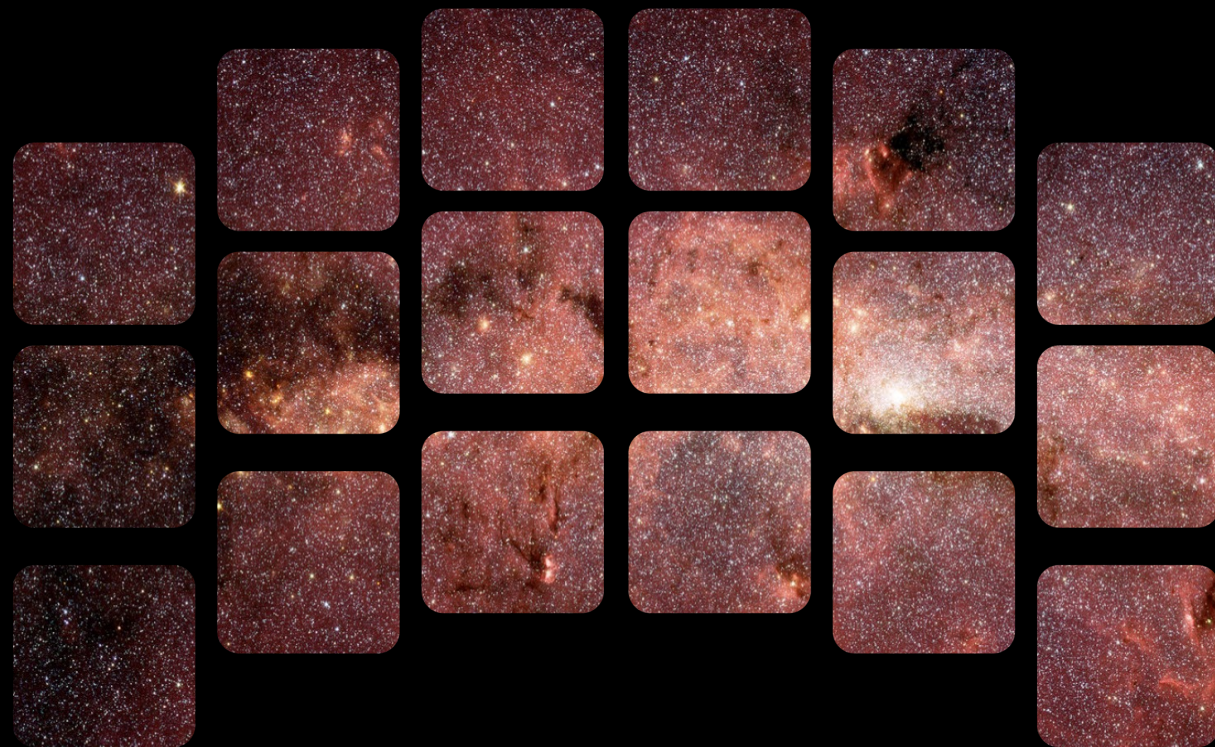


General Astrophysics and Community Surveys

Ryan C. Hickox
Dartmouth College
On behalf of the
Roman Science Interest Group

Presentation to Committee on Astronomy and
Astrophysics
Roman Observations Working Group
7 April 2022

R.ÖMAN



SPACE TELESCOPE

Roman Science Interest Group (2020 - ..)

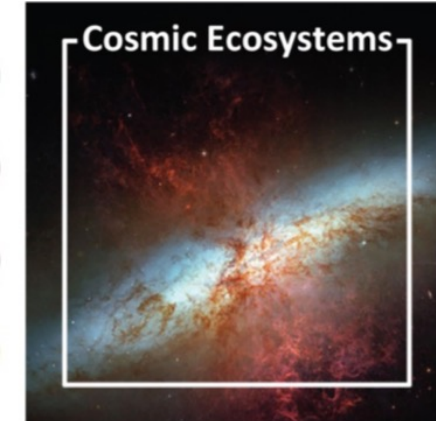
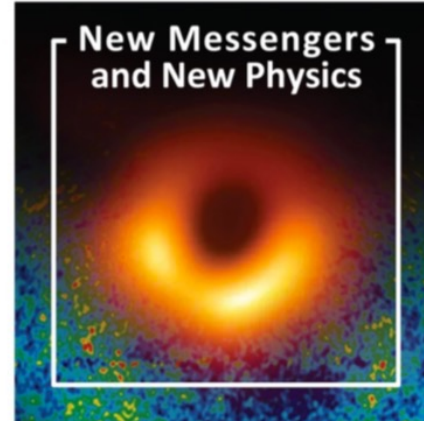
- <https://roman.gsfc.nasa.gov/science/rsig.html>

The Roman Science Interest Group provides broad-based community input to the Roman project and NASA headquarters. Its primary purpose is to assist NASA in ensuring that the interests of the scientific community are served by the Roman Space Telescope project in planning for and executing Roman development and operations.

- **Meeting presentations and notes available on the meetings tab**
 - Discussions on observing program, proposal opportunities, mission/instrument status, etc.
- **Regular opportunities to join this group**
- **Reports to Project and Program Scientists**

Megan Donahue (Chair)	Michigan State U.
Zeljko Ivesic	U. Washington
Jessica Lu	UC Berkeley
John MacKenty	STScI
Ashley Villar	Columbia U / Flatiron Institute
Alice Shapley	UCLA
Keith Bechtol	UW, Madison
Saurabh Jha	Rutgers U
Peter Melchior	Princeton U
Dara Norman	NOIRlab
Jessie Christiansen	NEXSci/ CalTech
Rachel Bean	Cornell U
Ryan Hickox	Dartmouth
Dimitri Mawet	Caltech
David Spergel	Simons Foundation (ex-officio)
Jeremy Kasdin	U. San Francisco (ex-officio)
Roeland van der Marel	Science Center (STScI) (ex-officio)
Lee Armus	Science Center (IPAC) (ex-officio)

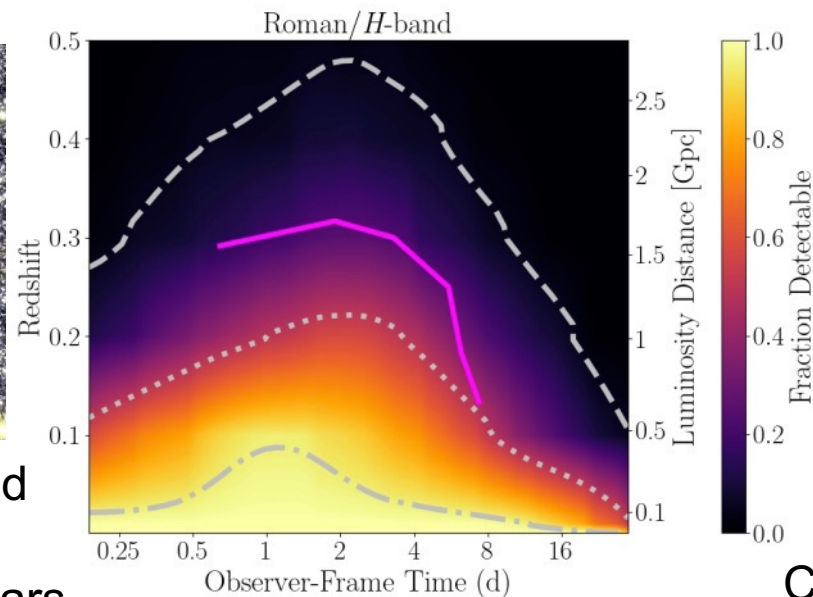
General Astrophysics with Roman



e.g., Galactic Bulge Time Domain Survey

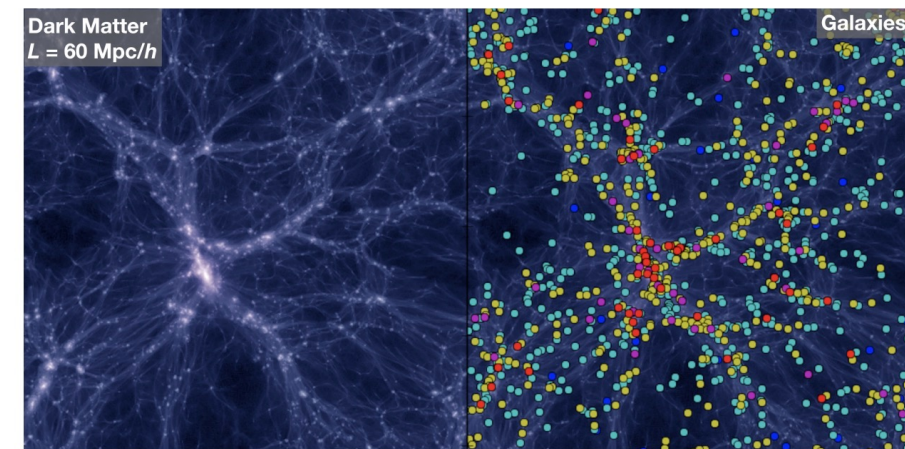
e.g., High Latitude Time Domain Survey

e.g., High Latitude Wide Area Survey



Detection of kilonovae

Chase et al. (2021)



Co-evolution of galaxies and dark matter halos

Robertson et al. (2019)

Gaudi et al. (2019)

Take-away message for question (2)

- **Consensus of the Roman Science Interest Group**
 - The RSIG **strongly supports** the plan to use 75% of Roman observing time for Core Community Surveys
 - The RSIG feels that the CCS will have **strong advantages for general astrophysics** by making use of Roman's survey-oriented design (>1000x Hubble capacity for large surveys)
 - The RSIG feels that the emphasis on community-defined surveys will also maximize the **inclusivity** and **breadth of access** to Roman science, and will positively impact the **broad astrophysical community**
 - RSIG support for this plan is based on some conditions:
 - Clear, transparent, and effective **community engagement** in finalizing the CCS strategies
 - Emphasis on **general astrophysics** in addition to primary cosmology goals
 - **Broad access to resources**, particularly funding, for contributing to Roman science
 - Ability to **update survey strategies** making use of lessons learned post-launch

Core Community Survey Definition

- **Goals of CCS definition process:**
 - Provide observations needed to enable mission science objectives in **cosmology** and **exoplanet demographics**
 - Maximize science return, including **general astrophysics**
 - Ensure **breadth of science and community** across all surveys
 - Maximize **community engagement** and input in definition of surveys
 - Establish a **transparent process**
 - Ensure final survey definition recommendations made by a body and process the community perceives as **representative and balanced**

CCS and General Astrophysics

- **Benefits of Core Community Surveys for General Astrophysics**

- CCS are explicitly defined to take full advantage of Roman's design that is optimized for **large surveys**
- Large, community-planned surveys will allow for a **well-defined and calibrated data set** that is optimal for many general astrophysics applications

The **Sloan Digital Sky Survey** provides a good example of the benefits of well-defined large surveys for observatories that are designed for specific survey goals while having wide applicability to general astrophysics (flux calibration, broad filter set, etc.). SDSS also illustrates the potential for **updating survey strategies** as new data come in (SDSS quasar selection is one example).

The SDSS Science Legacy

<https://classic.sdss.org/signature.html>

“Here we list some highlights among the many discoveries made by the SDSS...Half of these achievements were among the original "design goals" of the SDSS, but **the other half were either entirely unanticipated or not expected to be nearly as exciting or powerful** as they turned out to be.”

Core Community Surveys and Inclusivity

- **Inclusivity in Roman science**

- The RSIG feels strongly that a **collaborative** rather than a **competitive** process in developing Roman's observing plan is optimal for maximizing the science return in general astrophysics for the largest community of researchers
- Engagement of the community with the CCS enables **broad-based ownership** of the (public) Roman data more so than with competed projects (even if those are public immediately)
- To enable the most inclusive science, **access to resources** (in particular funding) should be distributed widely among researchers from a range of institutions

Community voices in survey definition

- The RSIG supports the overall plan for community outreach and engagement in CCS definitions, including:
 1. Make sure that the **entire community** has a voice in the survey definition process
 2. **Broad outreach** via mailing lists and conference sessions
 3. **Workshops and white paper calls** inform the CCS definitions
 4. **Proactive outreach** to researchers at undergraduate serving institutions and minority serving institutions, both for CCS definition and potential funding support

(3) Distribution of Roman GAS time

- The RSIG supports the possibility of a **wide range of possible projects**, both in science topic and scale/observing time, in the 25% of Roman time set aside for general astrophysics surveys
- The RSIG emphasizes the importance of potential **new, community-driven large survey programs** that are outside the CCS, but larger than what typically would be selected in a Great Observatory General Observer program. These may make up a considerable fraction of the additional 25% of Roman time, taking further advantage of Roman's strengths for large surveys.

Take-away messages

- **Consensus of the Roman Science Interest Group**
 - The RSIG **strongly supports** the plan to use 75% of Roman observing time for Core Community Surveys
 - The RSIG feels that the CCS will have **strong advantages for general astrophysics** by making use of Roman's survey-oriented design
 - The RSIG feels that the emphasis on community-defined surveys will also maximize the **inclusivity** and **breadth of access** to Roman science, and will positively impact the **broad astrophysical community**
 - RSIG support for this plan is based on some conditions:
 - Clear, transparent, and effective **community engagement** in finalizing the CCS strategies
 - Emphasis on **general astrophysics** in addition to primary cosmology goals
 - **Broad access to resources**, particularly funding, for contributing to Roman science
 - Ability to **update survey strategies** making use of lessons learned post-launch
 - RSIG support for a **wide range of possible programs** for GAS time, emphasizing the importance of other potential large community-driven surveys