How COR Technology Priorities Are Established

Cosmic Dawn SIG Meeting at AAS

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We Will Cover …

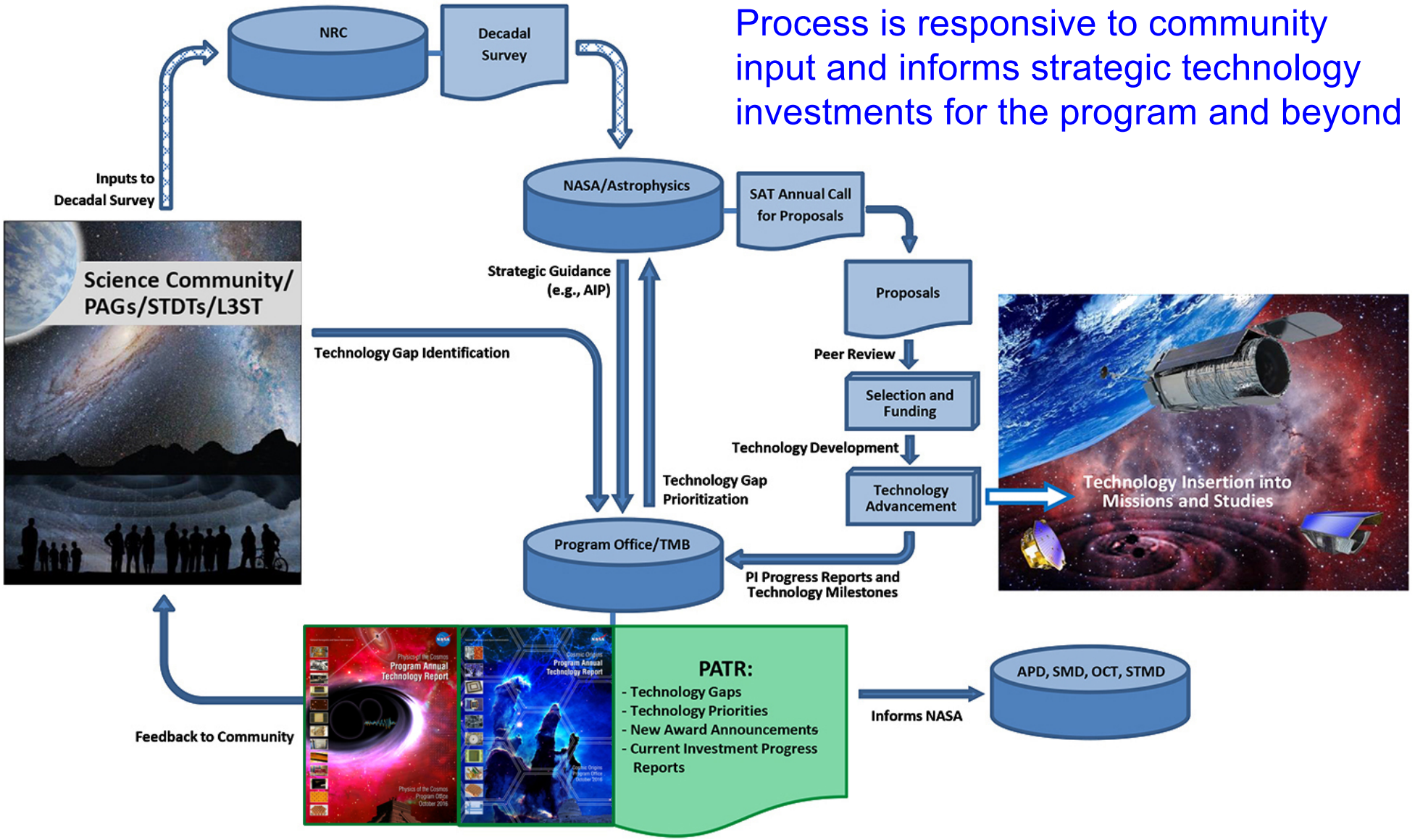
- Overview of COR strategic technology development process
- Technology gaps identification
- Prioritization process and 2016 results
- Current strategic technology portfolio
- How you can contribute and engage

NASA Astrophysics Funds All Levels of Technology Maturity

- **Astrophysics Research and Analysis (APRA) program** solicits basic research proposals relevant to NASA's astronomy and astrophysics programs, from basic principles through flight missions (Technology Readiness Level, TRL, 1 through 3 up to 9). Suborbital investigations (balloons, sounding rockets) are encouraged. Typically 4 or 5 yrs duration awards.
- **Strategic Astrophysics Technology (SAT) program** matures key technologies that address the needs of a strategic mission, taking them from proof of concept through component/breadboard validation in relevant environment (TRL 3 through 5). Typically 2 or 3 years duration awards.
- **Flight projects** address the final maturation stages (TRL 6 through 9) proving the technology's flight-worthiness for a mission-specific application.

Strategic Technology Development Process

Process is responsive to community input and informs strategic technology investments for the program and beyond



Program Annual Technology Report (PATR)

The PATR is an annual report that summarizes the Program's technology development activities for the prior year.

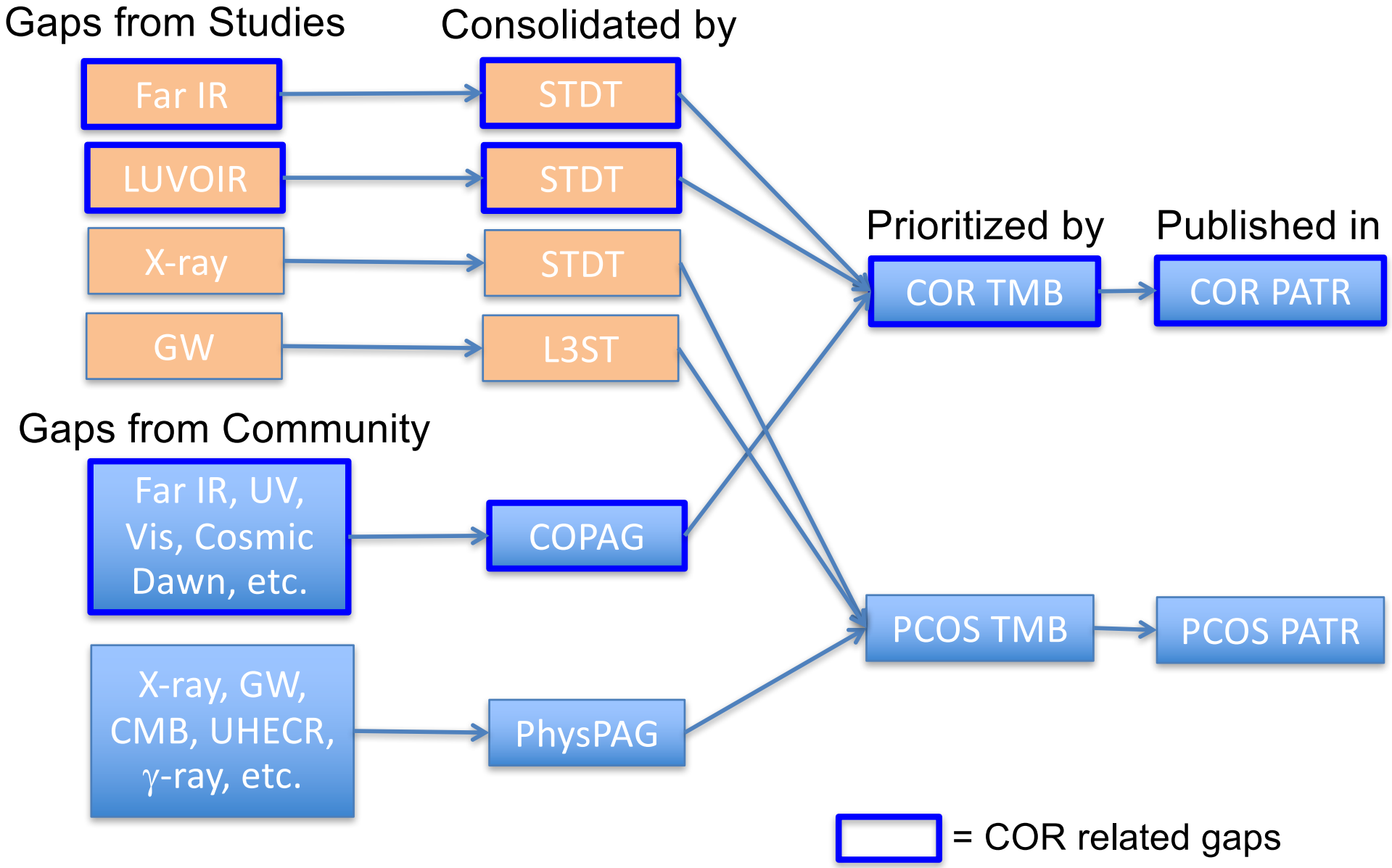
- Provides overview of the Program and its technology development activities.
- Gives status of the Program's strategic and targeted technology development for the prior year and announces the new SAT award selections.
- Presents the current set of technology gaps received from the community and study teams, divided into priority tiers to inform the SAT solicitations and selection decisions
- Updated annually and released in October to support annual technology development planning.

COR PATR can be downloaded from https://cor.gsfc.nasa.gov/technology/
PCOS PATR can be downloaded from https://pcos.gsfc.nasa.gov/technology/

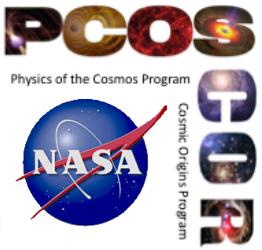
Objectives and Purposes of Technology Gap Prioritization

- **Objectives**
  - Identify technology gaps applicable and relevant to Program strategic objectives as described in the AIP, Roadmap, and Decadal Survey
  - Rank these technology gaps with respect to strategic alignment, benefits and impacts, cross-cutting capabilities, and urgency; then recommend investment priorities
- **Purposes**
  - Inform the SAT solicitation and other NASA technology development programs (APRA, SBIR, and other OCT and STMD activities)
  - Inform technology developers of Program technology gaps to help focus efforts
  - Inform selection of technology awards to be aligned with Program goals and science objectives
  - Improve transparency and relevance of Program technology investments
  - Inform the community and engage it in our technology development process
  - Leverage technology investments of external organizations by defining our strategic technology gaps and identifying NASA as a potential customer
  - Inform the Astrophysics Division of the relative priorities of the technology gaps submitted by the study teams for future planning purposes

New This Year – Additional Gap Inputs From STDTs and L3ST



Overview of Technology Gap Identification and Prioritization Process



- **The community identifies technology gaps**
  - by working with the Program Analysis Group (PAG) or through direct individual submission to the Program Office (annual cutoff June 1)
- **Study teams submit their gaps by end of June**
- **The TMB reviews and prioritizes the gaps in July**
  - TMB membership includes senior members of NASA HQ Astrophysics Division, the Program Office, Aerospace, and as required, independent subject matter experts
  - Technology gaps prioritization is based on a published set of criteria that addresses strategic alignment, benefits and impacts, scope of applicability, and urgency
- **The technology gaps and resulting priorities are published in the PATR**

Community Technology Gap Submission

A technology gap can be identified by anyone and provided to the PO for prioritization in either of two ways:

- Provide it to the appropriate SIG of the COPAG for consolidation and submission to the COR Program Office, or
- Submit it directly to the COR Program Office (thai.pham@nasa.gov)
- Submissions will be forwarded to the COPAG Executive Committee for help with consolidation (combining similar, overlapping, or missing gaps) and editing if needed for accuracy and completeness
- Submissions relevant to any of the study teams will be forwarded to them for consideration to be added to their gap list.

Technology Gap Form

1. Name of technology capability gap
2. Description of technology capability needed
3. Assessment of the relevant current state-of-the-art technologies and those that could close this gap, including their Technology Readiness Levels (TRLs) and justification reference
4. Description of quantitative/ measurable performance goals and objectives to fill this capability gap
5. Scientific, engineering, and/or programmatic benefits of achieving this capability (filling the "gap")
6. Potential applications and relevant mission(s)
7. Urgency to mature this gap

COR Program Technology Capability Gap Input Form			
Technology Capability Gap Name:		Date Submitted:	
Submitter Name:	Organization:		
Telephone:	Email Address:		
PATR Prioritization Information (see accompanying instructions)			
Brief Description of the Technology Capability Needed (100 – 150 words):			
Assessment of the current State-of-the-Art (SOTA) and references justifying TRLs quoted at right (100 – 150 words):		Current TRL of SOTA:	
		Current TRL of Full Solution:	
Technical Goals and Objectives to Fill the Capability Gap:			
Scientific, Engineering and/or Programmatic Benefits (100 – 150 words):			
Applications and Potential Relevant Missions for COR, PCOS, and ExEP:			
Urgency (time to estimated launch date for enabled/enhanced missions or other schedule driver):			

Technology gap input form and instructions can be downloaded from http://cor.gsfc.nasa.gov/technology/

Suggestions for Technology Gap Inputs

- Focus on technology capability gaps associated with missions prioritized in the Astrophysics Implementation Plan, Roadmap, or Decadal Survey
- Submit technology gaps that are directly applicable to Program objectives.
  - Don't include gaps that are not in our charter such as technologies associated with launch vehicle, rover, avionics, spacecraft systems, etc.
- Don't include gaps that do not require technology development, that are not well defined, that are redundant (duplicate, similar, or subsets of other gaps), or are at TRL 6 or higher
- Inputs should be submitted as technology capability gaps between the current state-of-the-art and what's needed to achieve the science objective targeted, not specific implementations
- Inputs should not endorse or advertise for any organization, mission, or person
- Inputs should not contain proprietary or ITAR-sensitive information

Prioritization Criteria Address…

- **Strategic Alignment:** How well does the technology align with the science and/or programmatic priorities of the Astrophysics Implementation Plan (AIP) or current programmatic assessment?
- **Benefits and Impacts:** How much impact does the technology have on COR science related mission(s)? To what degree does the technology enable and/or enhance achievable science objectives, reduce cost, and/or reduce mission risks?
- **Scope of Applicability:** How cross-cutting is the technology? How many Astrophysics programs and/or mission concepts could it benefit?
- **Urgency**: When are launches and/or other schedule drivers of missions enhanced or enabled by this technology anticipated?

COR 2016 Technology Gaps Prioritization

	COR Capability Gaps	Science	Tech
1	Large-format, low-noise and ultralow noise Far-IR direct detectors	FIR	Detector
	Heterodyne Far-IR detector arrays and related technologies	FIR	Detector
	Large cryogenic optics for the Far-IR	FIR	Optics
	High-performance, sub-Kelvin coolers	FIR	Cooler
	Compact, integrated spectrometers for 100 to 1000 µm	FIR	Detector
	Large-format, high-sensitivity, high-dynamic-range UV/FUV detectors	UV/FUV	Detector
	High-efficiency UV multi-object spectrometers	UV	Detector
	Band-shaping and dichroic filters for the UV/Vis	UV/Vis	Optics
	Lightweight large-aperture high-performance telescope mirror systems	UV/Vis/IR	Optics
2	Advanced Cryocoolers	FIR	Cooler
	Mid-IR spectral coronagraph	Mid-IR	Optics
	High-performance spectral dispersion component/device	UV/Vis/IR, FIR	Optics
	High-reflectivity mirror coatings for UV/Vis/NIR	UV/Vis/IR	Coating
	High-contrast segmented aperture coronagraphy	UV/Vis/IR	Optics
	Ultra-stable opto-mechanical systems	UV/Vis/IR	Telescope
	Very-large-format, high-QE, low-noise, radiation-tolerant detectors for UV/Vis/NIR	UV/Vis/IR	Detector
3	Wide-bandwidth, high-spectral-dynamic-range receiving system	Radio Freq	Detector
	FIR interferometry	FIR	Detector

See COR PATR for more information about these gaps

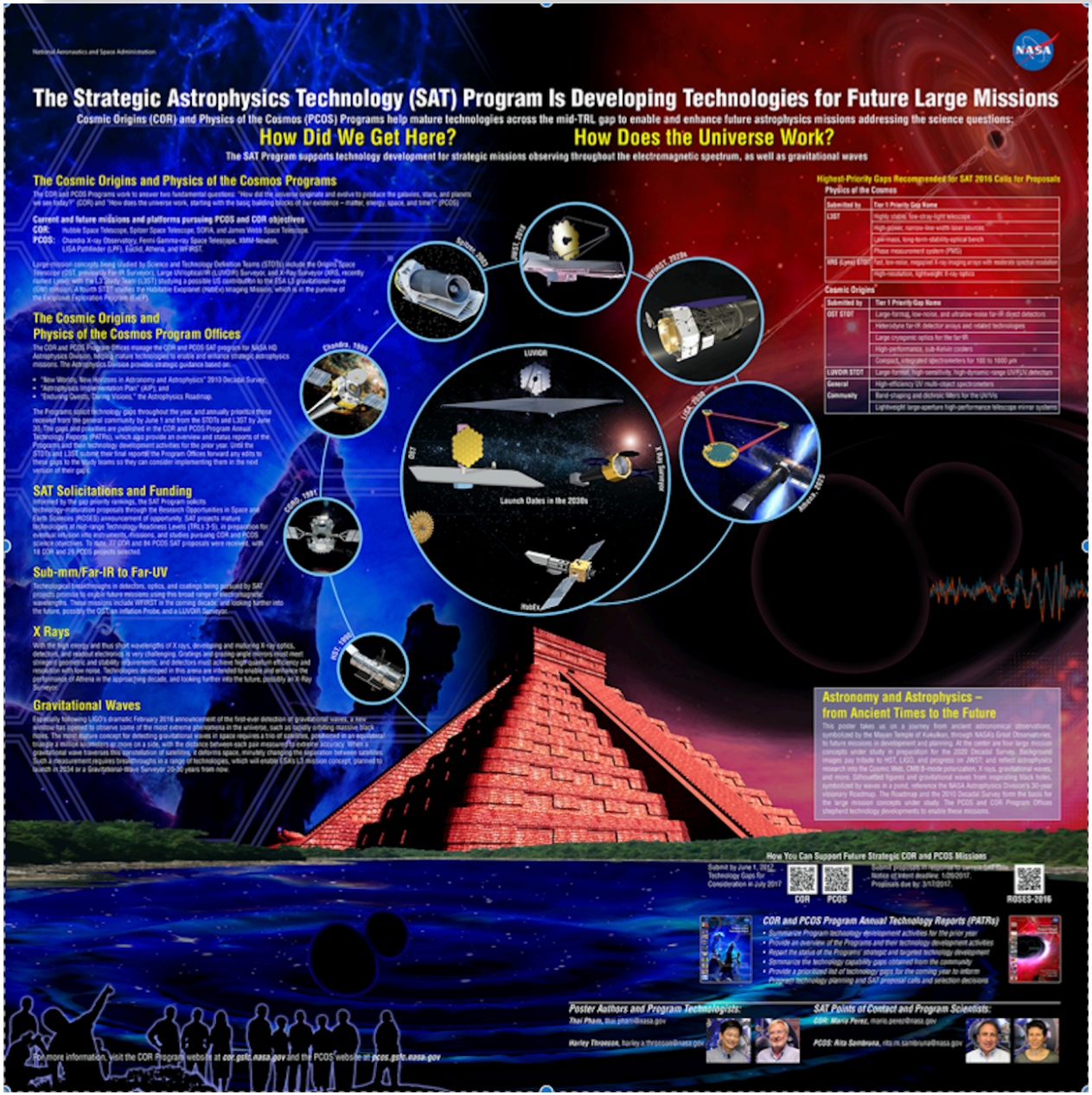
Current COR SAT Portfolio

Funding Source	Technology Development Title	Principal Investigator	Org	Start Year, Duration	Science Area	Tech Area
SAT2011	Ultraviolet coatings, materials and processes for advanced telescope optics	Kunjithapatham Balasubramanian	JPL	FY2013, 3 years	UV	Optical Coating
SAT2011	Kinetic Inductance Detector Imaging Arrays for Far-Infrared Astrophysics	Jonas Zmuidzinas	JPL	FY2013, 3 years	Far-IR	Detector
SAT2012	A Far-Infrared Heterodyne Array Receiver for CII and OI Mapping	Imran Mehdi	JPL	FY2014, 3 years	Far-IR	Detectors
SAT2012	Deployment of Digital Micromirror Device (DMD) Arrays For Use In Future Space Missions	Zoran Ninkov	RIT	FY2014, 2 years	UV	Detector
SAT2012 SAT2010	Advanced Mirror Technology Development Phase 2	Phil Stahl	MSFC	FY2014, 3 years	UVOIR	Optics
SAT2014	Raising the Technology Readiness Level of 4.7-THz local oscillators	Qing Hu	MIT	FY2016, 3 years	Far-IR	Detector
SAT2014 SAT2010	Development of Large Area (100x100 mm) photon counting UV detectors	John Vallerga	UCB	FY2016, 2 years	UV	Detector
SAT2014	Building a Better ALD - use of Plasma Enhanced ALD to Construct Efficient Interference Filters for the FUV	Paul Scowen	ASU	FY2016, 3 years	UV	Optical Coating
SAT2014 SAT2011	Advanced FUVUV/Visible Photon Counting and Ultralow Noise Detectors	Shouleh Nikzad	JPL	FY2016, 3 years	UVOIR	Detector
SAT2014	Ultra-Stable Structure: Development and Characterization Using Spatial Dynamic Metrology	Babak Saif	GSFC	FY2016, 4 years	UVOIR	Stable Structure
SAT2015	High-Efficiency Continuous Cooling for Cryogenic Instruments and sub-Kelvin Detectors	James Tuttle	GSFC	FY2017, 3 years	Far-IR	Cooling System
SAT2015 SAT2012 SAT2010	Predictive Thermal Control Technology for Stable Telescope	Phil Stahl	MSFC	FY2017, 3 years	UVOIR	Optics

Takeaways

- COR Program Office solicits community input on technology gaps throughout the year
  - Submit gaps by June 1 for this year's prioritization
- Technology gap priorities are published each October in the PATR
  - Consult the PATR to learn what strategic technologies are needed by the COR program
- Propose to SAT through NSPIRES to ROSES Program Element D.8
  - Notices of Intent to propose are due January 20, 2017
  - Proposals are due March 17, 2017

Thank You For Listening



Thursday Poster Session 238.01

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