

CCAPP's role in Roman: a >20 year journey to the launch pad



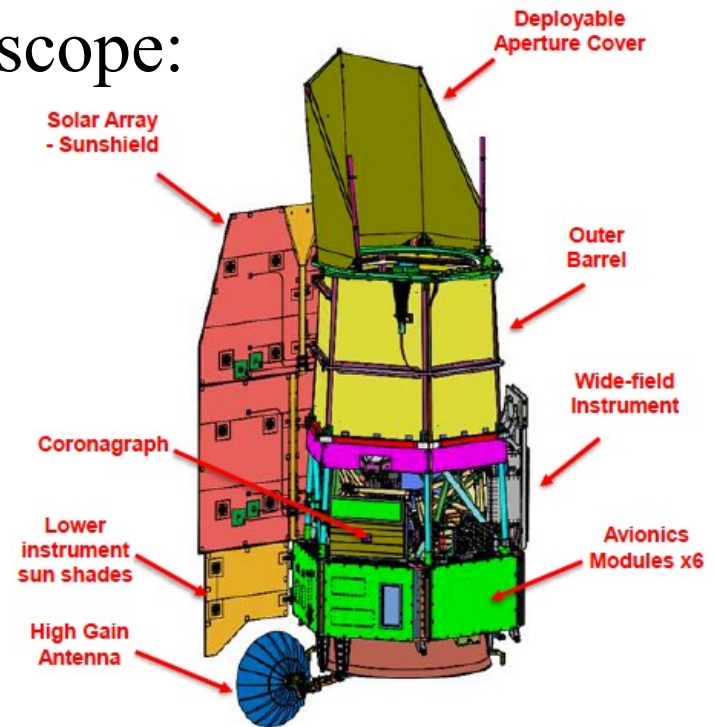
Christopher Hirata

CCAPP 20th Anniversary • June 11, 2026

The Nancy Grace Roman Space Telescope: the next-generation near infrared survey ...

<http://roman.gsfc.nasa.gov/>

- NASA's next large astrophysics mission
- 2.4 m diameter mirror
- Wide field instrument
300 Mpix, wavelength range 0.5–2.3 μm
- Coronagraph
(technology experiment for high contrast imaging)
- 3 science pillars:



Cosmology

- Type Ia supernovae (imaging + prism spectroscopy)
- Weak lensing with high-resolution, multiband imaging
- Galaxy redshift survey (grism spectroscopy for $H\alpha$ and $[O III]$ emission lines)

Exoplanets

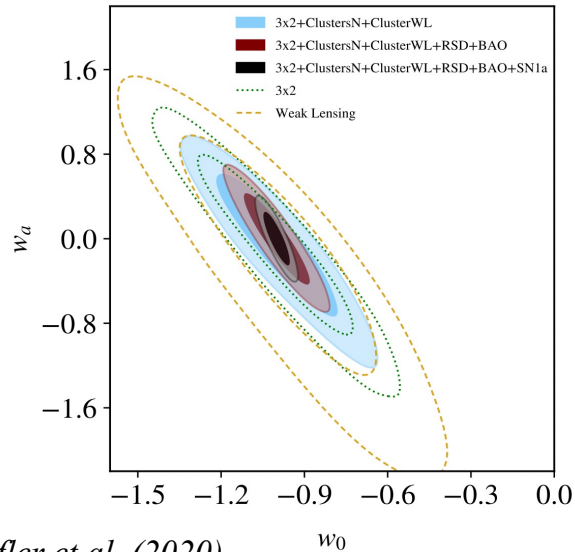
- Microlensing survey of the Galactic bulge – census of cold exoplanets
- Coronagraph technology demonstration (direct imaging + slit spectroscopy)

General Astrophysics

- High redshift galaxies, reionization
- Nearby galaxies – resolved stellar populations, galactic halos
- Stars from brown dwarfs to compact objects

... and many more!

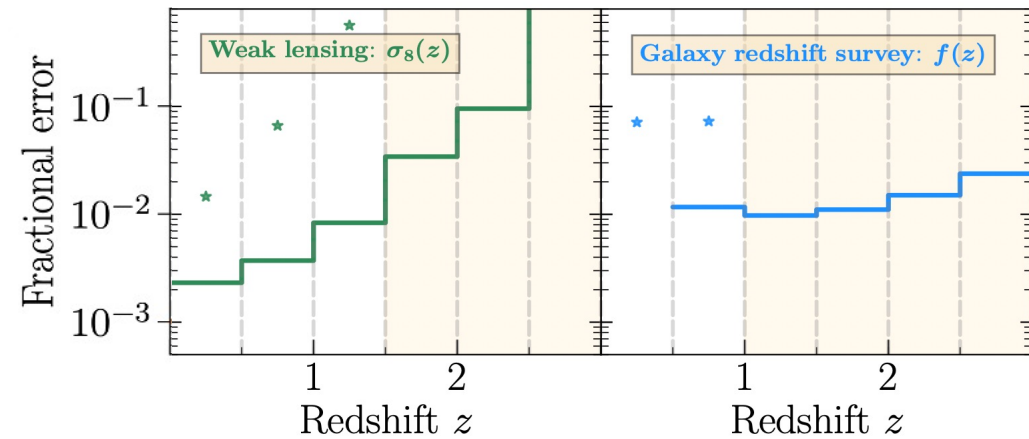
Equation of State of Dark Energy



Eifler et al. (2020)

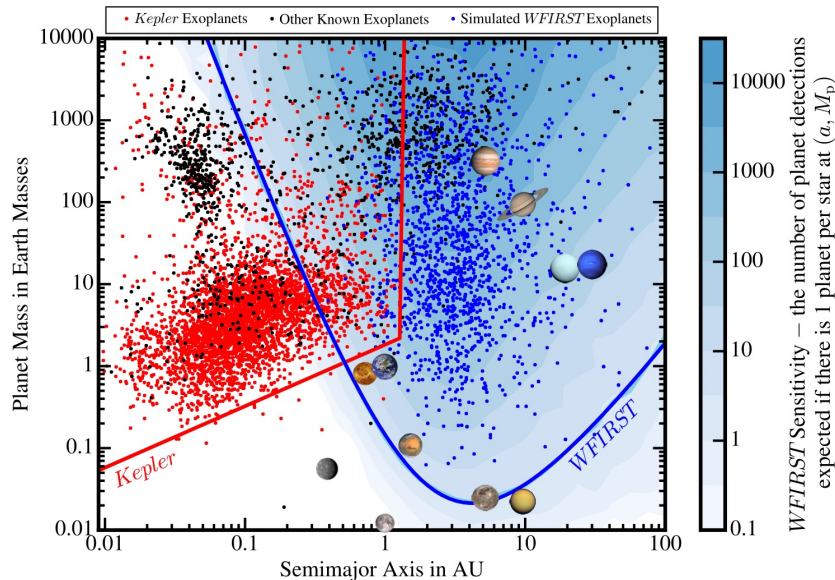
Growth of Cosmic Structure

– Notional Survey * circa 2019



Doré et al. (Astro2020 White Paper) –
notional survey performance with other parameters held fixed

Exoplanet Microlensing Survey



Coronagraph Technology Demonstration

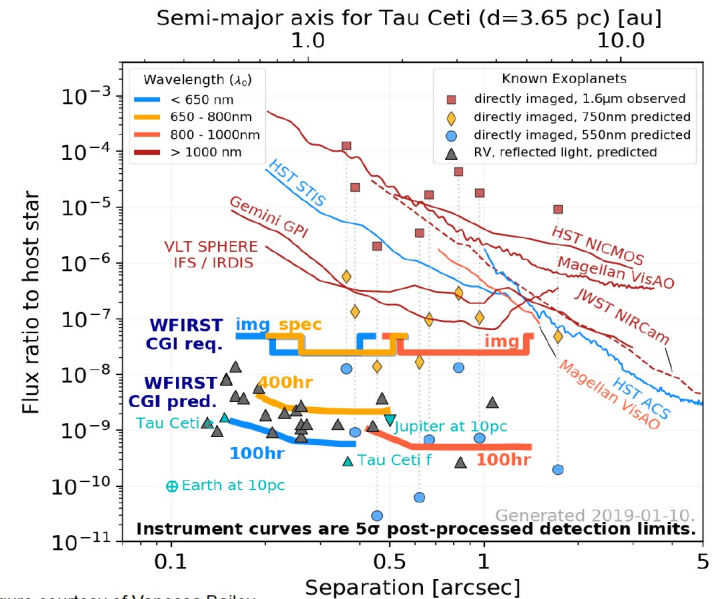


Figure courtesy of Vanessa Bailey

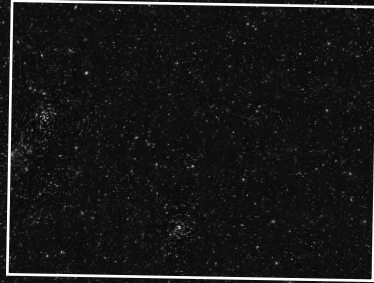
A (simulated) portion of Roman's survey



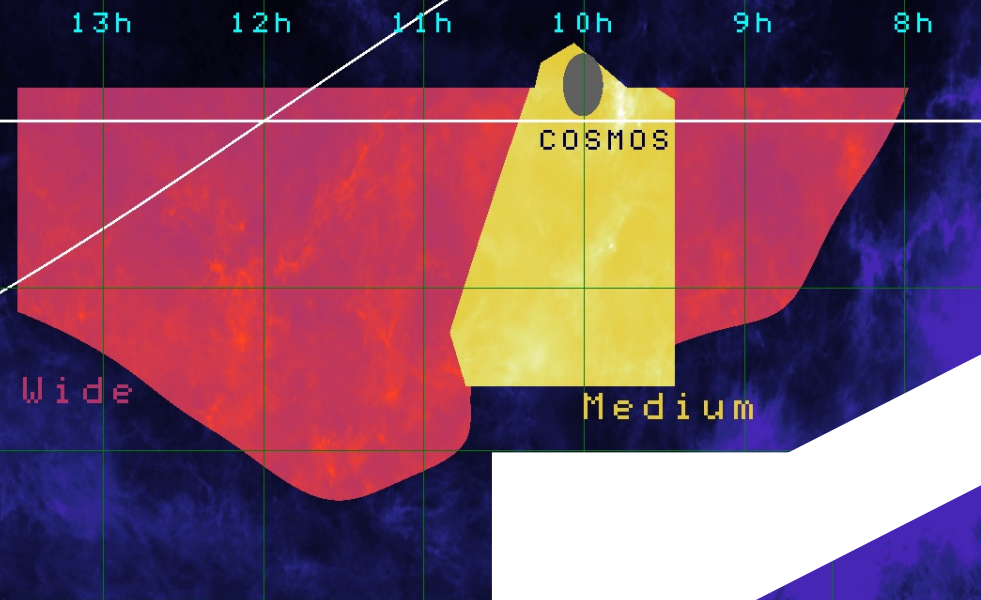
RGB = 1.58, 1.29, 1.06 μm

*OpenUniverse (2024) simulation, combined effort for Rubin + Roman
+ Roman High-Latitude Imaging Survey Project Infrastructure Team*

2.2 degrees



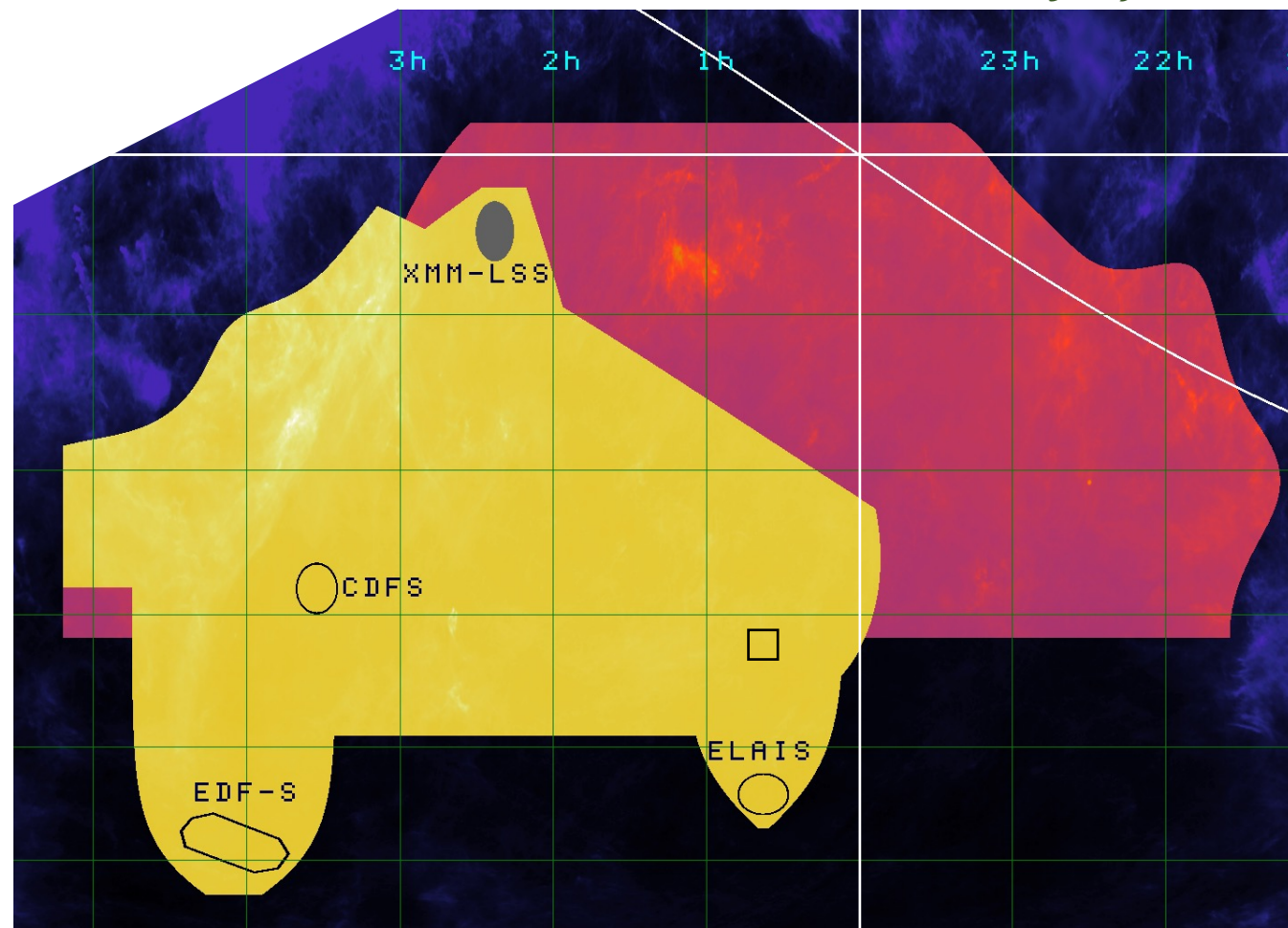
*OpenUniverse (2024) simulation, combined effort for Rubin + Roman
+ Roman High-Latitude Imaging Survey Project Infrastructure Team*



High Latitude Wide Area Survey

Core Community Survey Definition Committee

Southern footprint

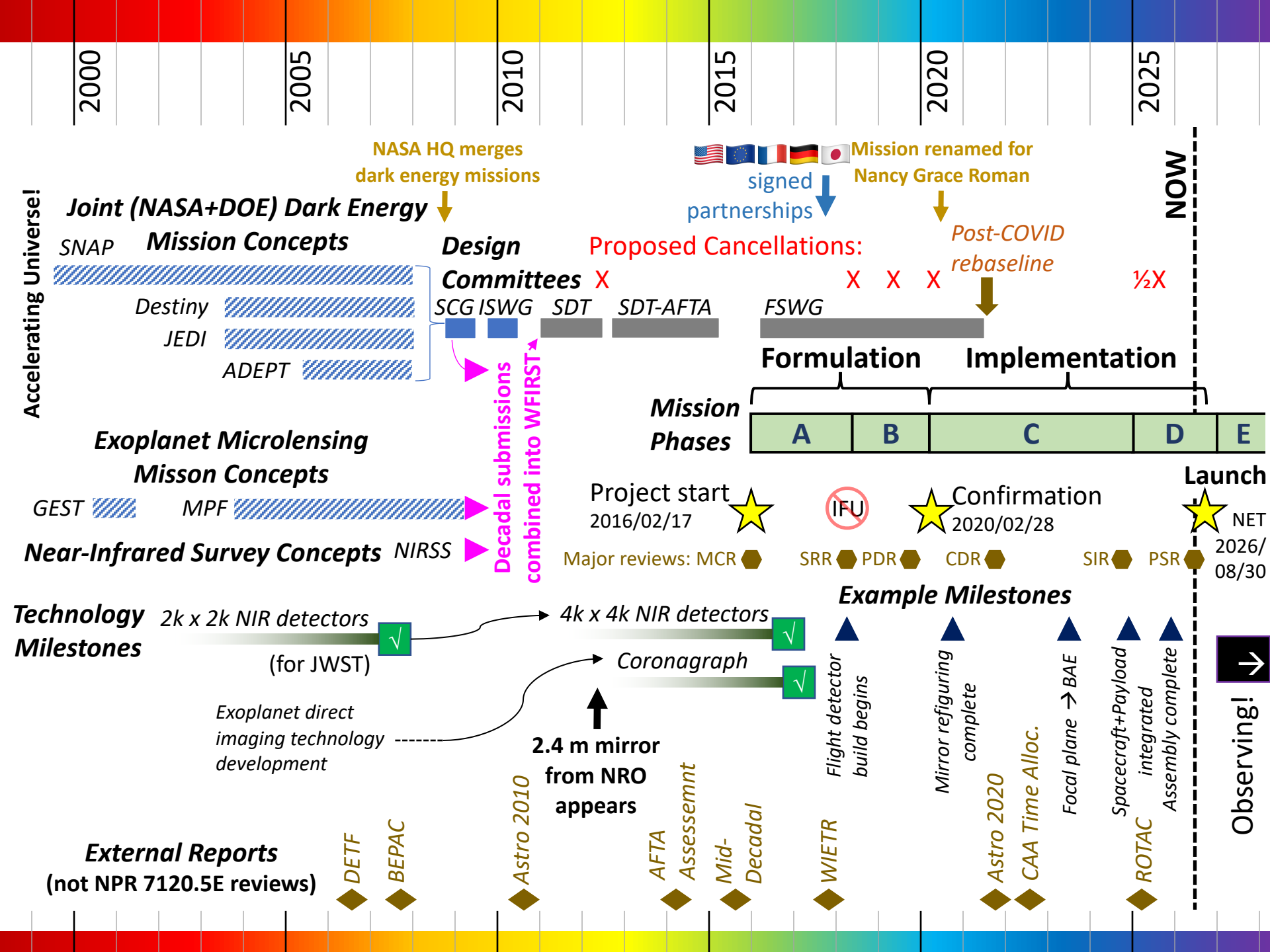


Medium = 3 bands
(1.06, 1.29, 1.58 μm)
+ grism spectroscopy

Wide = 1 band only
(1.58 μm)

(and this is just one of
the surveys)





For me, the start of a journey ...

Date: Fri, 8 Jul 2005 11:07:19 -0400 (EDT)
From: "Christopher M. Hirata" <chirata@Princeton.EDU>
To: "C. Bennett" <cbennett@jhu.edu>
Subject: Re: please call me

Chuck,

I'm at the Jadwin office today at (609)258-4472. I have a couple of meetings but I will be in between 2 and 5pm. Feel free to call during those times if any are good for you.

Thanks,
Chris

> Chris,

>

> Hi - I don't know if we have met, but I would like to talk to you about dark
> energy. I currently lead the JDEM Science Definition Team for NASA and DOE.
> I left a message for you at your IAS phone number too. I have moved my WMAP
> base of operations from NASA to Johns Hopkins University where I am now at
> 410-516-6177. Please call me when you get a chance. Thanks.

>

> Chuck Bennett

>

>

Science Definition Team Meeting @ NASA Goddard

February 2012



It was also a journey for OSU:



Scott Gaudi wrote to our committee in 2008 advocating for combining the dark energy mission with a microlensing mission because they needed similar hardware.

He was the main technical lead for the microlensing program in the subsequent rounds of design studies, and is now the PI of the Roman Galactic Exoplanet Survey Project Infrastructure Team.



With expertise in multiple cosmological probes, **David Weinberg** became a key overall architect of the Roman dark energy portfolio, coordinating groups with different programmatic histories and technical requirements.

He most recently led the Survey Working Group in the Roman High-Latitude Imaging Survey Project Infrastructure Team.

At a project meeting on May 18, 2012, David informed me that the departments had voted to offer me a faculty job at OSU. Yay!

4k x 4k NIR detectors from Teledyne

We needed a 300 megapixel IR focal plane (18×4088^2) with tight specifications on noise, defects, calibration, ...

Don't just trust the manufacturer's specs! Get scientists to look at the data and find "features."

CCAPP students & postdocs partnered with the Detector Characterization Lab (@NASA Goddard) to understand the impact of detector systematics on Roman's science goals.



Ami Choi



Jenna Freudenburg



Jahmour Givans



Katherine Laliotis



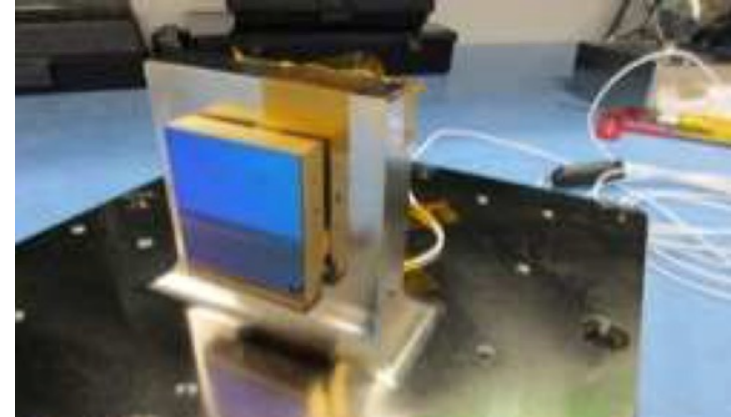
Emily Macbeth



Anna Porredon

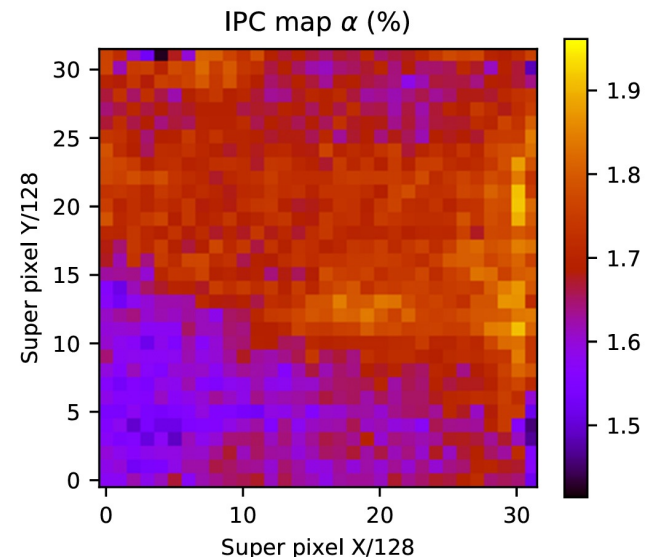
Development detector SCA18237 on the vibration test fixture, 2016

(WFIRST IR Technology Milestone Report #5)

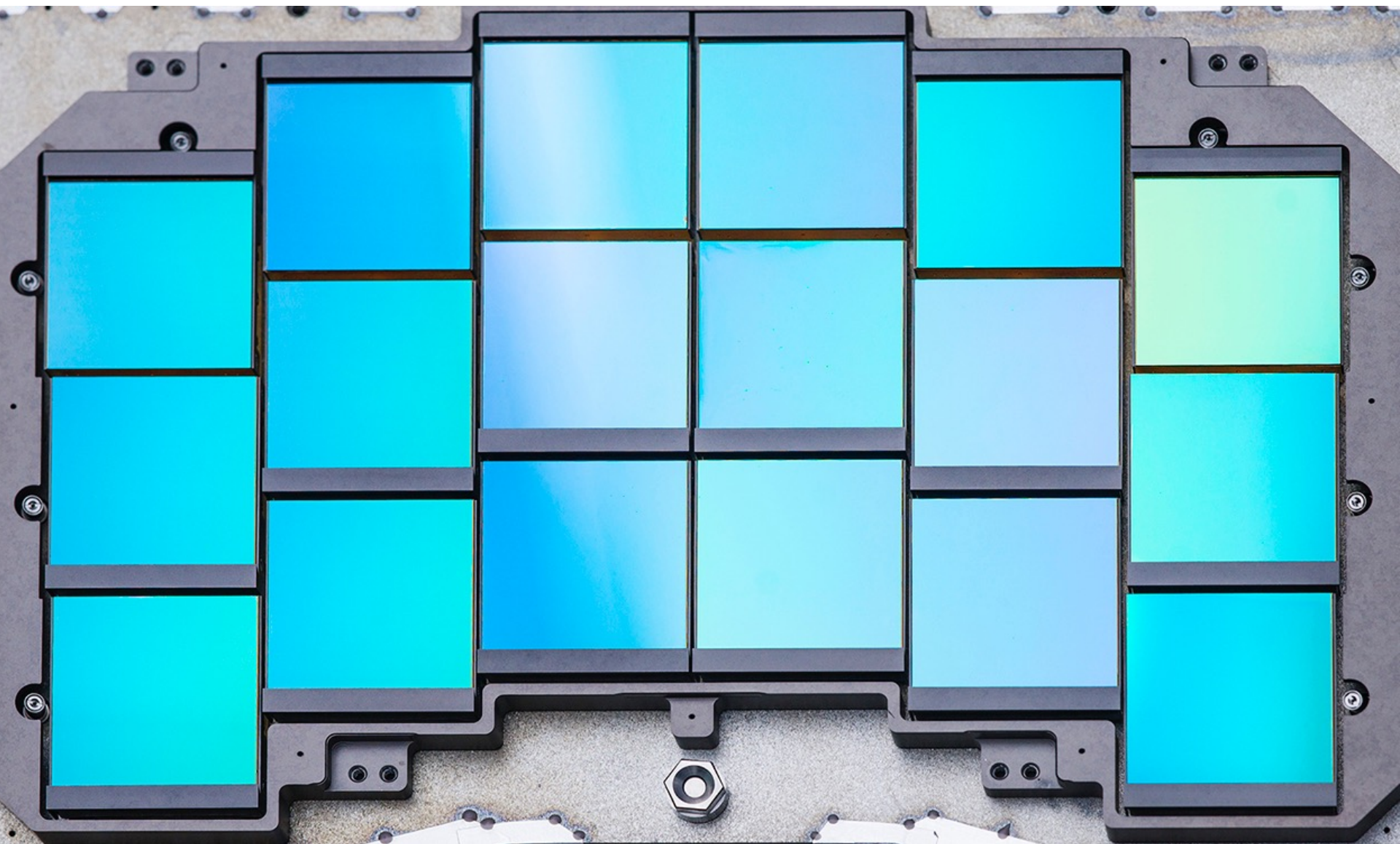


SCA18237 cross-talk map

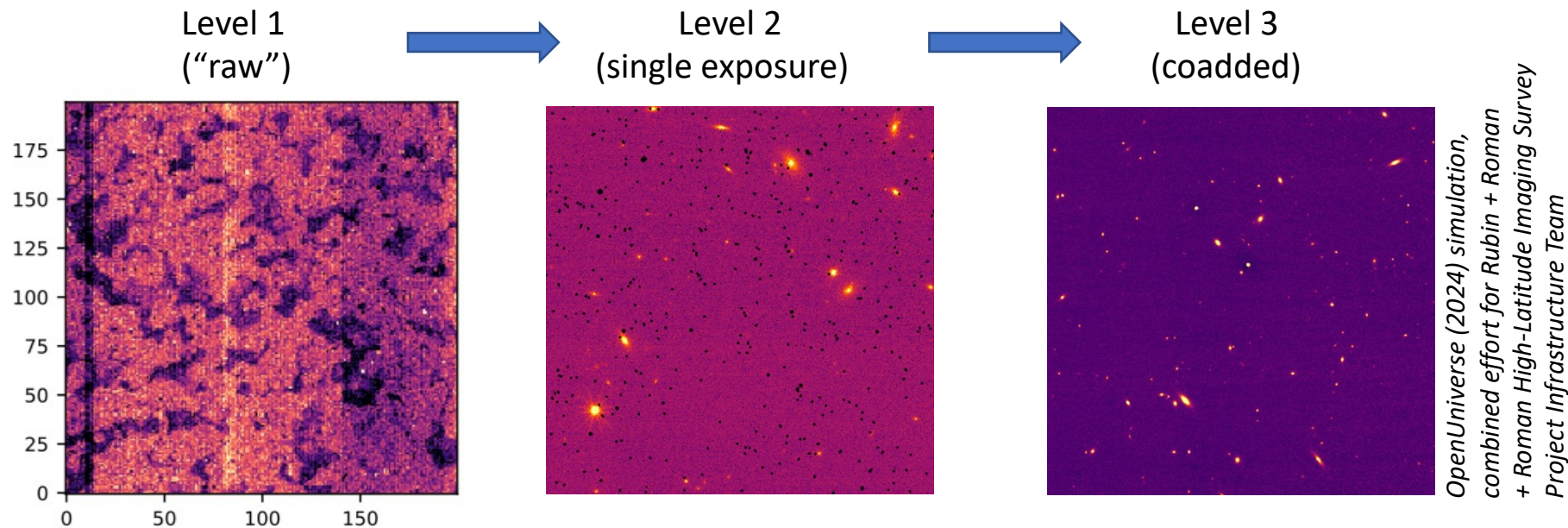
(Choi & Hirata, 2019)



Every one of the 18 detectors in the Roman focal plane was chosen after CCAPP analysis tools were run on the acceptance test data.



We're about to have lots of data ...
but we also need simulation & analysis tools!



Many of the analysis tools were
prototyped at the Ohio Supercomputer
Center.



Ohio Supercomputer Center

The image simulation effort for the
wide-area imaging survey was largely
coordinated by **Michael Troxel**
(CCAPP postdoc, 2016–2019) and his
group at Duke University ...

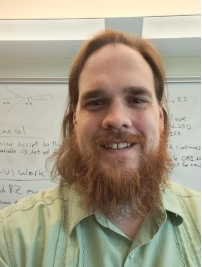


... and so much of the simulation & analysis
software is being built by CCAPP and OSU
students, postdocs, faculty, and alumni ...

... in addition to people on the previous slides!



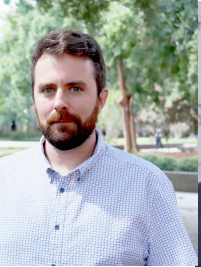
Andres
Salcedo



Ashley
Ross



Tim
Eifler



Matt
Penny



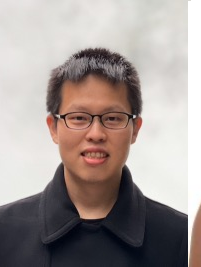
Peter
Melchior



Hee-Jong
Seo



Eric
Huff



Chun-Hao
To



Gisella
De Rosa



Heidi
Wu



Charuhas
Shiveshwarkar



Eduardo
Rozo



Kaili
Cao



Anthony
Harbo Torres



Michael
Gabe



Nihar
Dalal



Marc
Pinsennault



Amber
Malpas



Heyang
Long



Samson
Johnson



Emily
Koivu



Alison
Crisp



Sinclair
Jones



Xavier
Lesley



Arjun
Murlidhar



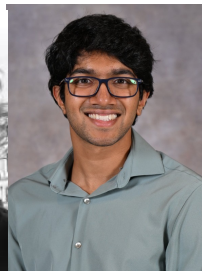
Brandon
Abrego



Xiao
Fang



Jonathan
Blazek



Sai Vidyud
Senthil Nathan



Brynn
Ayers



Chloe
Smith



Amy
Albert



Kara
DiLudovico

Elle
Moore

Ollie
Snow

Zac
Brutko

... the journey continues!

Roman in its shipping container

June 5, 2026 • Photo by Tyler Groff



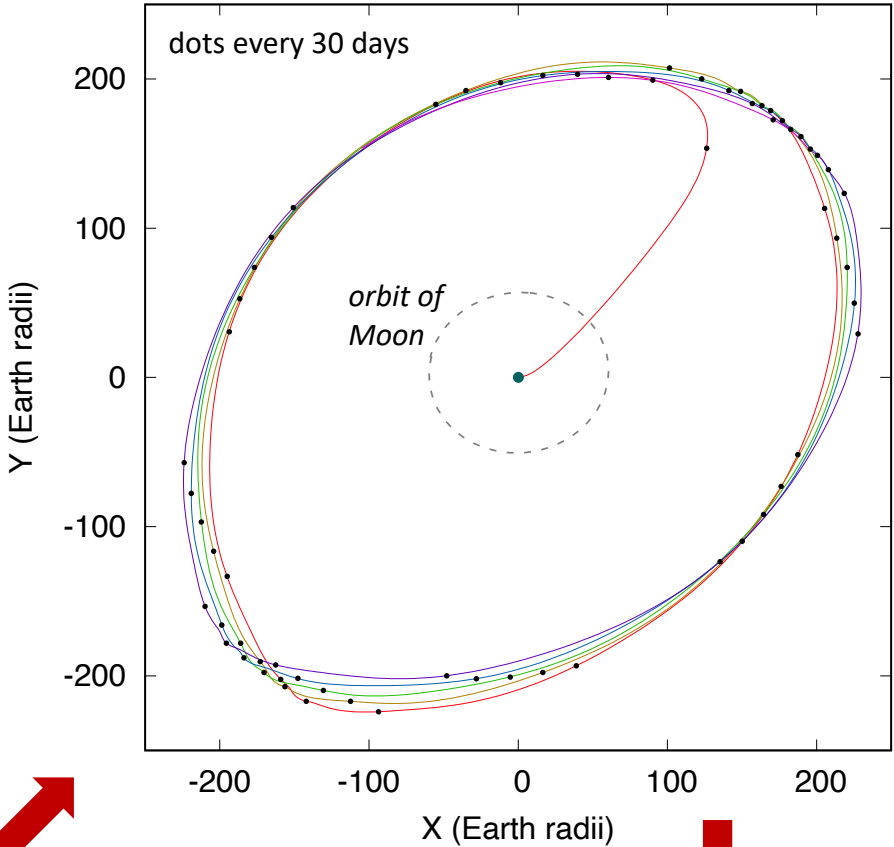
Launch Complex 39 @ Cape Canaveral

NASA / Jamie Peer



Roman orbit @ L2

in Earth-centric, non-rotating frame
(looking down from over the North Pole)



Get ready for 1.3 TB of images per day!

Roman will launch from Pad 39A, at left.