter: Bridge the science user with the tech provider

- The TIG will facilitate communication that will merge the needs and desires of the science community with the achievements and plans of the broader technology community
- COR office asks COPAG-EC to provide review and initial analysis of draft of collated Technology Gaps
  - TIG formed to provide that function for the COPAG-EC
- TIG open to all community members that will provide professional input concerning technology gap assessment
- Membership combines those from the astrophysics technology community, relevant industry representatives, and any additional community members who can bring expertise or insight into the process.
- The TIG will actively reach out to technology associations, government and university laboratories, industry and trade groups inside and outside the field of astrophysics and space sciences to independently validate state-of-the-art assessments and verify astrophysics technology gaps across several disciplines, commercial suppliers, and applications

TIG provides COR technology gaps review

- TIG activities are intended to operate year-round
- However, the primary Technology Gap review occurs from late spring into early summer
- COR office provides the initial listing tabulated by the following headings:

Tracking No. 2017 (2016)	Gap Name	Description	Current State-of-the-Art	TRL	Performance Goals and Objectives	Scientific, Engineering, and/or Programmatic Benefits	COR Applications and Potential Relevant Missions	Time to Anticipated Need

- TIG concurs or critiques the narratives under each heading and provides where independent inputs
- Area of concern is documentation of the TRL assessments
  - Both for state of the art, and proposed solutions to be developed

Proposed TIG task: summarize mission technologies

- Develop template that identifies functional categories of technologies to be described by mission
- List past and proposed future missions within COR domain
- For each mission, identify first the broad categories:
  - Orbit
  - Sensor system
  - Observatory support
  - Ground support
  - AI&T support
- Each broad category will have sub-level detail as shown on next charts
- The goal is to clearly identify the nature of existing technology that has flown (TRL=9) and understand the regression for those technologies as applied to future missions
  - What is the gap between past and future mission “relevant environments”

Orbit selection drives supporting technology

- Launch vehicle
- Launch sites/facilities
- Orbit Insertion Navigation & Station Keeping
  - Tracking/ephemeris determination
  - Propulsion system
- Communications
  - Data rates
  - Link requirements (BER & EIRP)
  - Spacecraft
    - Transmitter power
    - Antenna size and technology
    - Frequency domain (rf bands, lasercom, etc.)
    - Data rates
  - Intermediate infrastructure
    - For example, DSN, TDRS, single or multiple dedicated ground stations
  - Ground station
    - Antenna
    - Receiver sensitivities
    - Data rates

Sensor system technologies

- Telescope technologies
  - Optical design
  - Materials
  - Coatings
  - Active/adaptive controls
- Instruments
  - Instrument type
    - (e.g. imager, spectroscopy, photometer, polarimeter)
  - Bench/support technology
  - Component technology
  - Detector technology
- Command & Data Handling
  - Signal conditioning
  - Signal Processing (how much done on board)
  - Data rates
  - Storage capacity

Observatory functional support

- Attitude Control & Navigation
- Communications
- Command & Data Handling
- Electrical Power Systems
- Thermal control
  - Passive
  - Active
- Dynamics control or mitigation

Ground system support

- Intermediate infrastructure
  - TDRS
  - DSN
- Ground station(s) technology
  - Receiver technology
  - Tracking technology
  - Data relay from Ground Station to Mission Control and Science Operations Center

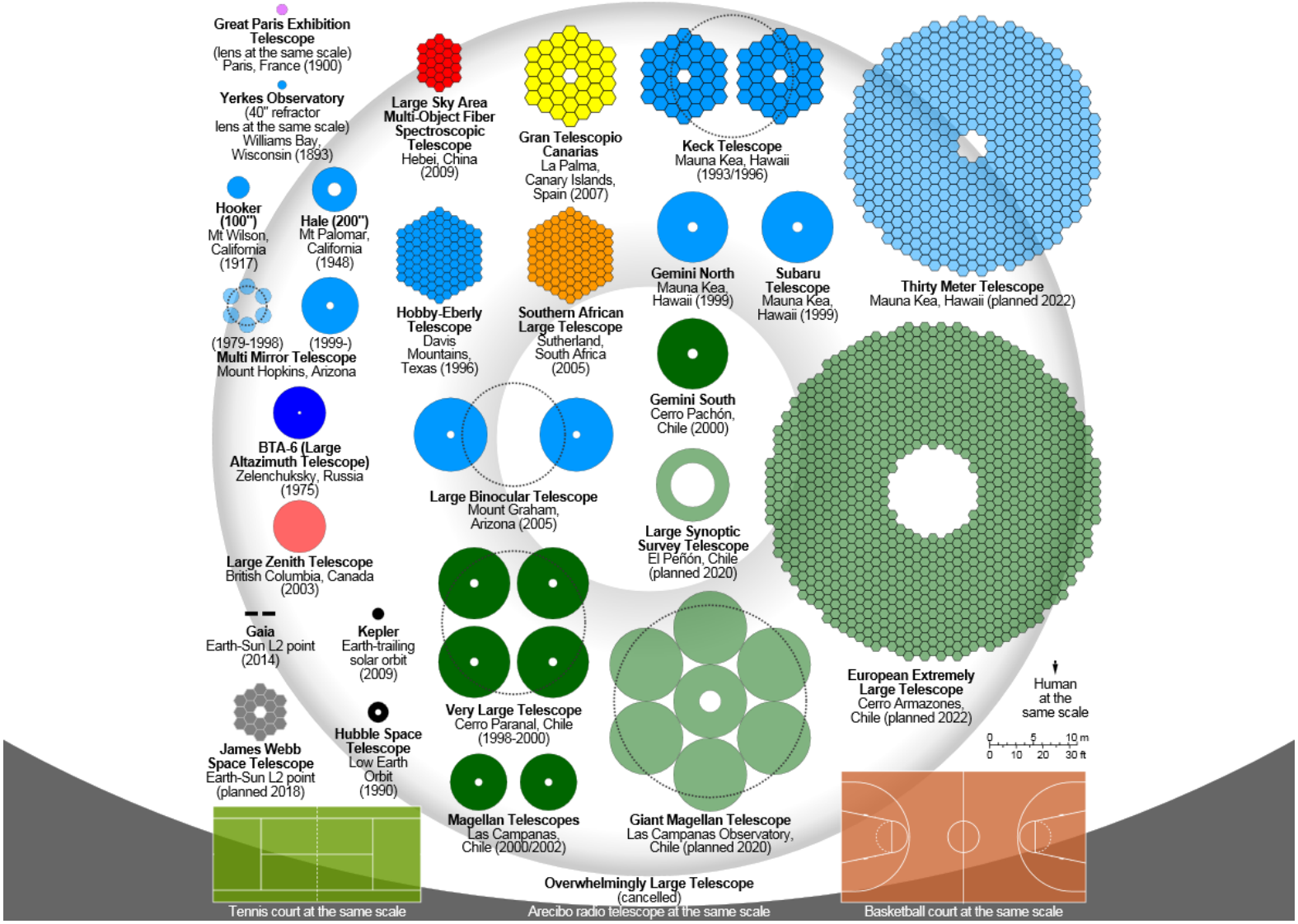
AI&T support

- Integration facilities
- Dynamics verification
  - Integrated modeling
  - Dynamics test facilities
  - Acoustic test facilities
- Thermal verification
  - Thermal-Vacuum facilities
    - Cryogenic support
- Performance verification
  - Test facilities
  - Integrated Modeling
- EMI/EMC verification
- Contamination Controls
  - Monitoring
  - Modeling

So what are the missions to include?

- How far back?
- How to handle future mission concepts as they develop

History, evolution, and future of large astronomy telescopes



Current or Recent Space Telescopes in the UV-Vis, IR, and Microwave Spectrum

Name	Agency	Launch Date	Termination	Location
Hisaki (SPRINT-A)	JAXA	14 September 2013	—	—
Hubble Space Telescope	NASA & ESA	24 April 1990	—	Earth orbit (586.47–610.44 km)
Interface Region Imaging Spectrograph (IRIS)	NASA	27 June 2013	—	Earth orbit
Kepler Mission	NASA	6 March 2009	—	Earth-trailing heliocentric orbit
MOST	CSA	30 June 2003	—	Earth orbit (819–832 km)
Gaia mission (astrometry)	ESA	19 December 2013	—	Sun-Earth L2 Lagrange point
Herschel Space Observatory	ESA & NASA	14 May 2009	29 April 2013	Sun-Earth L2 Lagrange point
Spitzer Space Telescope	NASA	25 August 2003	—	Solar orbit (0.98–1.02 AU)
Wide-field Infrared Survey Explorer (WISE)	NASA	14 December 2009	(hibernation Feb 2011-Aug 2013)	Earth orbit (500 km)
Odin	Swedish Space Corporation	20 February 2001	—	Earth orbit (622 km)
Planck	ESA	14 May 2009	October 2013	Sun-Earth L2 Lagrange point (mission) Heliocentric (Derelict)
WMAP	NASA	30 June 2001	October 2010	Sun-Earth L_2 Lagrange point

Current or Recent Space Telescopes in the Gamma Ray to X-Ray Spectrum

Name	Agency	Launch Date	Termination	Location
Swift Gamma Ray Burst Explorer	NASA	20 November 2004	—	Earth orbit (585–604 km)
International Gamma Ray Astrophysics Laboratory (INTEGRAL)	ESA	17 October 2002	—	Earth orbit (639–153,000 km)
Fermi Gamma-ray Space Telescope	NASA	11 June 2008	—	Earth orbit (555 km)
Astrorivelatore Gamma ad Immagini Leggero (AGILE)	ESA	23 April 2007	—	Earth orbit (524–553 km)
Chandra X-ray Observatory	NASA	23 July 1999	—	Earth orbit (9,942–140,000 km)
Nuclear Spectroscopic Telscope Array (NuSTAR)	NASA	13 June 2012	—	Earth orbit (603.5 km)
Suzaku (ASTRO-E2)	JAXA & NASA	10 July 2005	—	Earth orbit (550 km)