STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

The Community Definition of Roman's Core Community Surveys: Update on Initial Request for Community Input

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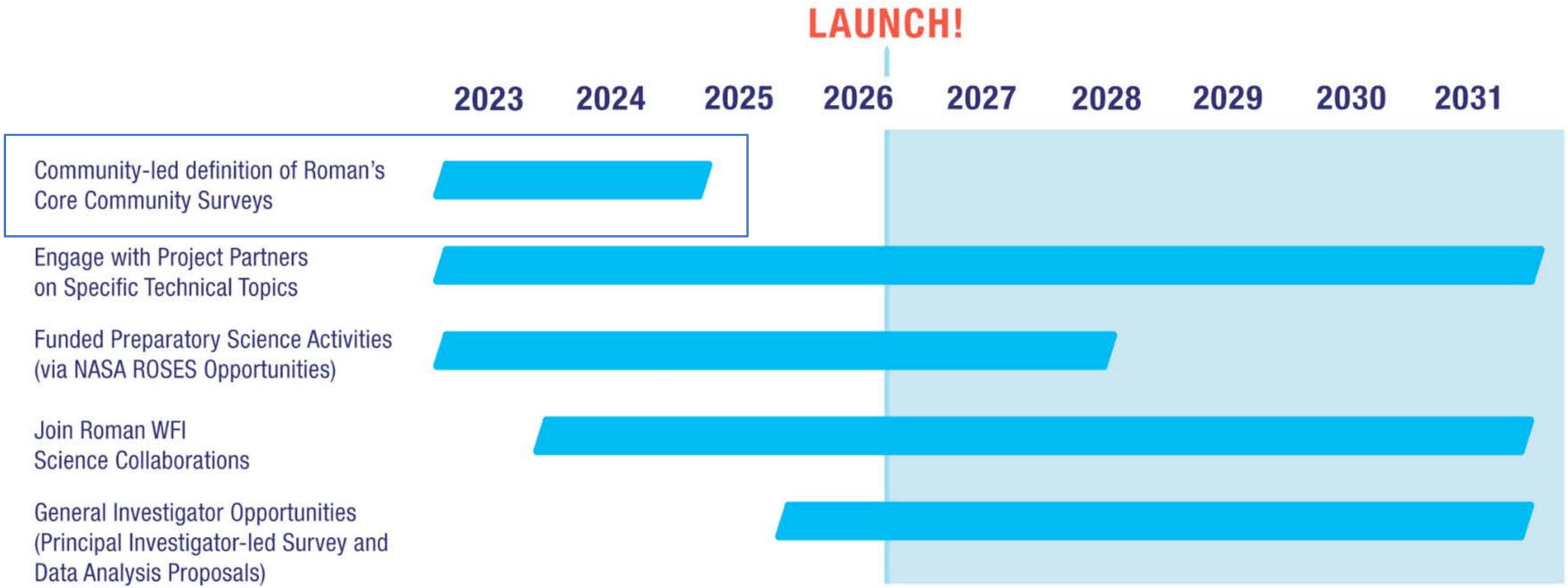
Ways for the Community to Engage with Roman



Roman Observational Program: Wide-Field Infrared Surveys of the Universe

Large Core Community Surveys *majority of observing time*

Dark Energy

Exoplanets

High-latitude wide area survey
Enables Weak Lensing, Baryon Acoustic Oscillation cosmology investigations

High-latitude time-domain survey
Enables Supernovae Ia cosmology investigations

Galactic Bulge time-domain survey
Enables exoplanet microlensing investigations

Astrophysics with Wide Field IR Surveys

Smaller Astrophysics Surveys *nominally 25% of observing time*

- Selection via a peer-review process

Archival Investigations

- All data will be public immediately
- Anticipated to be main component of community involvement

Top Level Goal for Defining the Core Community Surveys

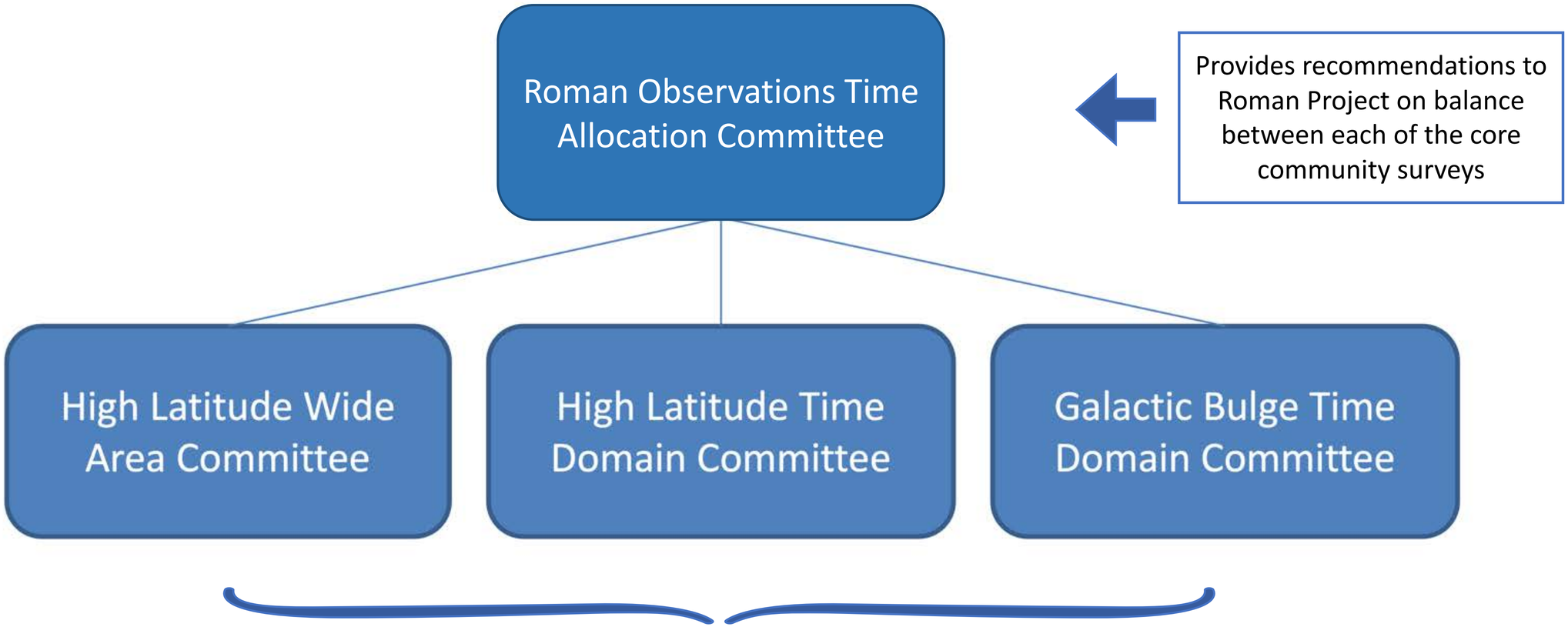
Maximize the overall science return of Roman's wide field infrared surveys

While meeting Mission requirements focused on cosmology and exoplanets

The existing survey strategies served their primary function in showing the mission can meet its requirements.

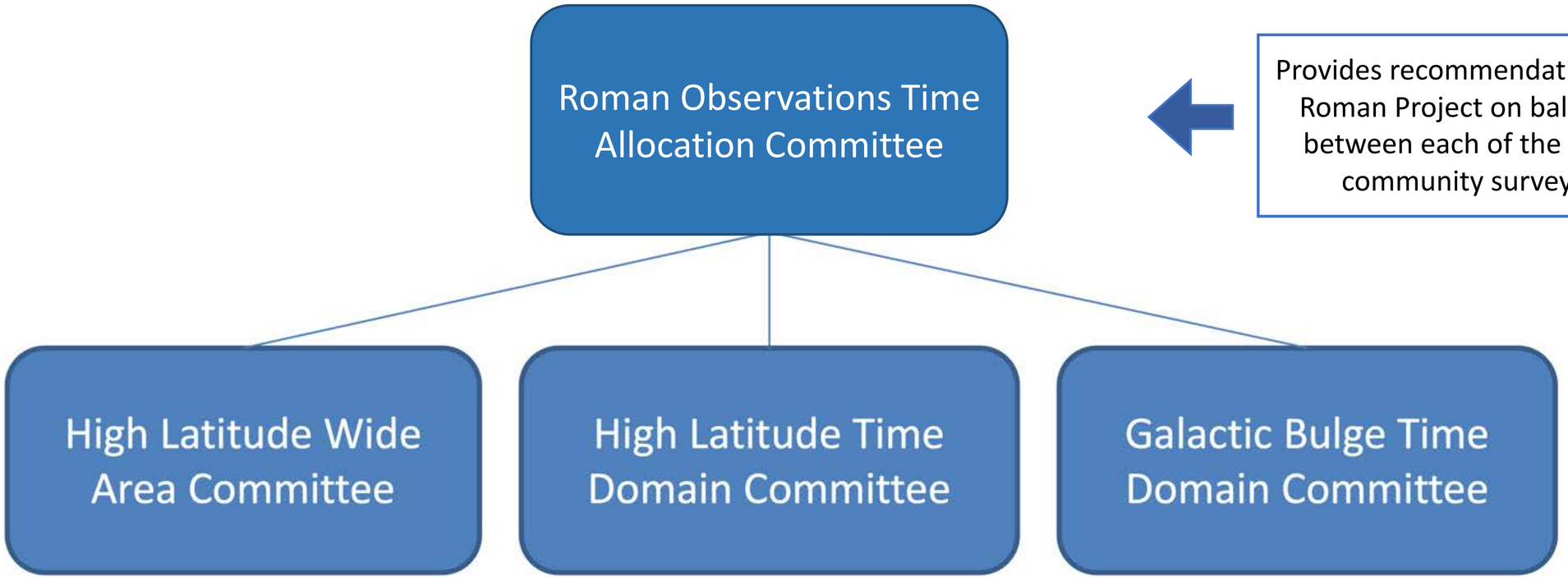
The actual surveys to be implemented will be defined by the astronomical community.

Strategy for Defining the Core Community Surveys



Evaluate initial community input; solicit additional, more targeted community input through a variety of channels; evaluate survey options against science metrics; produce recommendations for survey implementations with options for enhancements/descopes

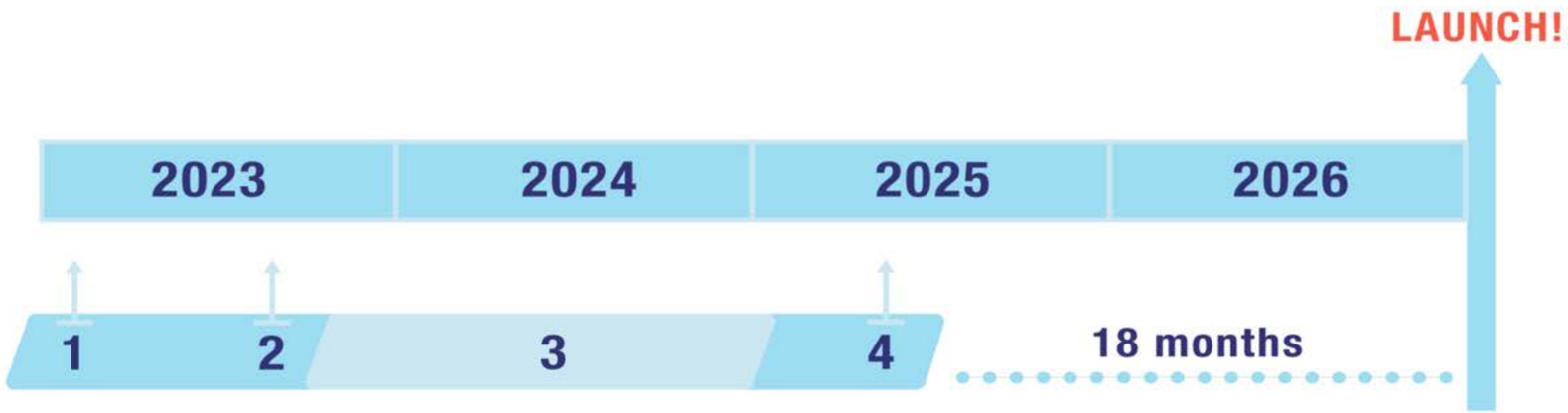
Strategy for Defining the Core Community Surveys



These committees will be *your* committees, and will be charged with understanding and representing the full breadth of the astronomy community's interests in Roman's Core Community Surveys.

There will be no "survey teams" selected to define or implement the surveys.

Timeline for Defining the Core Community Surveys



(1) Initial Request for Community Input

(2) Formation of CCS Definition Committees

(3) Committee-driven investigations, deliberations, and gathering of additional community input, including community workshops

(4) Final report detailing CCS observations due to Project

Current Call for Input: First Step in Defining the Core Community Surveys

Two independent avenues to respond to the initial request for community input into the CCS definitions:

(1) A "Science Pitch" plus questionnaire was requested by February 17

- science pitch: 1-2 paragraphs "pitching" a science investigation that could be done with an appropriately configured CCS

- an associated questionnaire to collect ***high level*** input on important survey characteristics for a given science pitch (e.g., survey area, depth, filters, cadence, etc.)

(2) A more traditional white paper, requested by June 16

All input will be given to the CCS definition committees and made available for interested members of the astronomy community.

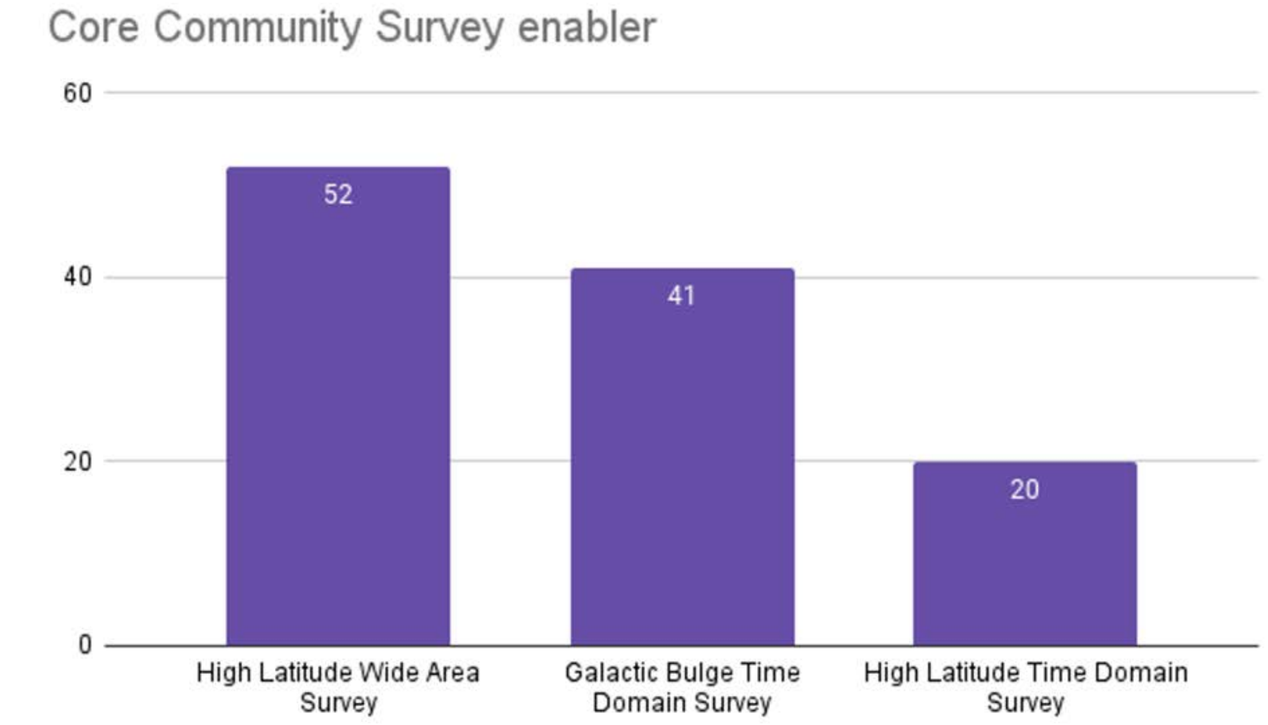
Call for Initial Community Input

Science Pitch Submissions

Science Pitches: Demographics

113 science pitches received from the astronomical community

- 96 unique submitting authors*
- International response
  - 67 US, 18 Japan, 22 Europe, and 6 other (Australia, Canada, Israel)
- Robust response for all three core community Surveys



** Does not account for overlap (partial or full) in co-authorship*

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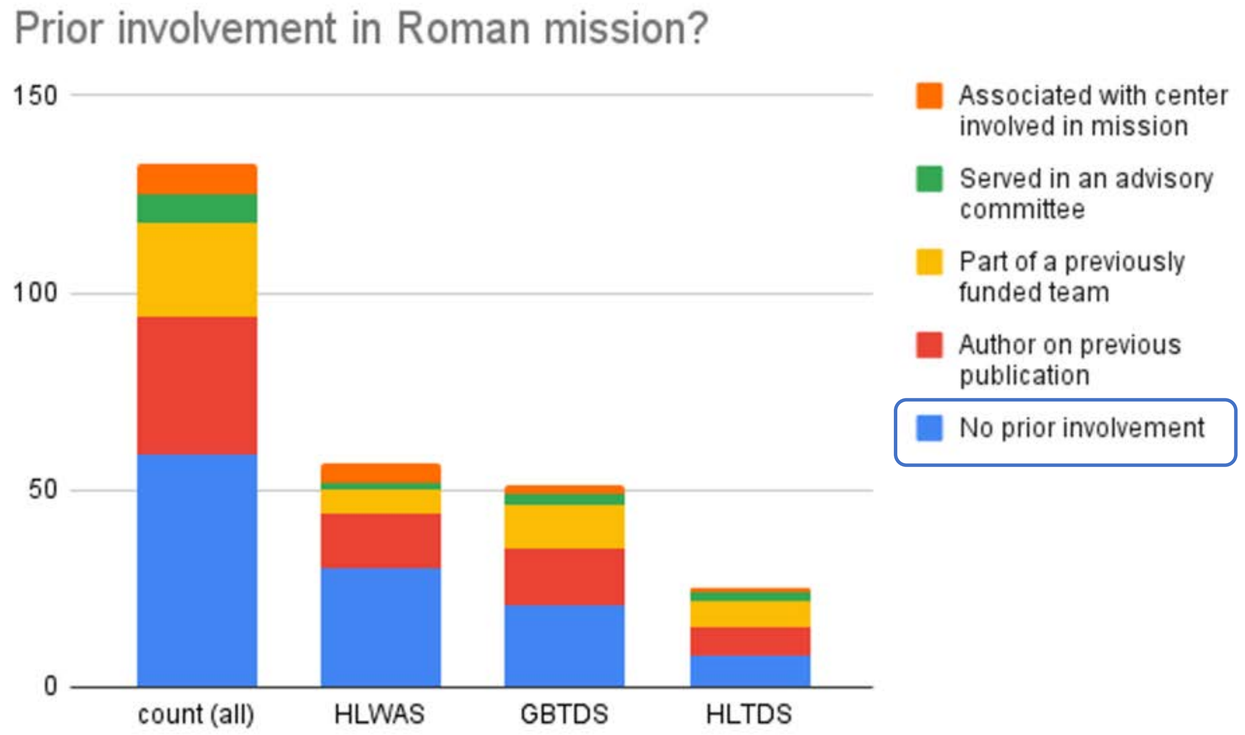
- Robust response for all three core community Surveys
- Successfully engaged astronomers new to Roman community
  - 59 pitches (52%) from submitting authors who had no prior involvement with Roman



Science Pitches: Demographics

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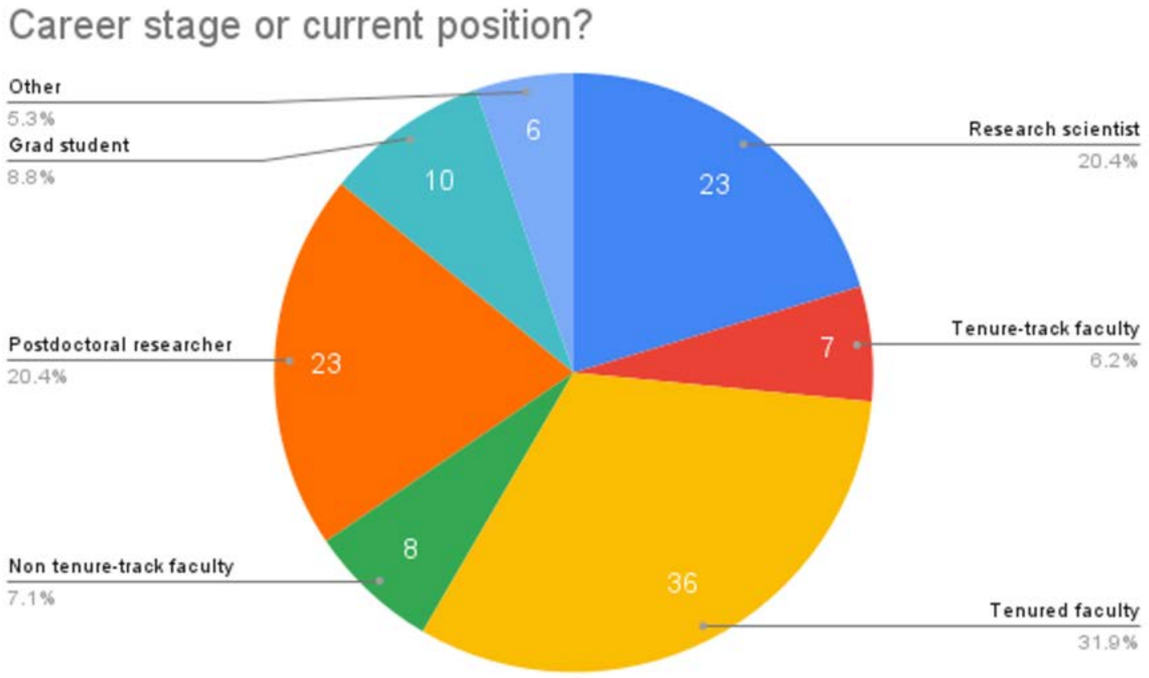
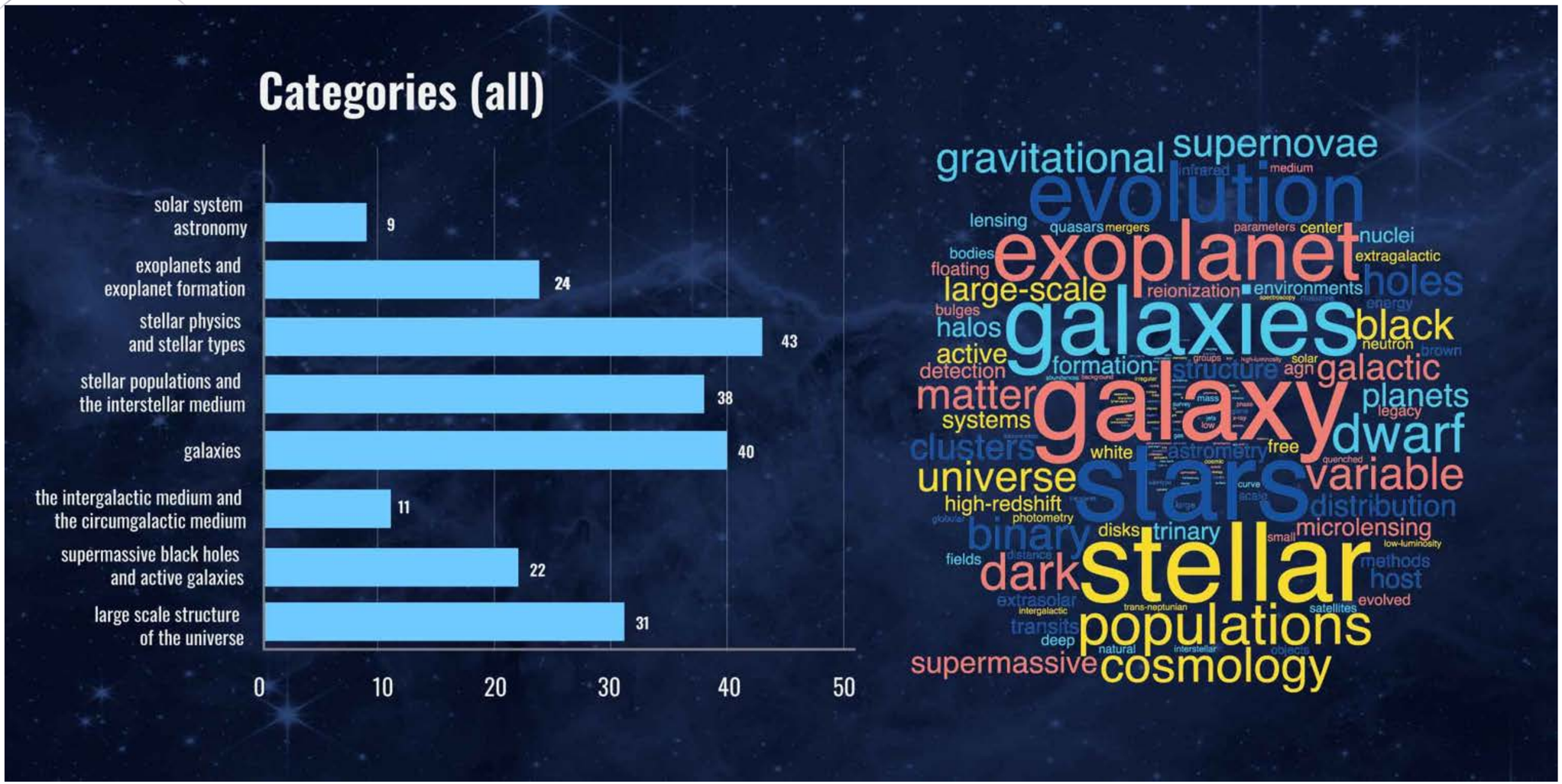
- 96 unique submitting authors
- International response
  - 67 US, 18 Japan, 22 Europe, and 6 other (Australia, Canada, Israel)
- Robust response for all three core community Surveys
- Successfully engaged astronomers new to Roman community
- Successfully engaged junior astronomers
  - 35% of submitting authors graduate students, postdocs, or tenure-track faculty



Science Pitches Cover a Broad Range of Science Topics



Science Pitch Submissions

High Latitude Time Domain Survey: Science Topics

The High Latitude Time Domain Survey provides tiered, multiband time domain observations on timescales of days of 10s deg^2 at high latitudes.

All types of SNe

Rare Transients

- Strongly lensed supernova, tidal disruption events, statistical samples of rare and exotic (Pop III star) supernovae at high *z* (including z>10), fast blue optical transients

AGN

- evolution with redshift of AGN dust via dust reverberation mapping, low mass AGN beyond Local Universe, massive black hole binaries

Galaxy Evolution

- using survey as a deep field to study cosmic dawn, investigate the bright-end of the UV luminosity function and massive galaxy formation in the early universe at z>10

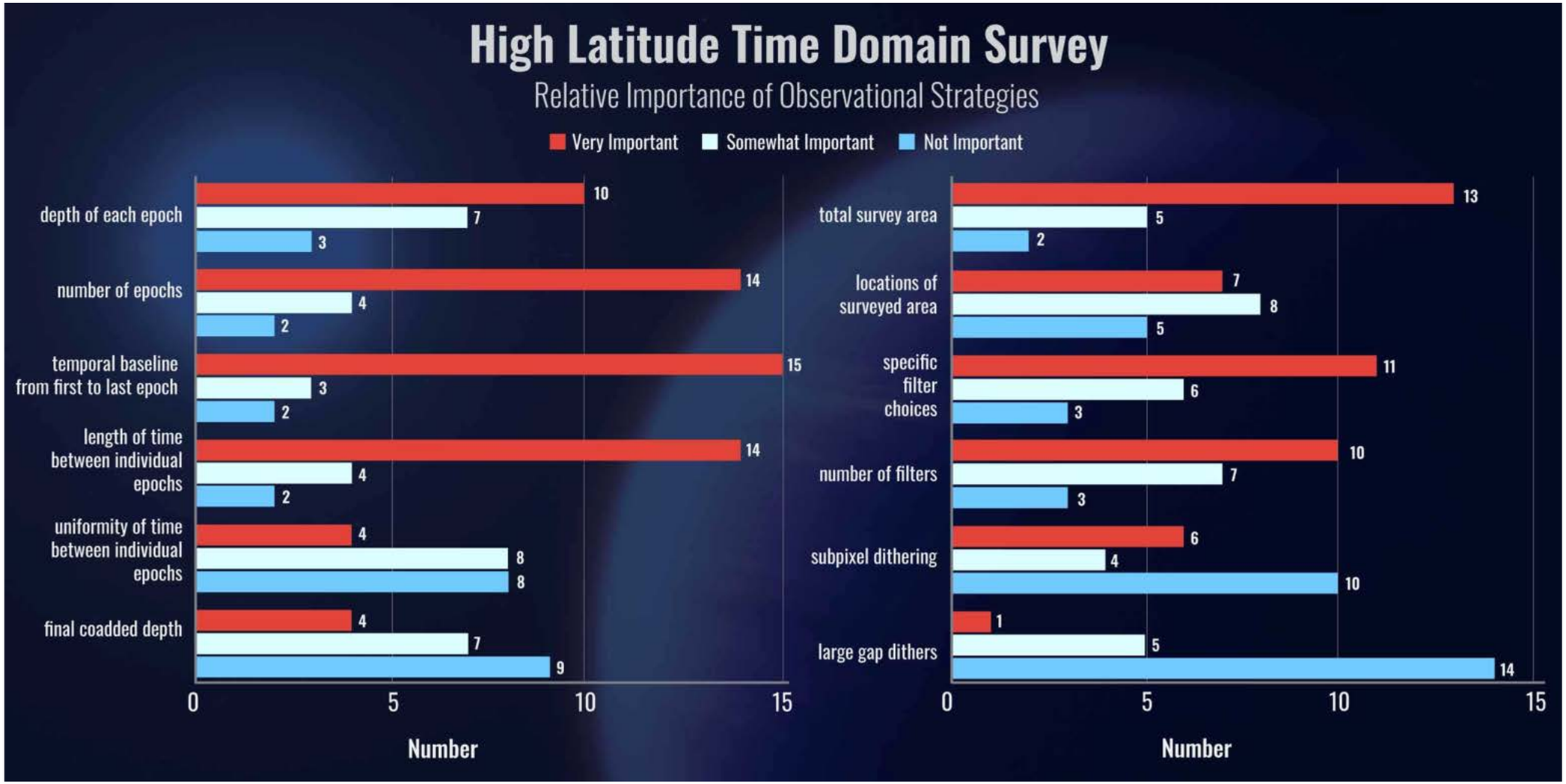
Multimessenger Astrophysics

- kilonova detection

Milky Way

- solar system planetary analogs, stellar mass black holes, detecting the stellar pulsation of stars near the tip of the red giant branch to measure distance and identify the edge of the MW's stellar halo, nearby bright stars for joint radial velocity/astrometry

Importance of Different Observational Strategies



Newsletter Article Summarizing Science Pitches

High Latitude Time Domain Survey

Representative Examples of Possible Trades, Modifications and Extensions:

- Location of survey footprint
- Increased cadence for some portion of the observations
- Additional or different filters (for example, add F213 observations)
- Balance of time between imaging and slitless spectroscopy
- Longer total time baseline (e.g., beyond 2 years)

Galactic Bulge Time Domain Survey: Science Topics

The GBTD Survey is ~<15 min cadence observations over few deg^2 towards Galactic Bulge for six ~70 day seasons spanning the prime mission phase.

Stellar Variability
- Stellar flares, eclipsing binary stars, cataclysmic variables, x-ray binaries, asteroseismology

Exoplanets
- Exoplanet microlensing (and extensions for additional companions, brown dwarfs), exoplanet transits (including transiting planets around white dwarfs, earth-like planets in earth transit zone), exomoons

Multimessenger Astrophysics
- White dwarf binaries/LISA counterpart sources

Stellar populations
- Astrometry, initial mass function

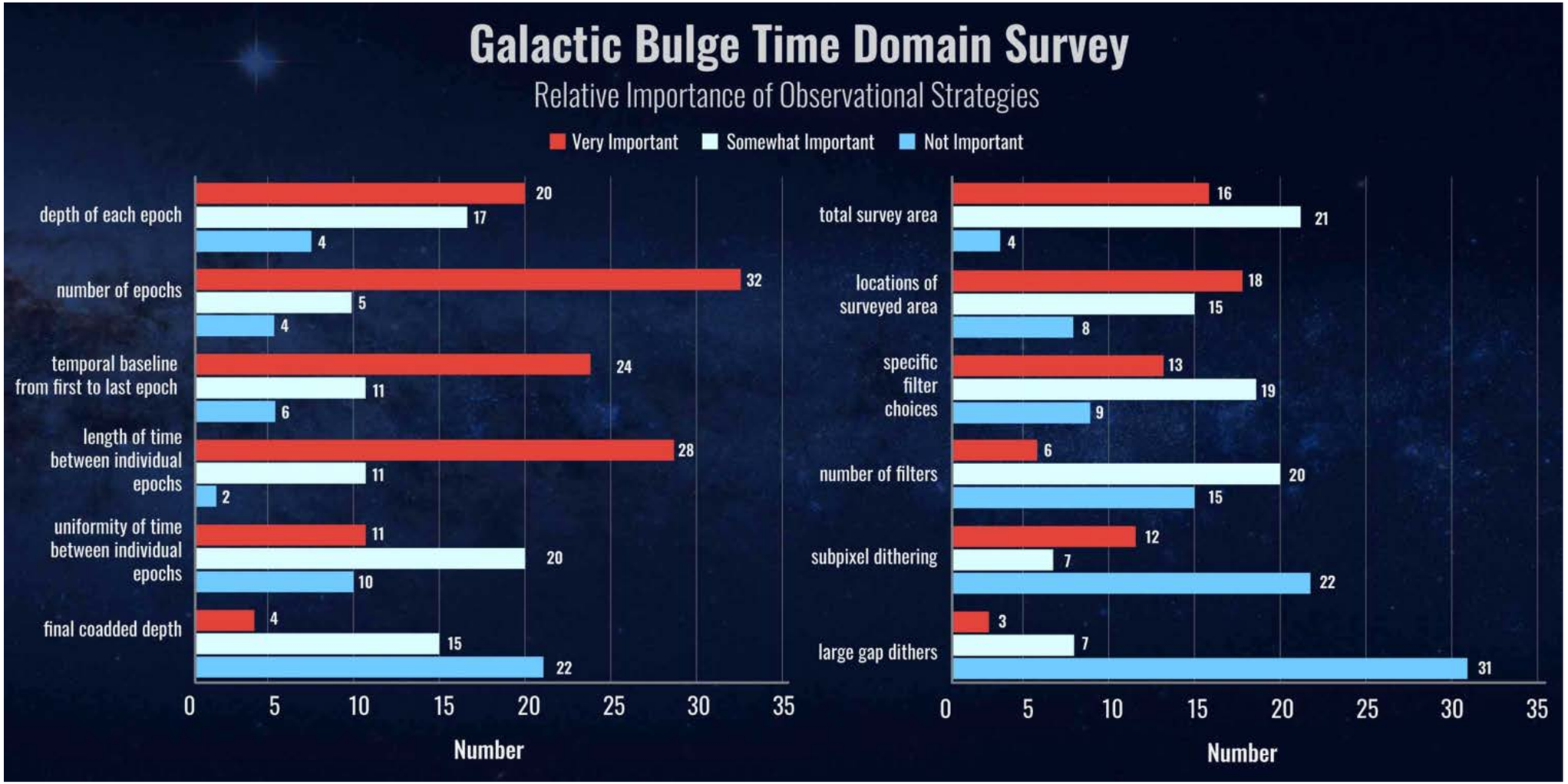
Transients
- Galactic center, XRBs etc

Compact Object Census
- Finding isolated black holes and neutron stars via microlensing

Looking behind the galactic bulge
- Quasars, supernova (exploring advantages of high cadence observations)

Synergies with other facilities

Importance of Different Observational Strategies



Newsletter Article Summarizing Science Pitches

Galactic Bulge Time Domain Survey

Representative Examples of Possible Trades, Modifications and Extensions:

- Additional (or moved) field, for example a field on the Galactic Center
- Additional or alternate filters (with same or different cadence)
- Additional, larger survey area observed with lower cadence
- Portion of survey area observed with very high cadence
- Additional seasons

High Latitude Wide Area Survey: Science Topics

The HLWA Survey is a wide area (>1700 deg^2) multiband survey with slitless spectroscopy.

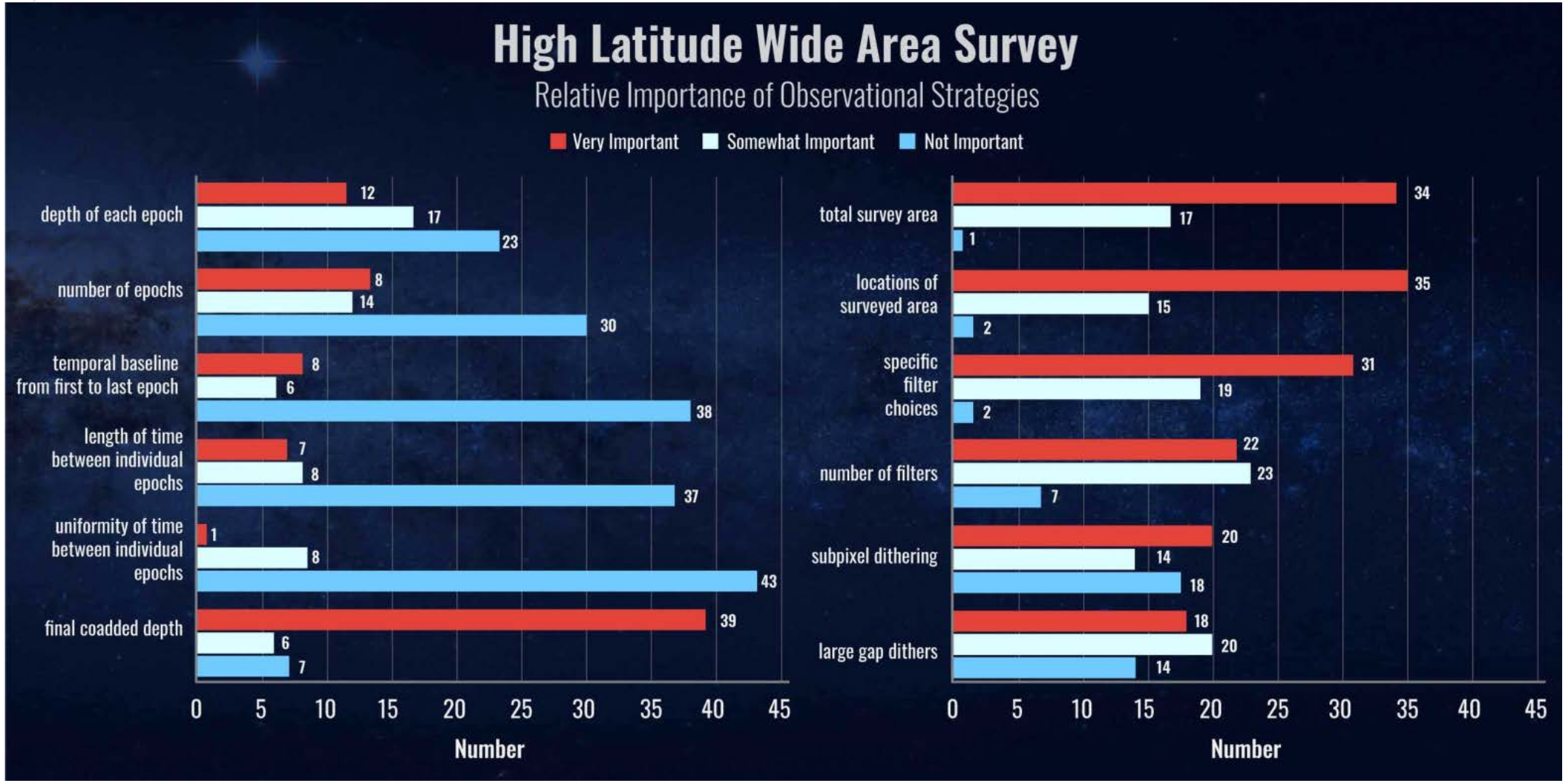
Cosmology and large scale structure
- IR background
- galaxy clusters and gravitational lensing
- IR transients

Milky Way
- Galactic structure and history (tidal streams, dwarf satellites, etc.)
- star formation and stellar evolution (stellar clusters, brown dwarfs, transients)

Nearby and Distant Galaxies
- galactic structure (tidal streams, groups and mergers, satellites, etc.)
- dwarf galaxies
- precision distance ladders
- star formation and stellar evolution
- active galaxies and galaxy evolution
- very rare transients, transients with long time baseline variations

Solar system science
- minor body discovery/tracking

Importance of Different Observational Strategies



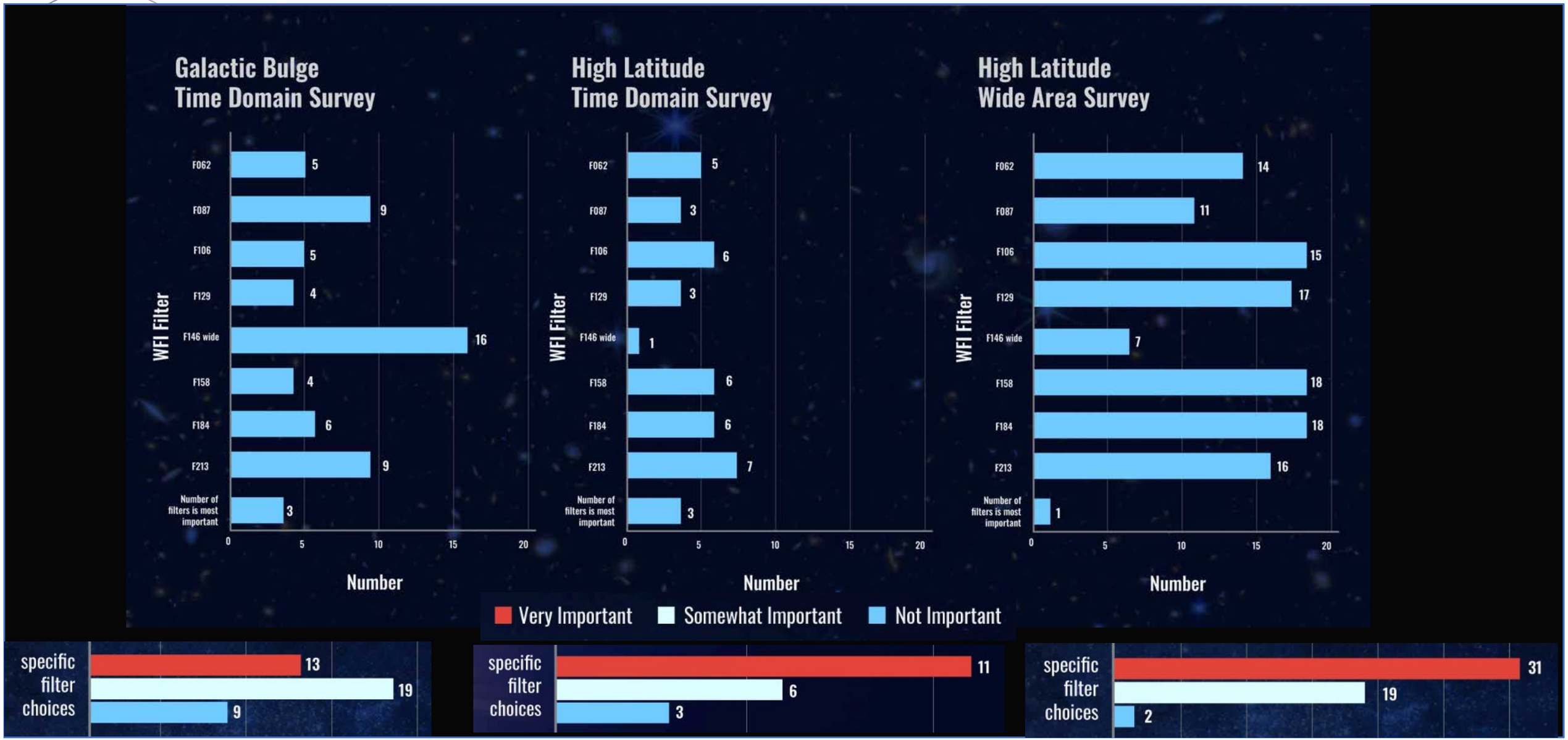
Newsletter Article Summarizing Science Pitches

High Latitude Wide Area Survey

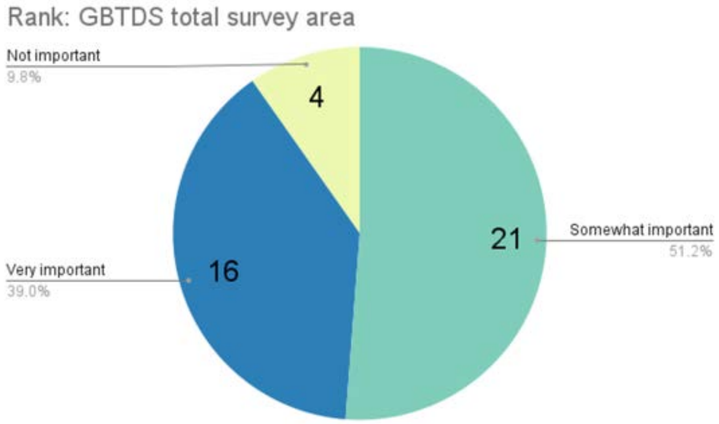
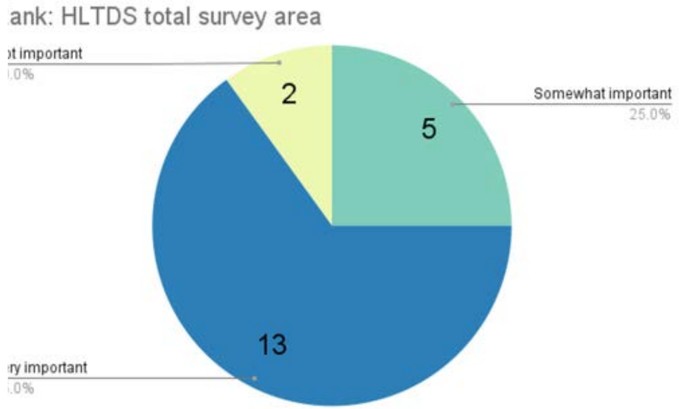
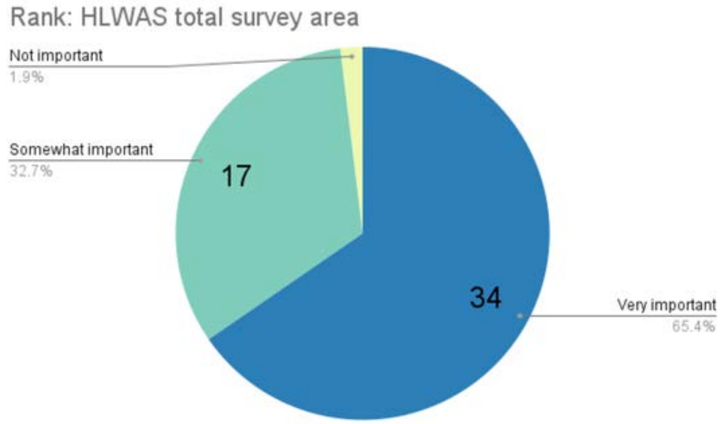
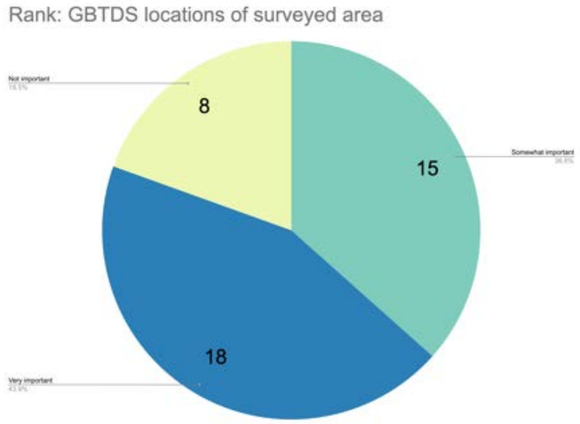
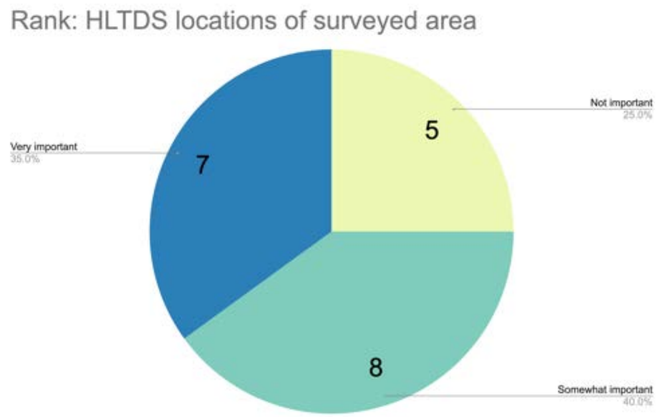
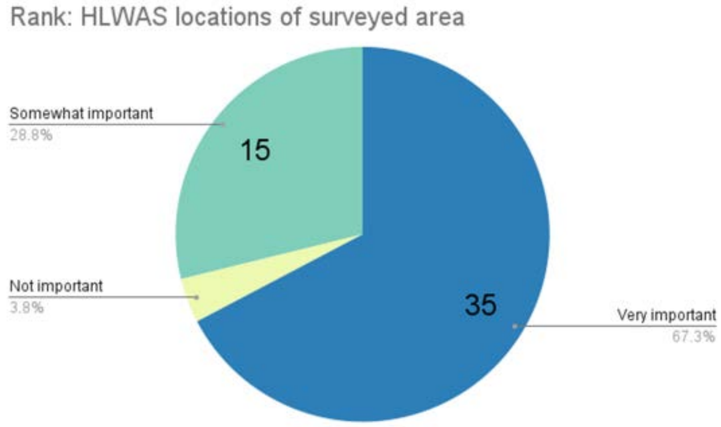
Representative Examples of Possible Trades, Modifications and Extensions:

- Location of survey footprint (wide and deep field component)
- Depth vs area
- Add additional filters to all or part of the survey footprint
- Extend time baseline, modify cadence (for example of deep field portion of the HLWAS)

Example Challenge: All the Filters Are in Demand – and Important



Example Challenge: Survey Area and Location

	Galactic Bulge Time Domain	High Latitude Time Domain	High Latitude Wide Area
Total Survey Area			
Location(s) of Surveyed Area			

Always Important, but Generally Different

Very Important

Somewhat Important

Not Important

Current White Paper Call

Avenue 2: White Papers due June 16

White papers should:

- Motivate the importance of the science investigation and how a Roman CCS will uniquely enable it.
  - Why should it be a science driver for designing the survey?
- Include quantitative discussions of what observational strategies will minimally enable, and optimize, a given science investigation.
  - e.g., survey area, location, filters, cadence, depth…
  - Discuss all survey parameters that are important for your science investigation
- Include figures of merit or other quantitative metrics by which a given observational strategy's impact on the science investigation can be judged.
  - How will success scale with different choices in survey parameters?
  - Within what boundaries of observational parameter space can trades be made without (significantly) impacting the science investigation?

Call for Initial Community Input

An extensive list of technical resources is available (see *Resources* links in call – QR code on right)

Avenue 2: White Papers

The most impactful white papers will:

- Consider the broader scientific landscape (including Roman science requirements)
- Make a compelling case for why the observations for your science investigation should be obtained as part of a Core Community Survey
- Illustrate scientific feasibility
- Speak to a broad range of expertise
- Be clear and concise

Details on the White Paper Call

An extensive list of technical resources is available (see *Resources* links in call – QR code on right)

The Community Process for Defining the CCSs Has Begun

The Roman CCS White Paper Call has been updated and released

- Roman Core Community White Papers are due June 16
- Virtual Q&A sessions are being held this week and next, details posted on Call for Community Input page (QR code to right)
- We want to hear from everyone! Regardless of career stage, science topic, or country.
- Based on science pitch submissions, the following areas are at risk of being under-represented:
  - Transients (in context of High Latitude Time Domain Survey)
  - Slitless spectroscopic galaxy surveys
  - Deep field galaxy survey applications
  - Multiwavelength synergies (beyond UV/optical/NIR)

Call for Initial Community Input

Additional Upcoming Sessions

Galactic Bulge Time Domain Survey

- Monday, April 24, 10:30 – 11:30 am EDT
- Tuesday, May 2, 4 – 5 pm EDT

High Latitude Wide Area Survey

- Wednesday, April 26, 11 am – 12 pm EDT
- Monday, May 1, 2 – 3 pm EDT

High Latitude Time Domain Survey

- Friday, April 28, 3 – 4 pm EDT
- Thursday, May 4, 12 – 1 pm EDT

Call-in details will be posted to **Roman Community Forum page**.

Community Forum Page