



NANCY GRACE R.ÖMAN



SPACE TELESCOPE

Roman Core Community Surveys

July 16, 2025

Thomas Barclay

Operations Scientist

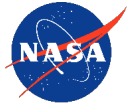
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The Nancy Grace Roman Space Telescope

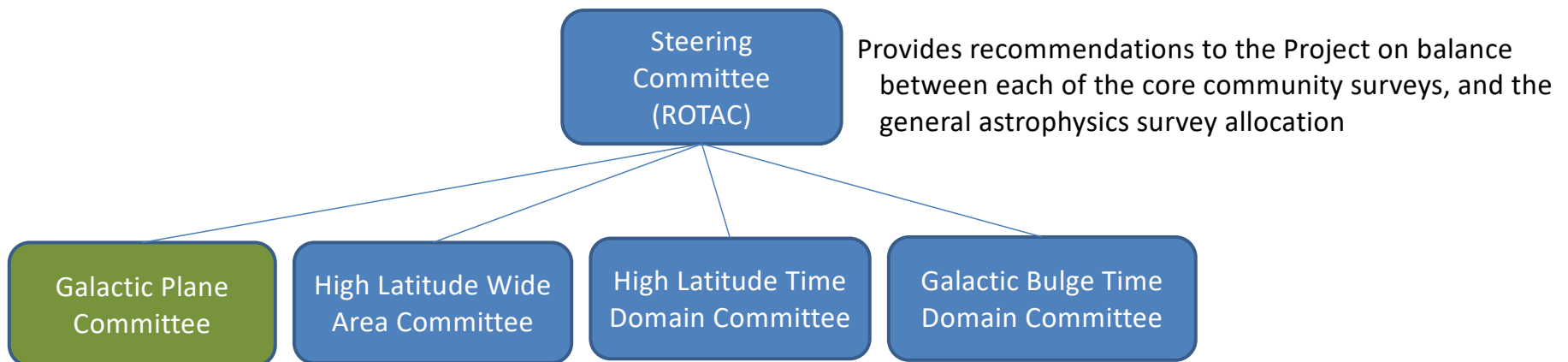


- **Roman will enable giant scientific strides through executing infrared surveys**
 - Roman will perform three Core Community Surveys and numerous General Astrophysics Surveys
 - In April 2025, the Roman Time Allocation Committee release their definition report that detailed how Roman will spent most of its observation time.
- **Roman will enable the next generation of exoplanet discovery through the coronagraph technology demonstration**
- **We are on schedule to start science operations in 2027**
 - Our official launch date is May 2027
 - The team is working toward an October 2026 launch, and we may launch as early as September 2026

The Survey Definition Process

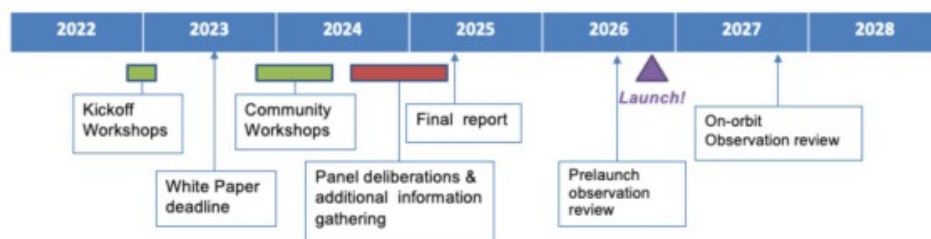


- **Earlier work by very many people led to the Roman science requirements and a design reference mission.**
- **We took a tiered structure to do the work of recommending survey definitions based on community input**
 - Committees include representatives of numerous science areas to be addressed by each survey (determined from white paper submissions etc.)
- **We are now close to the final definition of the Core Community Surveys. Any changes at this point will need strong justifications.**



The Survey Definition Process

Roman Mission & Observing Strategy Timeline



2023	White papers solicited from the community
2023–2024	Core Community Survey (CCS) Definition Committees (DCs) design survey options <ul style="list-style-type: none"> - Galactic Bulge Time Domain Survey (GBTDS) - High Latitude Time Domain Survey (HLTDS) - High Latitude Wide Area Survey (HLWAS)
2024 November	ROTAC convened
2025 January	CCS DC reports & presentations released: GBTDS HLTDS HLWAS
2025 April	ROTAC report and presentation
2026 June–August	New General Astrophysics Surveys (GAS) programs selected



Community Defined Survey Status

The **Core Community Surveys** process is complete

- The Survey Definition Committees finished crafting recommended survey implementation options based on community input and delivered their reports in Dec 2024
- The Roman Observations Time Allocation Committee (ROTAC) evaluated their input
- The ROTAC made their recommendations in April 2025

Planning of the Early Definition **Galactic Plane General Astrophysics Survey** is wrapping up

- Broad community input was requested and received
- The Survey Definition Committee is finishing crafting their recommended survey implementation based on community input
- The ROTAC will evaluate their input



Learn about the ROTAC recommendations: Read the report or view a recorded presentation by the ROTAC chairs


ROTAC
Report



April 24
Roman
Community
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Roman Observations: A Community Driven Process

Each  marks the institution of someone (often, multiple people) who contributed white papers, proposed science pitches, or who served on the PITs, the DCs, and the ROTAC.

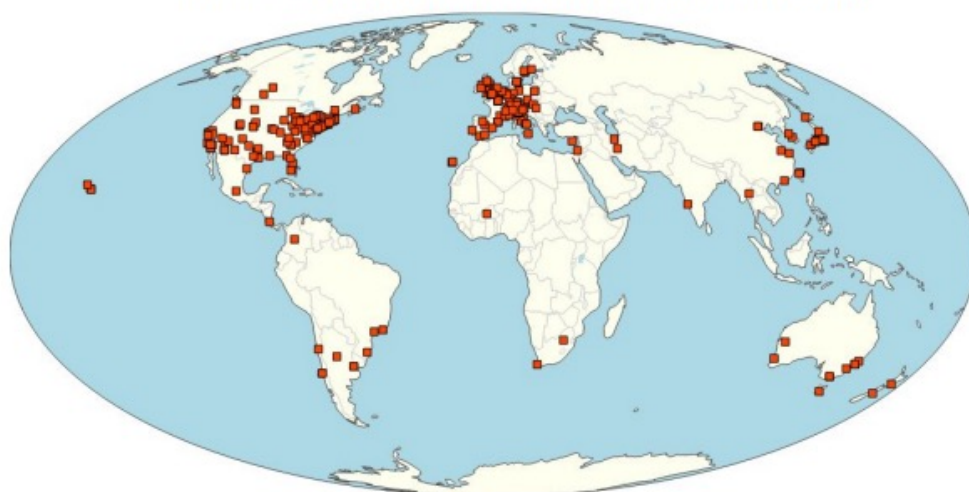


Figure credit: Gail Zasowski; additional data provided by Leslie Beauchamp, Jenna Ballard, and Julie McEnery



ROTAC Recommendations: Executive Summary



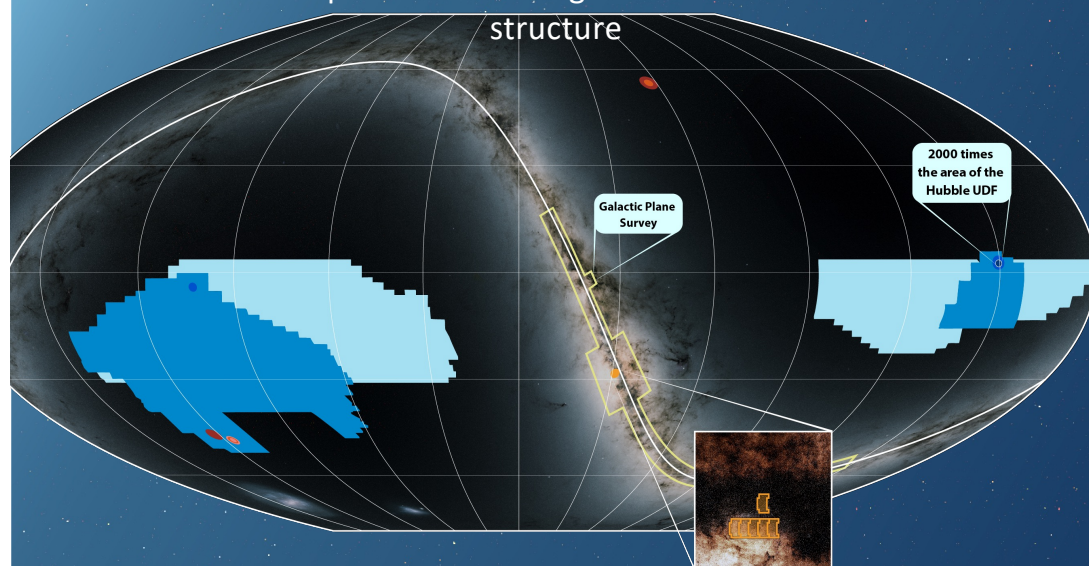
The ROTAC recommends:

1. a nominal allocation (520 days) for the High Latitude Wide Area Survey,
2. a nominal allocation (180 days) for the High Latitude Time Domain Survey,
3. an overguide allocation (438 days) for the Galactic Bulge Time Domain Survey, with potential modifications, and
4. 389 days reserved for General Astrophysics Surveys (25.5% of prime mission science operations time), including the early-definition Galactic Plane Survey.

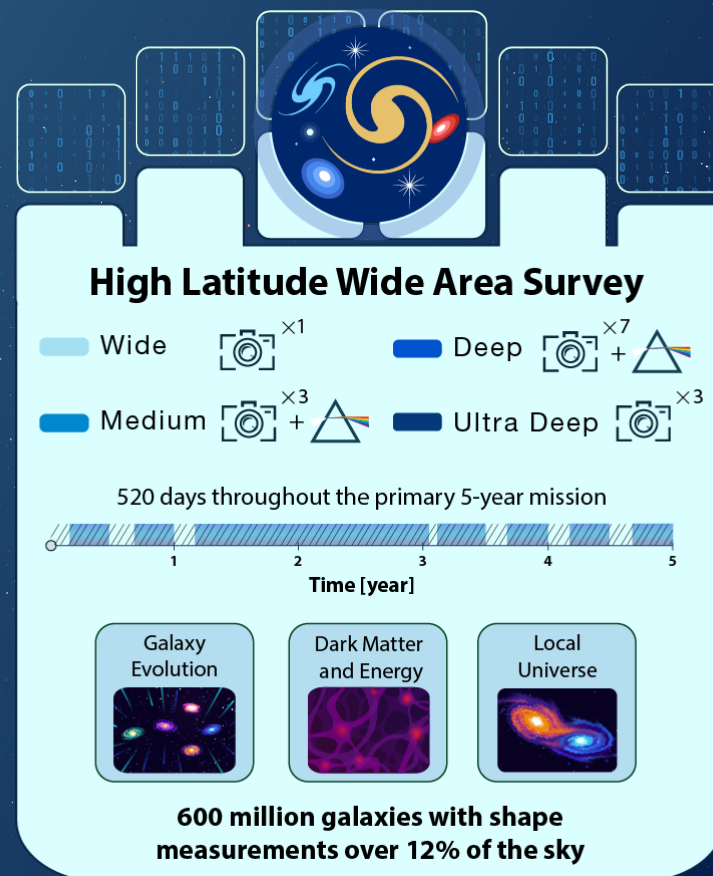
Science for All

ROMAN'S EXTENSIVE SURVEYS

Precise measurements of cosmic expansion and the growth of cosmic structure



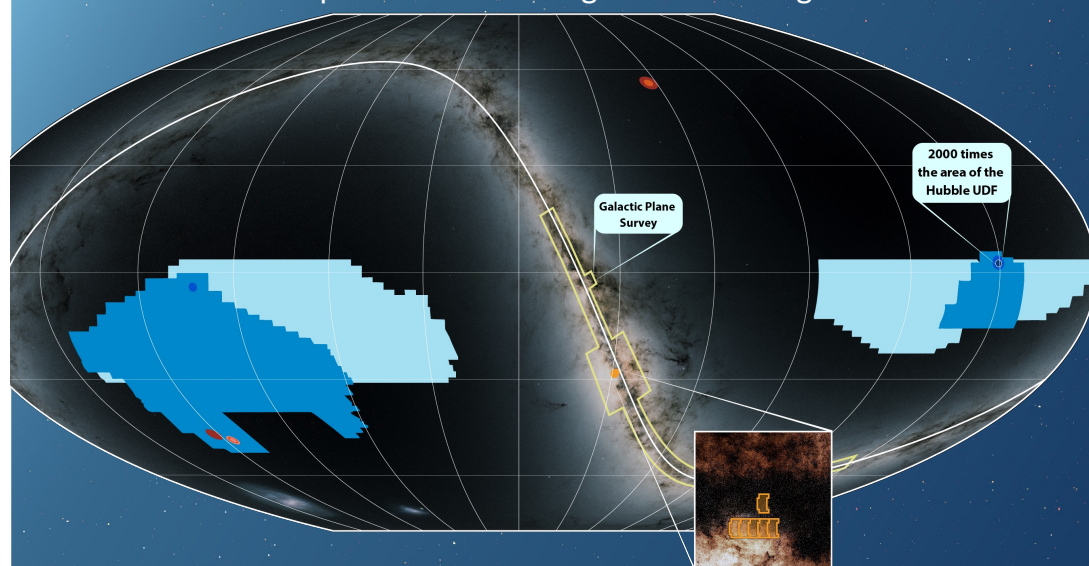
Via weak gravitational lensing, galaxy clustering, baryon acoustic oscillations, and redshift-space distortions



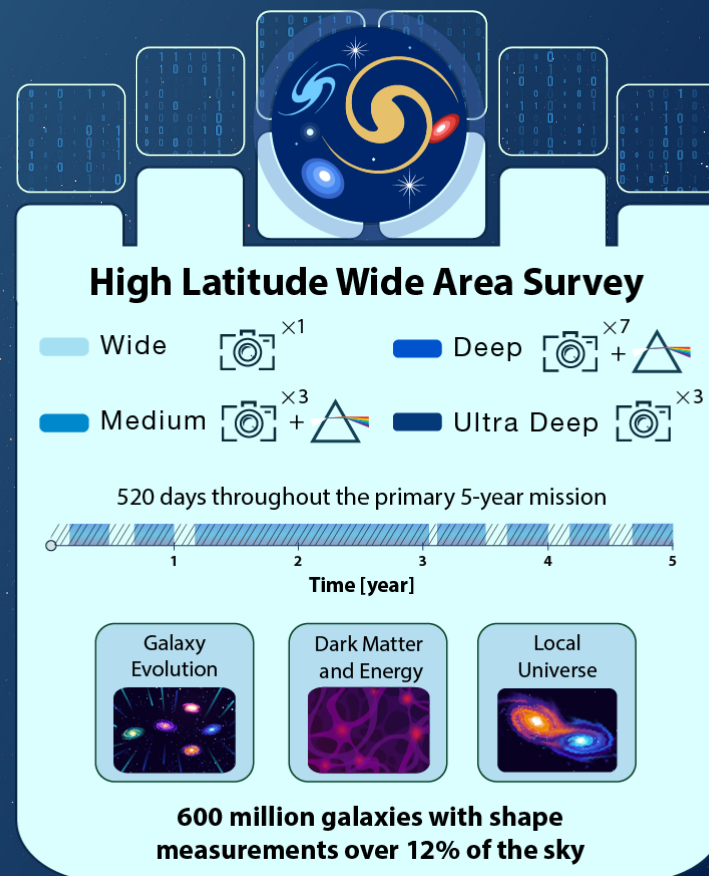
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Science for All ROMAN'S EXTENSIVE SURVEYS

Multi-band imaging and spectroscopy
to depths > 26.5 AB mag over 2400 deg^2



Enabling investigations on scales ranging from studies of solar system objects, to tracing galaxy and quasar evolution to the epoch of reionization, to studying large samples of high z galaxies and quasars



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HLWAS recommendations



In-Guide Survey Breakdown				
Name	Area & Filters	Exposure times	Depth	Survey yields
★ Wide	2702 deg ² H	2x3x107 s (H)	26.2 (H)	$n_{\text{eff}} = 26.7 \text{ arcmin}^{-2}$ $N_{\text{shape}} = 260\text{M}$
★ Medium	2415 deg ² YJH + Grism	2x3x107 s (YJH) 4x2x190 s (Grism)	26.5 (Y) / 26.4 (JH) 1.5×10^{-16} (Grism)	$n_{\text{eff}} = 41.3 \text{ arcmin}^{-2}$ $N_{\text{shape}} = 360\text{M}$ $N_{\text{spec}} = 19.1\text{M (total)}$ 9.3M (z=1-2) 1.7M (z=2-3) $n_{\text{spec}} = 9.8 \times 10^{-4} h^3 \text{Mpc}^{-3}$
★ Deep	19.2 deg ² WZYJHFK + Grism	+5x3x295 s (WZYJHFK) +36x2x190 s (Grism)	27.7 (ZY) / 27.6 (J) / 27.5 (H) / 27.0 (F) / 25.9 (K) / 28.3 (W) 5.8×10^{-17} (Grism)	(for calibration)
★ Ultra Deep	5 deg ² YJH	+10x3x295 s (YJH)	28.2 (YJ) / 28.1 (H)	(for calibration)

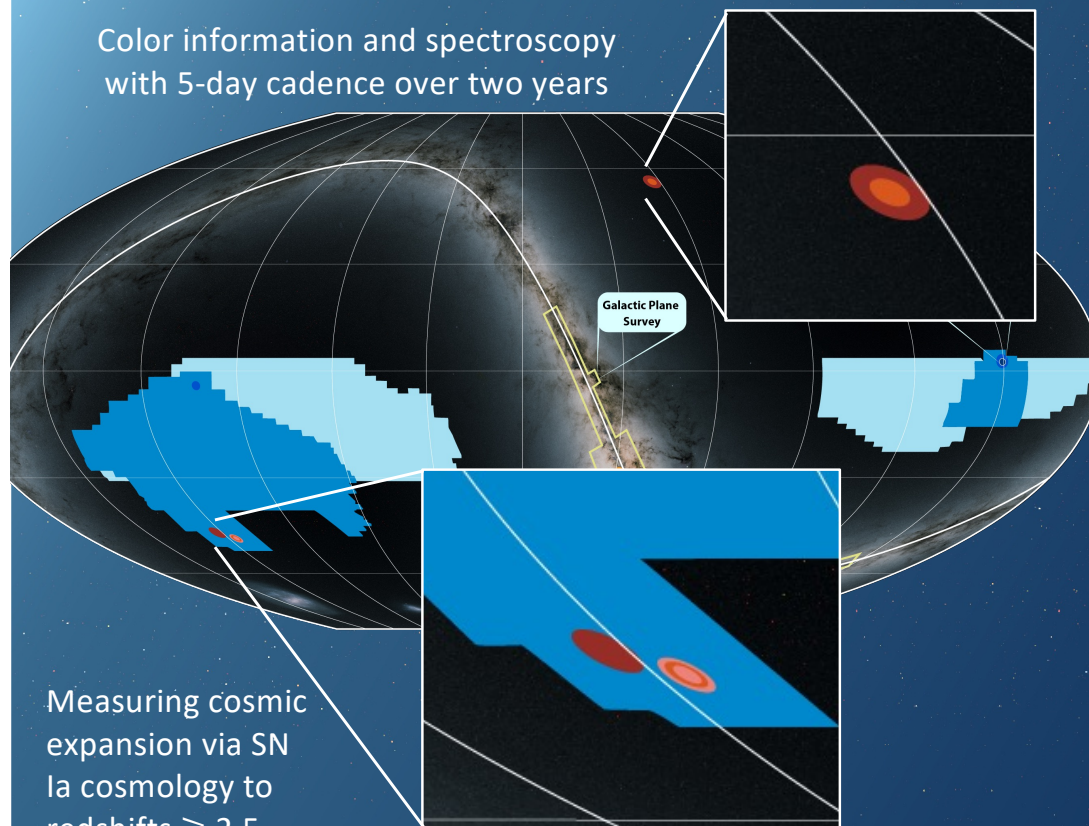
Survey yields:

> 600M galaxies
with shape
measurements

> 19M galaxies
with spectroscopic
redshifts

Science for All ROMAN'S EXTENSIVE SURVEYS

Color information and spectroscopy
with 5-day cadence over two years



High Latitude Time Domain Survey

⌚ 5–10 days

Wide N  $\times 5$ S  $\times 5$ 
Deep N  $\times 5$ S  $\times 5$ 

180 days executed primarily in the middle of the mission



Explosive
Transients



Dark
Energy



AGN

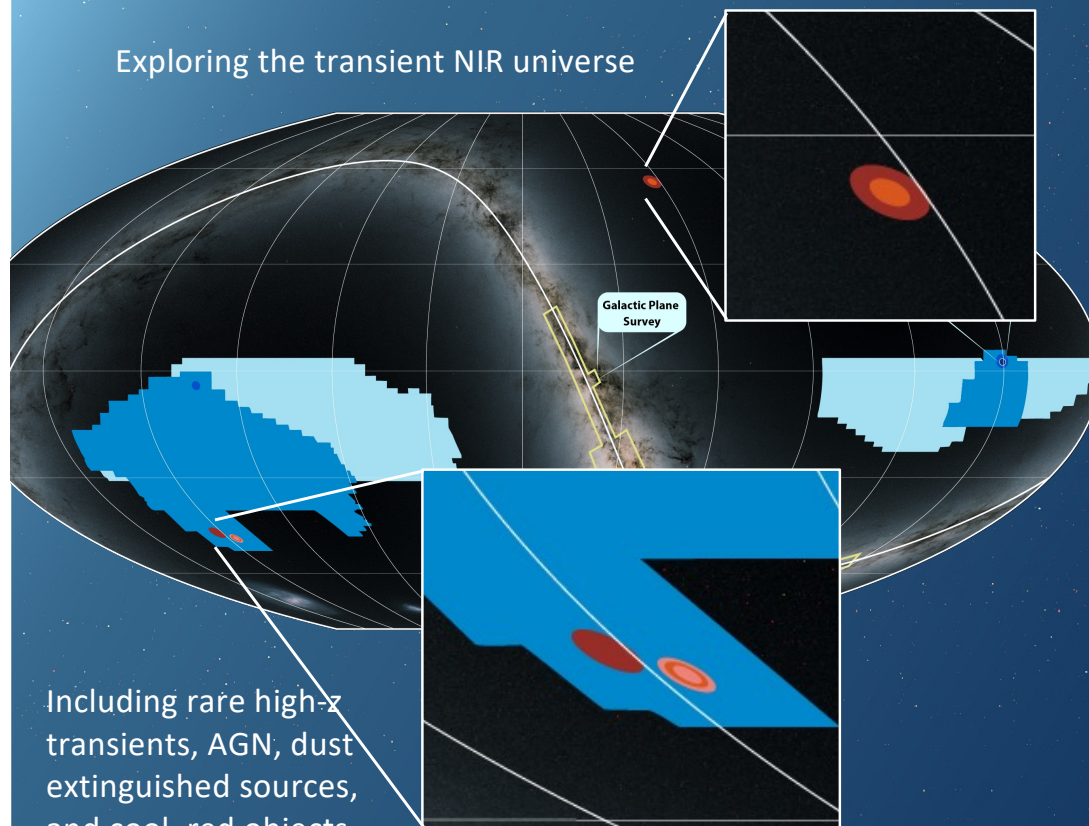


100,000 transient light curves

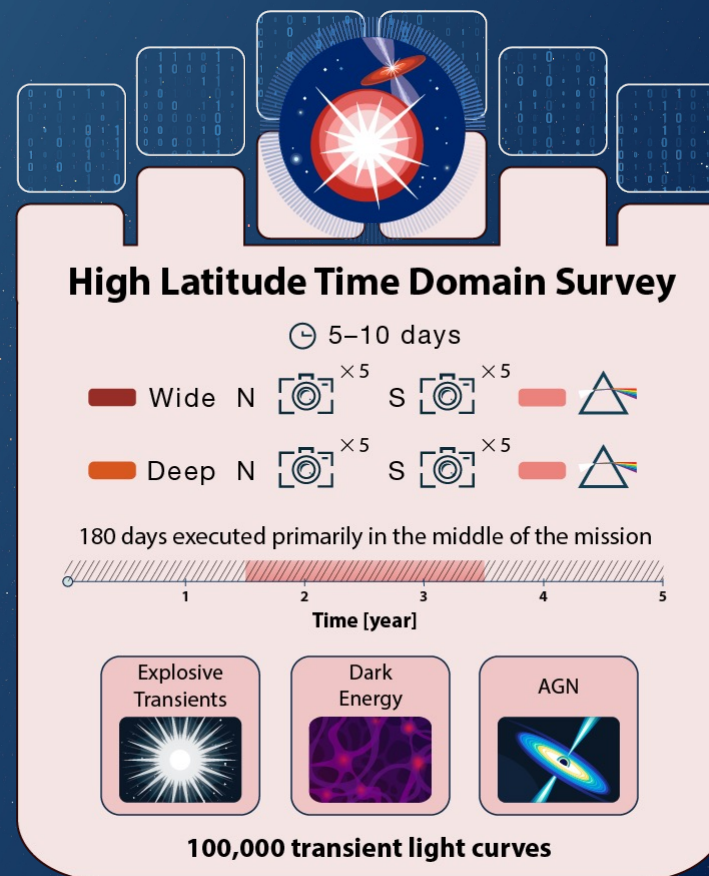
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Science for All ROMAN'S EXTENSIVE SURVEYS

Exploring the transient NIR universe



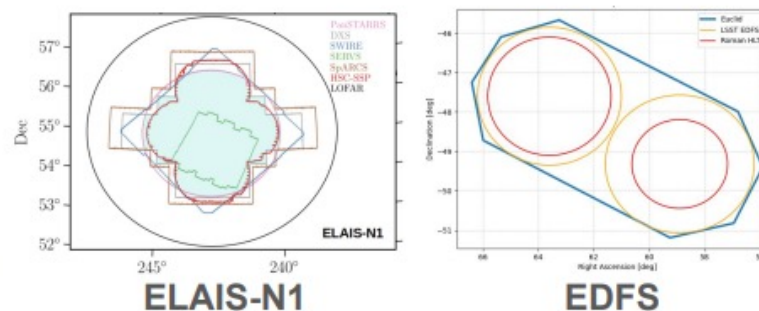
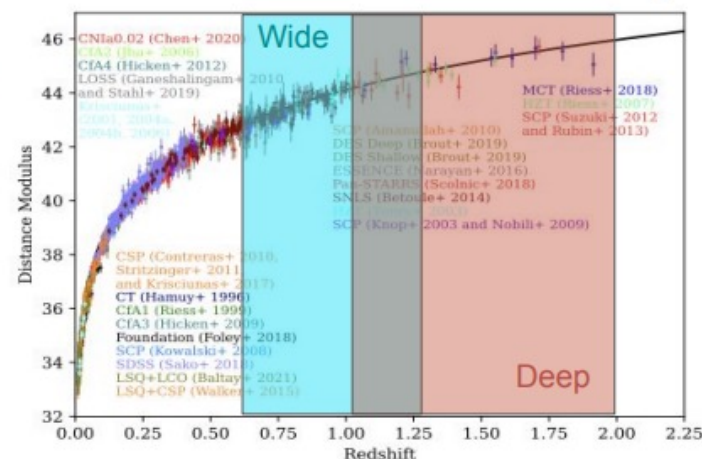
Including rare high- z transients, AGN, dust extinguished sources, and cool, red objects



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HLTDS summary

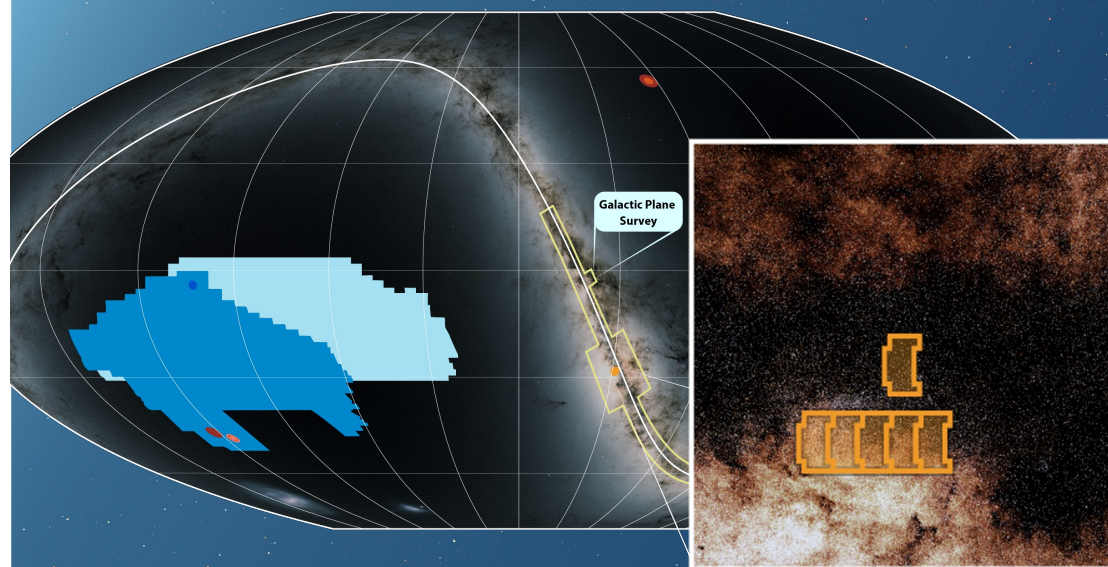
- **Core Component (158 days)**
 - Imaging (78%)
 - SN Ia: $z \sim 0.9$ (Wide), $z \sim 1.7$ (Deep)
 - 10-day interlaced cadence
 - RZJ / RYH Wide
 - ZYH / ZJF Deep
 - Prism spectroscopy (22%)
 - 5-day cadence in Deep Imaging
 - 900 sec, 3600 sec exposures
- **Pilot Component (15 days)**
 - 8 visits to all imaging and prism fields in first ~5 months of Roman.
 - Templates & other Core Component preparation, and early science.
- **Extended Component (7 days)**
 - 8 visits to Deep Imaging fields before and after Core Component.
 - Long-term monitoring of high-redshift, exotic transients.



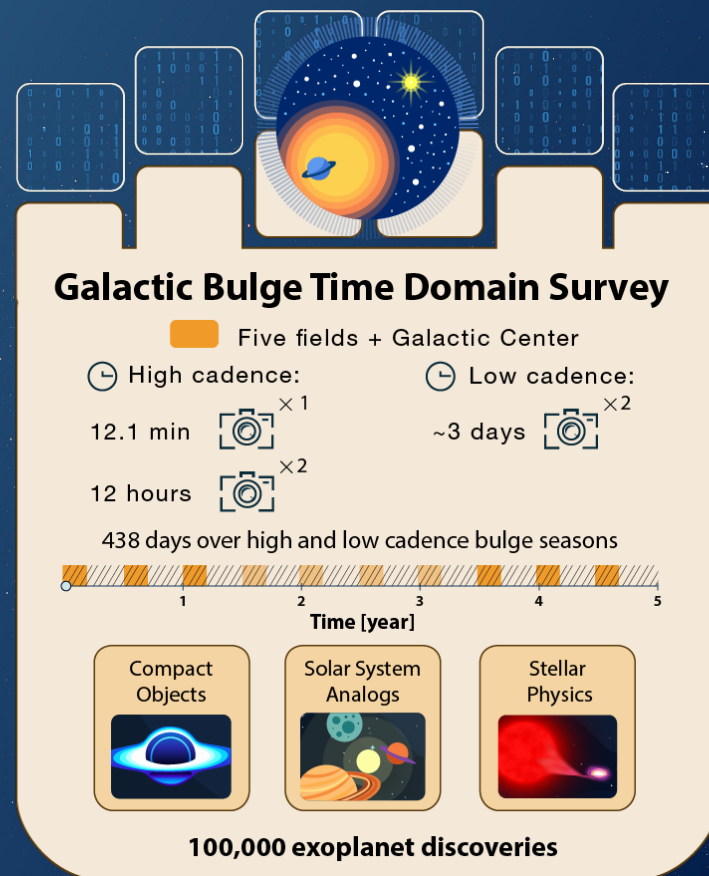
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Science for All ROMAN'S EXTENSIVE SURVEYS

High plus low cadence seasons maximize scientific yield



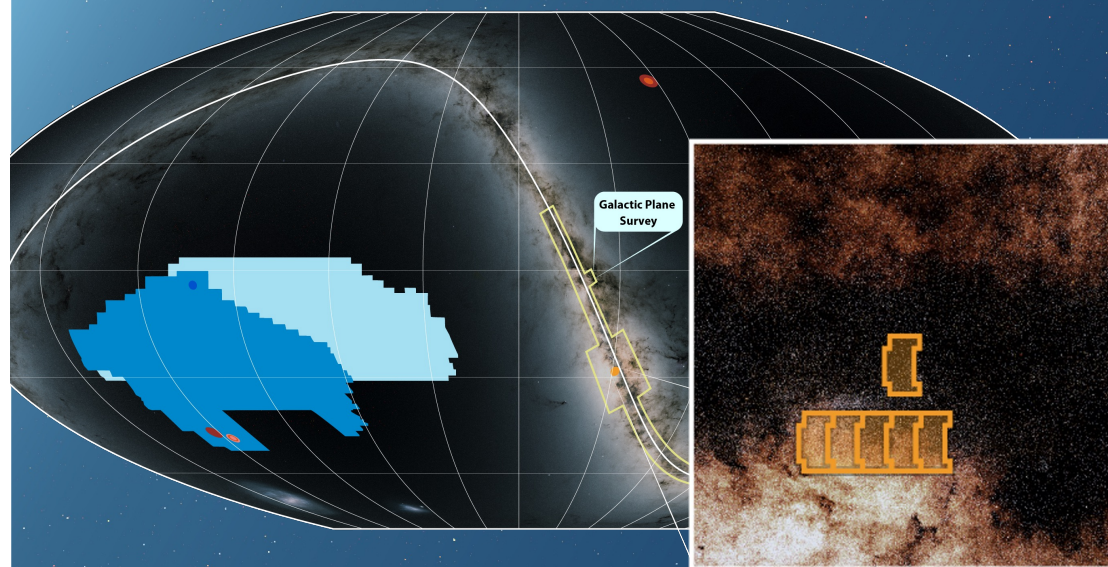
Enabling microlensing detections from scales of solar system analogues to stellar mass black holes, and detecting > 100,000 transiting exoplanets



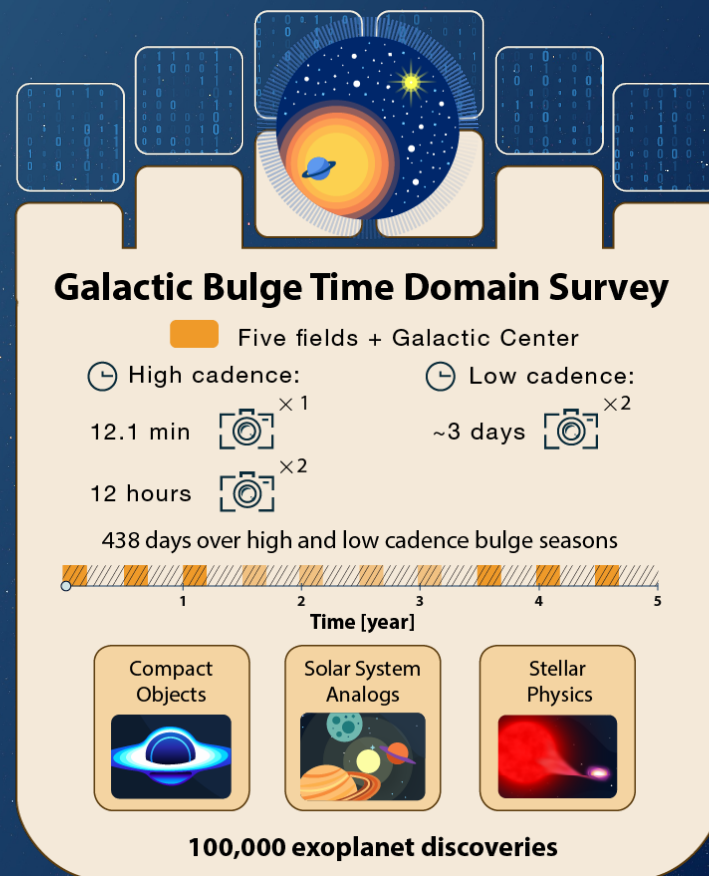
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Science for All ROMAN'S EXTENSIVE SURVEYS

Advancing stellar and Galactic astrophysics

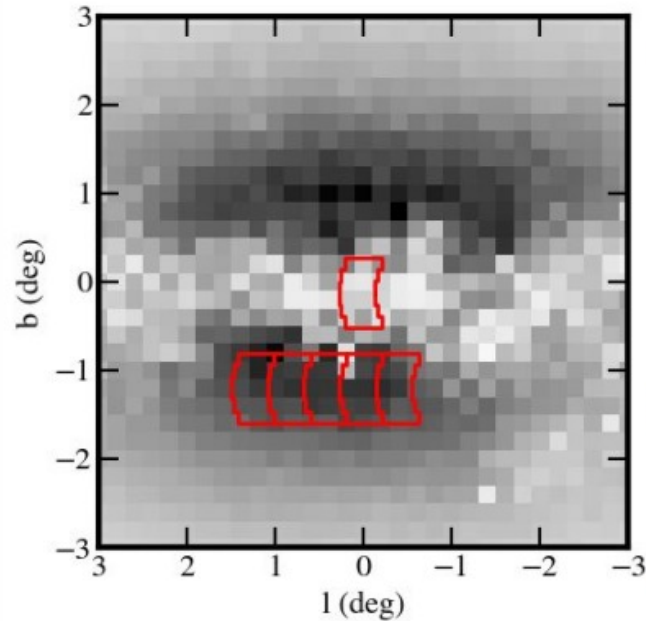


Via asteroseismology of several hundred thousand red giants, monitoring of Sgr A*, and studies of compact objects and high-energy X-ray binaries



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Recommended GBTDS



4 Components

- 6 × 70.5 day **high-cadence seasons**
 - first & last 3 bulge seasons
 - 5 fields + Galactic Center
 - 12.1 min cadence
 - wide F146 filter, 67 sec exptime
 - F087 and F213 at 12 hr cadence
- 4 **low-cadence seasons**
 - 3 or 5 day cadence (tbd based on scheduling constraints)
- 30 **photometric snapshots** (5 filters)
- 30 **grism snapshots**

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Survey Implementation Status

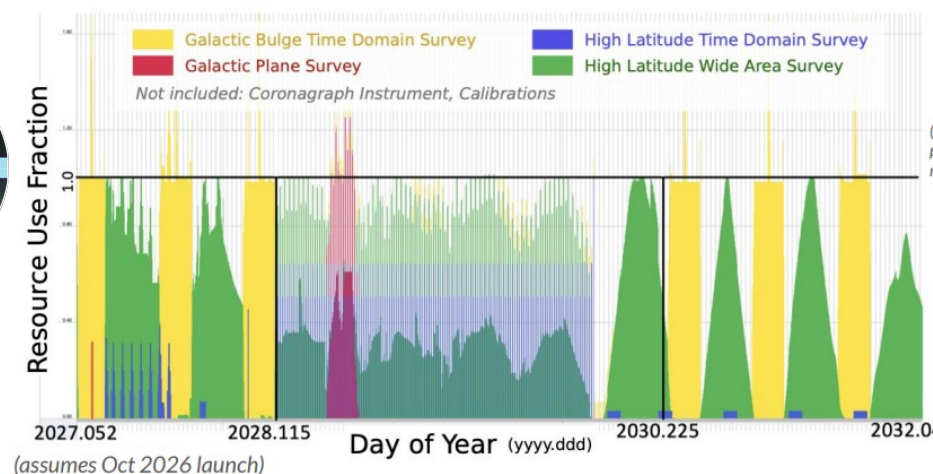
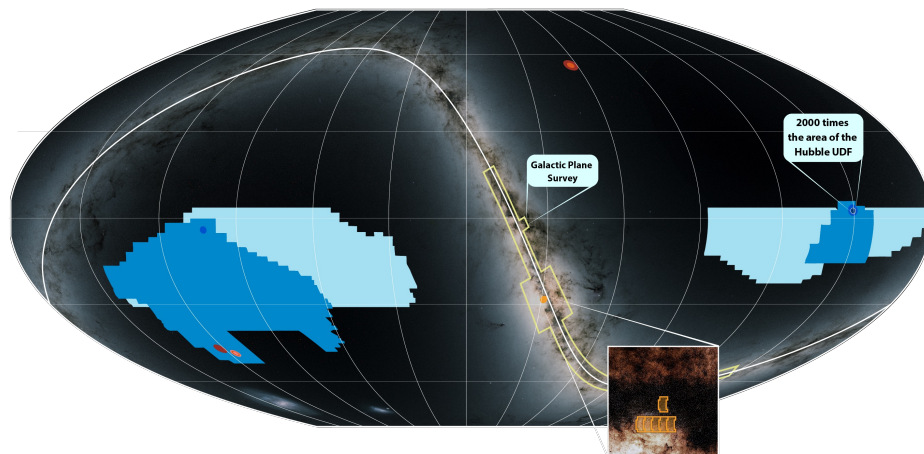
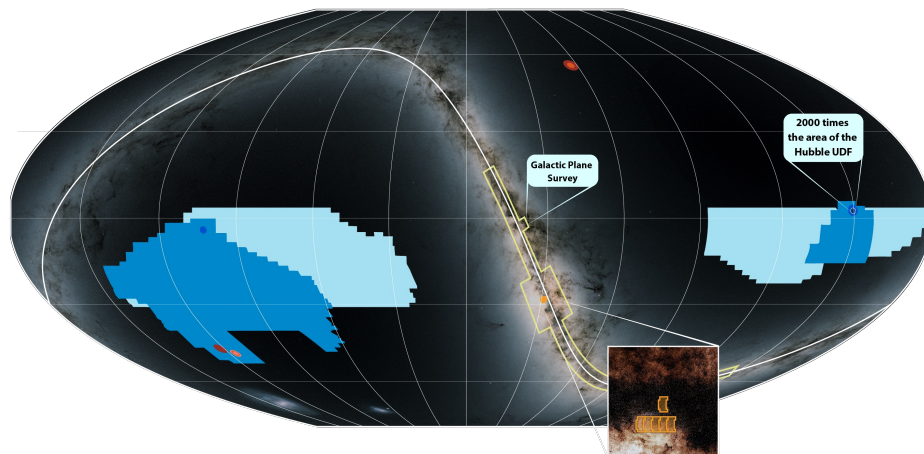


Figure credit: Roman Science Operations Center at STScI

- The 3 CCSs (and a draft Galactic Plane Survey) have been implemented in APT and the team at SOC are working through iterations to generate a plan that meets the survey goals while ensuring efficiently scheduled observations.
 - Once plans are baselined programs will be available via APT.
- To ensure continued community involvement in the scientific oversight and evolution of the Roman Core Community Surveys (CCSs), the Roman project plans to establish ongoing committees for each Core Community Survey.

Survey Implementation Status



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