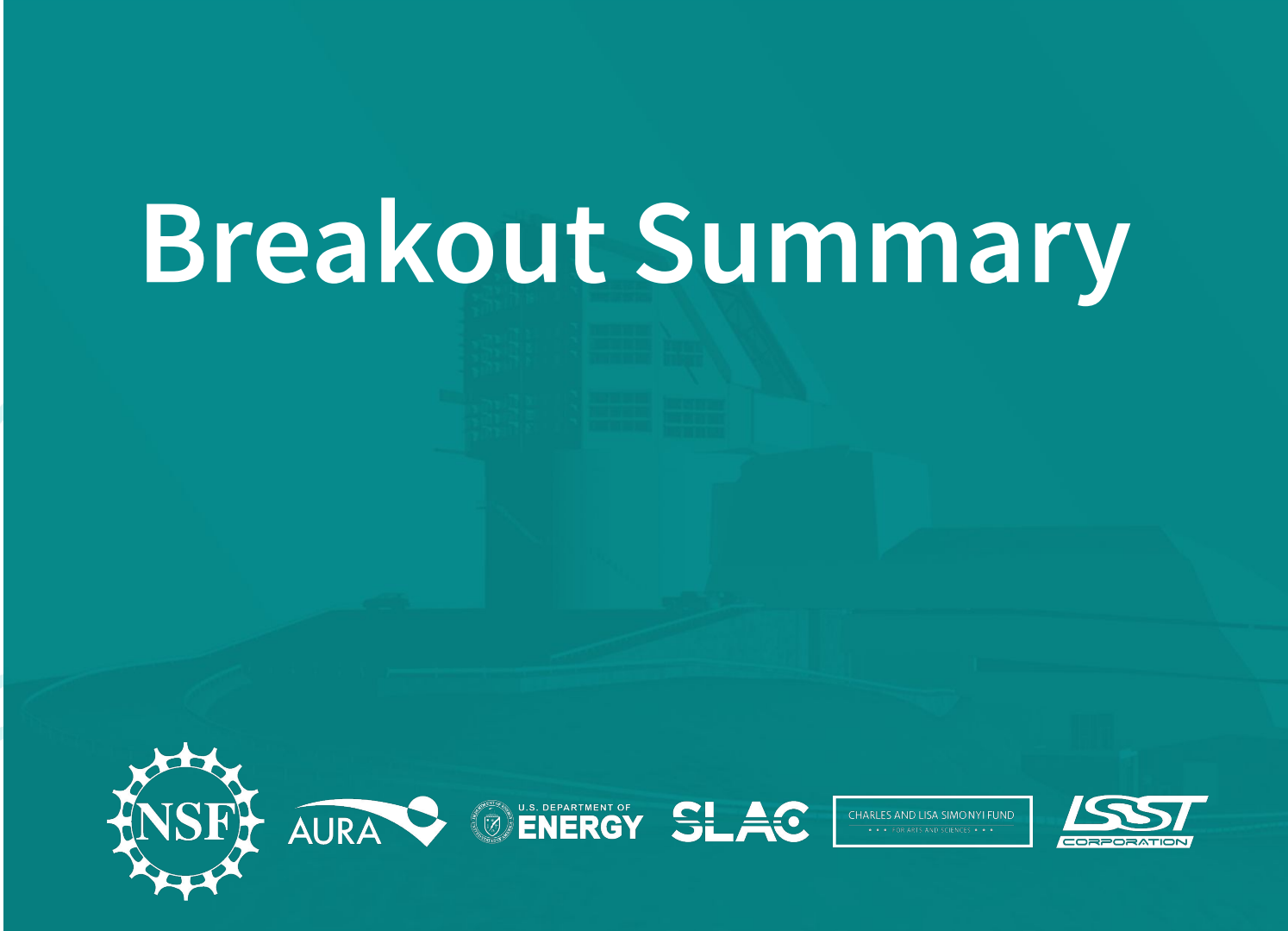
VERA C. RUBIN OBSERVATORY

Breakout Summary



NSF AURA U.S. DEPARTMENT OF ENERGY SLAC CHARLES AND LISA SIMONYI FUND FOR ARTS AND SCIENCES LSST CORPORATION

VERA C. RUBIN OBSERVATORY

Breakout Summaries

Project & Community Workshop

12 August 2022

NSF AURA U.S. DEPARTMENT OF ENERGY SLAC CHARLES AND LISA SIMONYI FUND FOR ARTS AND SCIENCES LSST CORPORATION

Instructions for Speakers

- Find the slide for your breakout session.
- Make sure the title and your name are correct.
- Fill in the slide with a brief summary, e.g.,
  - a plot or two
  - notes on a few key ideas
- Be ready to speak to it during the Friday plenary
  - **11:00am**, Ritz-Carlton Ballroom

MONDAY

Science Advisory Committee (SAC) Meeting – Strauss

Our agenda reflected many of the topics that have come up throughout the PCW:

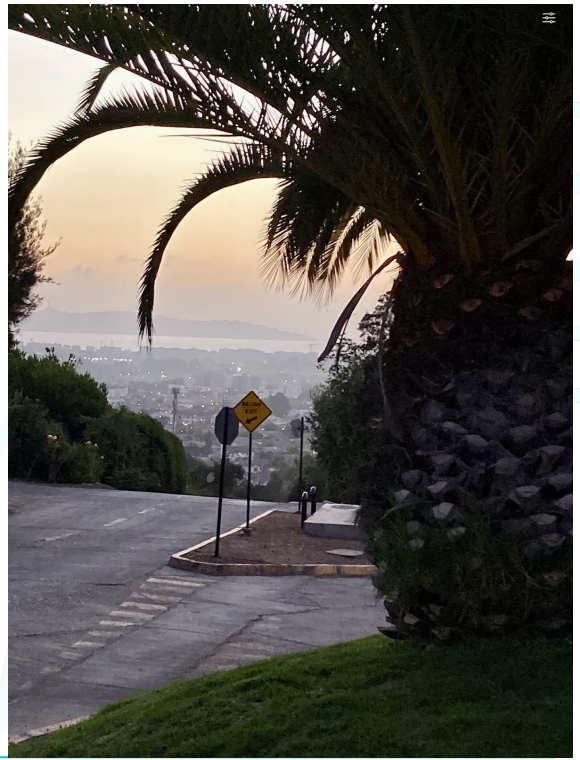
- The status of Rubin communications and plans for the Rubin website
- The work of the Survey Cadence Optimization Committee
- The Community Event Brokers
- The plans for Early Science
- The status of in-kind contributions from international partners
- Community involvement in commissioning plans.

The SAC is preparing a number of responses, questions, and recommendations for Project and Operations leadership.

The SAC will continue into Rubin Operations, and will prepare a charter to reflect its role during operations.

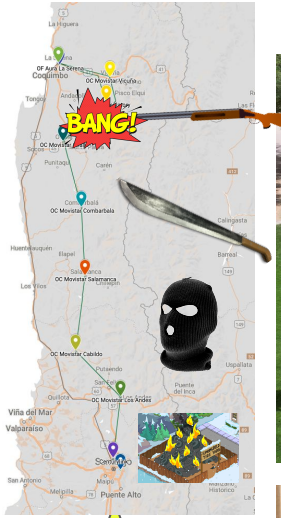
Travel to and within Chile - Reil

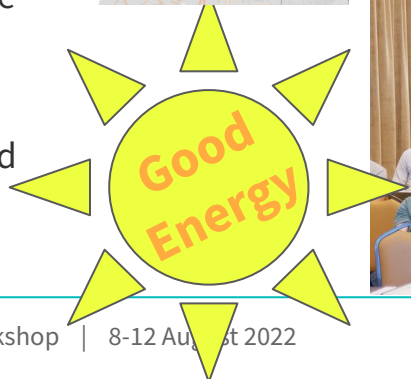
You will love it here! We discussed some tricks and tips for traveling to La Serena and exploring while here



DM Team All Hands Meeting – AlSayyad

- DM/DP/PF highlights
  - Updates from Pipelines, SQuaRE, Architecture, DAX, Chile DevOPs;
  - DP0.2
- Long Haul Network - Cristián Silva
- Butler Gen 3 - Tim Jenness
  - Gen2 is dead long live Gen3
  - At least 3 rounds of applause
- US Data Facility - Richard Dubois
  - NCSA close down Aug 15 and SLAC start up





Intro to Rubin: Systems, Jargon, Acronyms – Graham

Systems! Jargon! Acronyms!

Provided By:

Kristen Metzger	Ranpal Gill
Sandrine Thomas	Stuart Marshall
Lauren Corlies	Federica Bianco
Will Clarkson	Melissa Graham

We covered:

The PCW	Communications
Telescope & Site	Camera
Data Management	Survey Strategy

Education & Public Outreach
LSST Science Collaborations

ls.st/2022-fun-poll
Fun poll results to be posted by lunch!

New to Rubin?

1. The Acronyms & Glossary page is your friend: https://www.lsst.org/scientists/glossary-acronyms
2. Join a Science Collaboration! https://www.lsstcorporation.org/science-collaborations
3. Use the Community Forum to keep in touch: Community.lsst.org
4. Find more info on the “For Scientists” Webpage: lsst.org/scientists
5. View additional Rubin intro-level talks on YouTube: ls.st/cet-playlist

TUESDAY

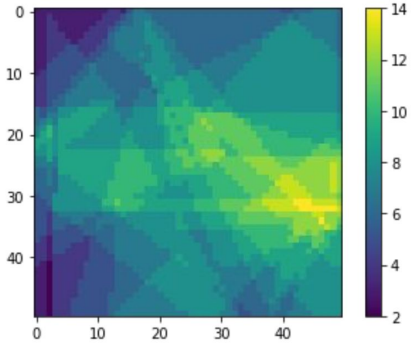
Difference Image Analysis – Bellm/Wood-Vasey

DIA Works! Currently produces good subtractions with reasonably clean catalogs. Ideas on how to do even better.

- Presentations from Project on current status and near-future plans
- community members on results using the LSST Science Pipelines DIA
- Toward a shared vision of the next year of work.
- Synthetic Source Injection is a key part of DIA performance evaluation. New SSI framework+metrics good!

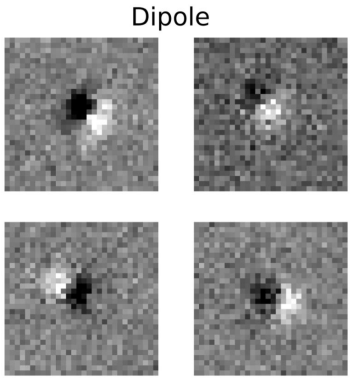
Next Tall Pole: Making templates is hard with the dithered and rotated image. Uneven coverage => uneven PSF

Images in Template Coadd



Activities over the next 6-12 months with joint DIA Community Commissioning Team and Project.

- Template Generation
- Dipole classification and noise whitening
- Bright stars and trails
- DIA characterization with CNN | DIA with CNN
- Learn to use USDF and learn to write METRICS



Equity and Inclusion Workshop – Shugart

Organizational Dimensions	1. Pre-Awareness	2. Diversity Awareness	3. Transition State	4. Intentional Inclusion	5. Cultural Inclusion
	• The general population is unaware bias is an issue for diverse groups. • Homogeneous groups are the norm.	• There is a growing awareness that bias exists and that diverse groups are negatively impacted by it. • Intellectual struggle around what is "fair" and how to "fix" the problem.	Organizational culture change gains progress through special programs, funding and leadership focused on issues of diversity.	Organizational culture change is embraced, most groups accepting and articulating how and why diversity is integral to the Organization's success.	• Organization is achieving a new culture of inclusion. • Valuing diversity is no longer separate but is being naturally woven into decision making, resource allocation and social interactions. Diverse groups are the norm.

Leadership **Organizational Planning** **Resource Allocation** **Accountability**

Needs

There's an App For That: Good UX and how it helps complicated ideas feel approachable – Mason

- ★ Chatted about the what and how of EPO's UI & UX decision-making
- ★ Invited the group to discuss astronomy/science software they use often, what they find valuable, satisfying, and useful about it, and why
- ★ Brainstormed about the future of EPO software development; What kind of software would you like to see EPO develop for the science-interested public?

Science Verification and Validation – Bechtol

We discussed a strategy for how to evaluate the scientific performance of the as-built Rubin Observatory using calibration and on-sky observations from ComCam and LSSTCam during the commissioning period, with a focus on demonstrating Operational Readiness

- Deliverables
- Tooling
- Construction / Data Delivery Milestones
- On-sky Observations during Commissioning
- AuxTel Imaging Survey as Pathfinder
- QA Timescales
- Proposed Organization

This activity will grow rapidly over the next two years; we will bring in expertise from individuals across DM Science Pipelines and V&V, Ops V&V, Systems Engineering, the subsystems, as well as in-kind contributors

Propose organizing effort around a set of “science units” with groups responsible for reporting characterization of the data quality to inform commissioning, Science Pipelines development, and verification efforts

Onboarding for SIT-Com In-Kind Contributions – Bechtol

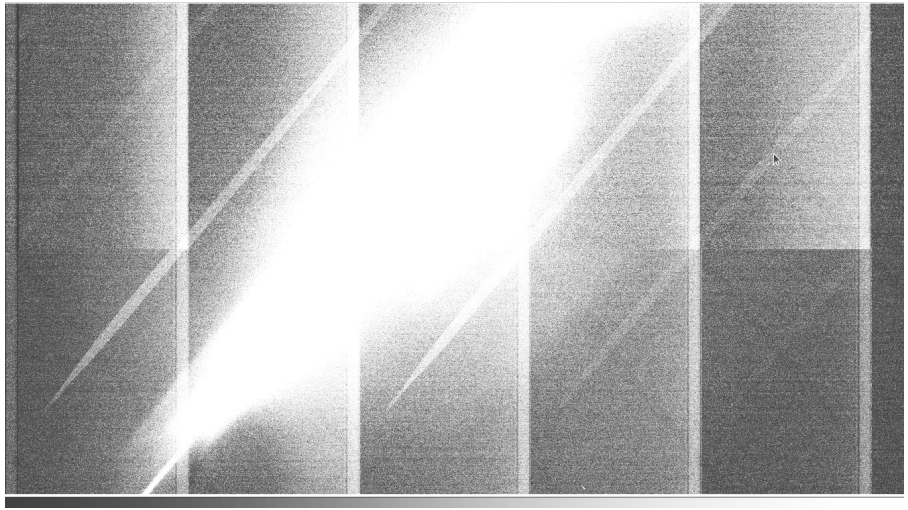
Roughly 30 groups (US/Chile + International) comprising ~100 individuals are making in-kind contributions to SIT-Com.

We are currently in the process of onboarding, creating accounts, and defining concrete initial work assignments

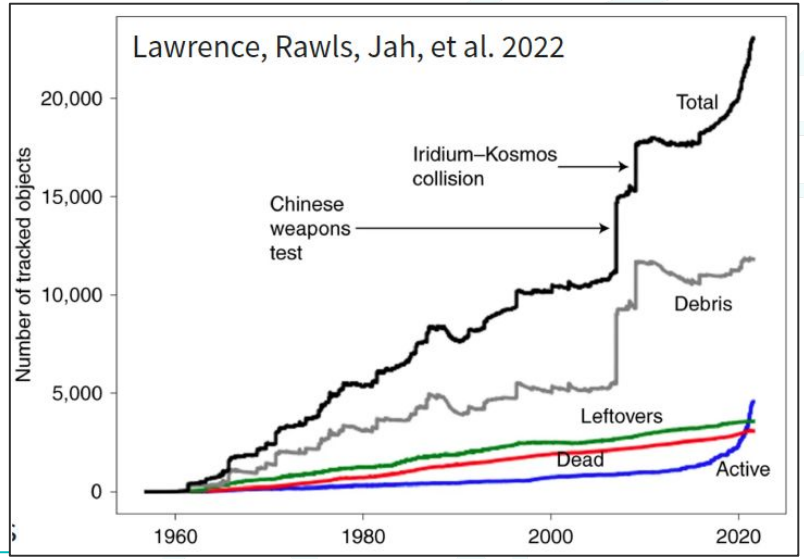
During the session:

- Introductions – several groups meeting in person for the first time!
- Status of accounts and onboarding – look for more updates in the coming weeks.
- Discussion breakouts by area
  - Tutorial notebook on using analysis_tools python package for generating science performance metrics and diagnostic plots

Satellite Constellations – Tyson



- V. bright, time- & flux-variable streaks + glints
- LSSTCam suffers saturation & crosstalk, hard to remove
- Several mitigation efforts underway in astronomy community + *some* LEOSat operators

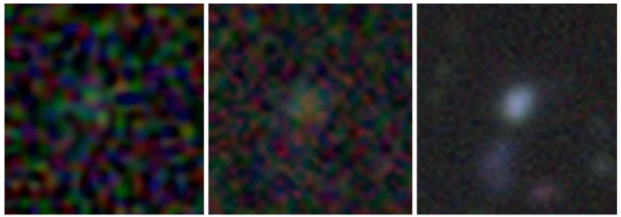


Many operators not engaged

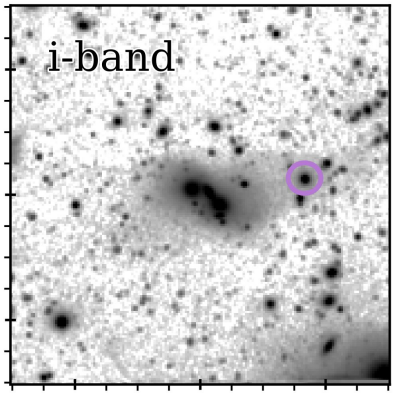
***Major Threat:* 6G SpaceMobile**

LEOsats will saturate LSSTCam

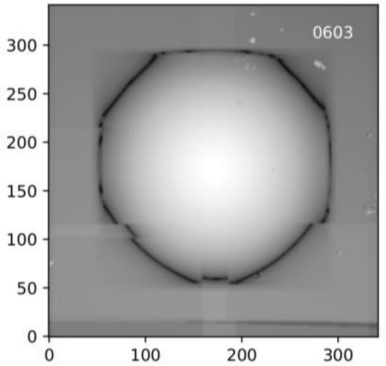
Low-Surface Brightness Science with Rubin: Unlocking LSST's Discovery Domain I & II – Watkins



- *LSST will find, for the first time, statistically robust samples of dwarf galaxies (top-left), tidal streams, intracluster/intragroup light (bottom-left), galaxy truncations, etc.*



- *High-redshift galaxies are also LSB objects! Cross-pollination between lensing and LSB (e.g. ICL as cosmological probe)*
- *Exploitation of this hinges on data-reduction*
  - *LSB flux extremely sensitive to scattered light, sky over-subtraction (right), and other small effects (e.g. amplifier misbehavior)*
- *Novel techniques thus being actively developed to preserve LSB flux in LSST*
  - *Good news is, what works for LSB likely benefits other sciences as well*

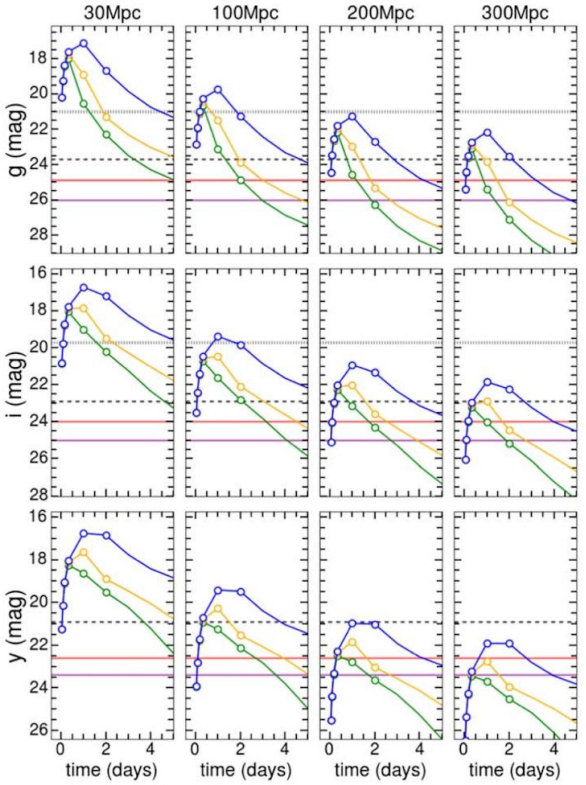


Multi-Messenger Astronomy with Rubin Observatory – Bellm

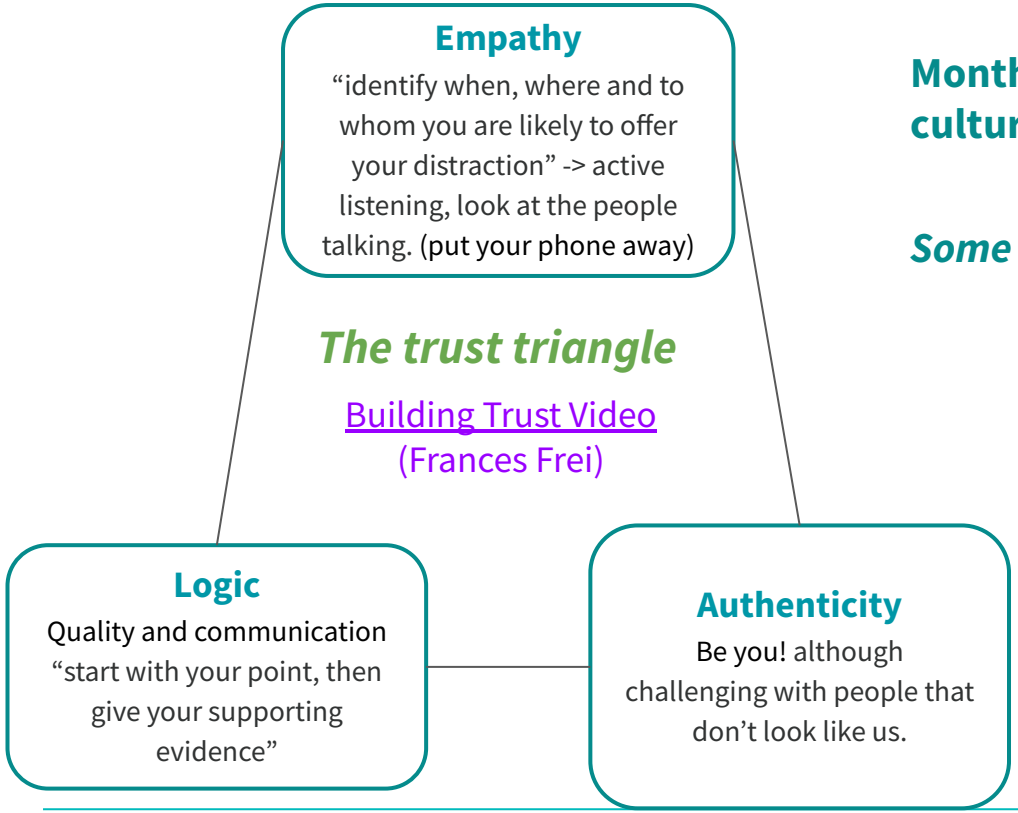
Rich scientific opportunities for Rubin TOO followup of GW sources!

LIGO-Virgo-Kagra O4 run overlaps only slightly with Rubin commissioning. Automated alert production unlikely at this time, but best-effort manual processing could enable some science.

Ongoing technical and simulation work to develop TOO infrastructure and procedures in consultation with the scientific community.



How To Foster Trust In The Workplace – Thomas



Monthly topical Discussion about IDEA or workplace culture topics – join #inclusion for announcements

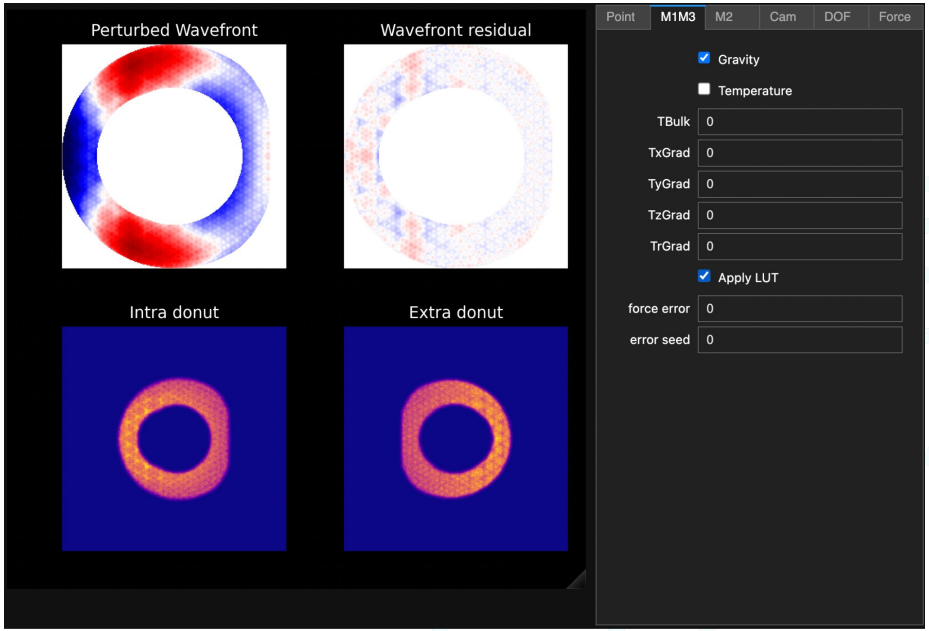
Some comments

- Applicable to everyone in the workplace
- Logic is the easy one to implement but is not enough
- Learning how to communicate takes time and patience, especially when other languages are involved.
- Celebrate differences

https://ls.st/rubinideas

Simulating the Rubin Optical System in ImSim – Walter

- In our session we had an Introduction to both imSim generally and to the batoid optical raytracer.
- We then talked about what tests are being done for the AOS, especially before we have the mirrors installed.
- We noted important physical effects, and wrote down a plan to simulate wavefront sensing in semi-real time during the hardware testing including interfacing imSim with the DAQ to simulate taking exposures.

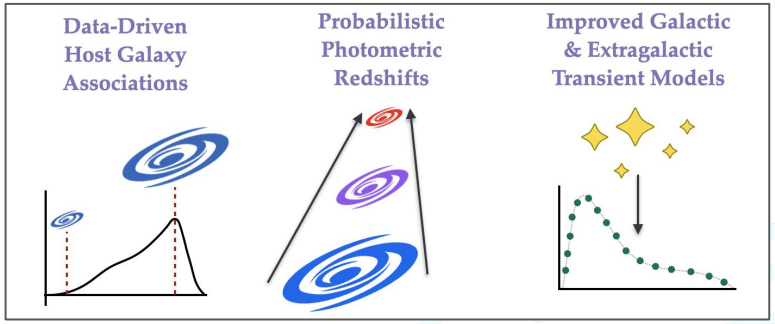


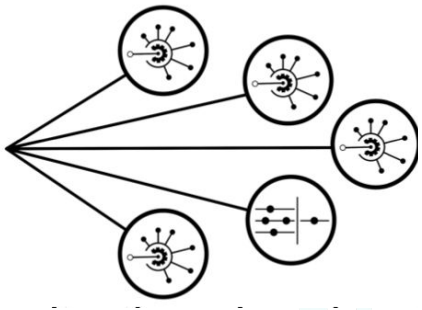
The Extended LSST Astronomical Time Series Classification Challenge (ELAsTiCC) – Gagliano, Malz

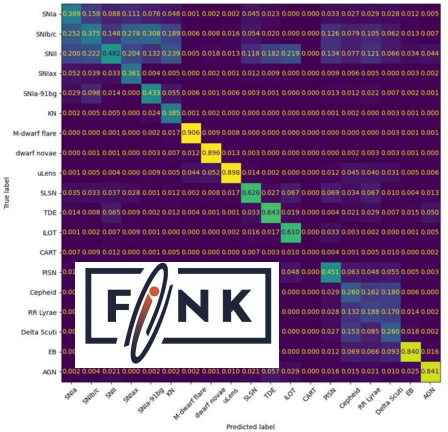
- ELAsTiCC vs. PLAsTiCC simulations:
  - format, goals, and timeline:

Full 100% sample will stream mid-Sep to mid-December, 2022:
4.2 million events and 42 million alerts (~90 GB compressed)

- Rubin AP lingo (there's a lot!)
- Brokers
  - Testing infrastructure and classification for many (science) goals
  - Early performance (Fink) raises interesting metric questions (past classification)
  - **Learning curve steep for users – planning joint science hacks!**
- Simulated LIGO Virgo/KAGRA Skymaps
  - Will allow us to fully validate Broker MMA follow-up pipeline

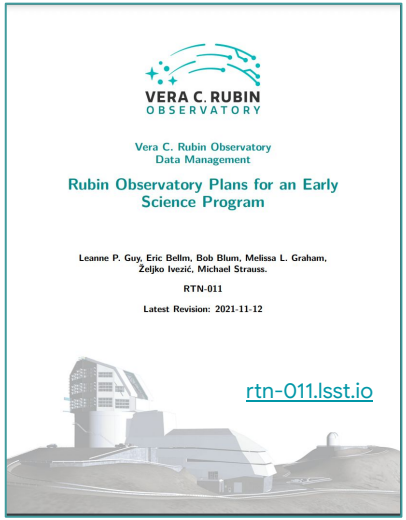






Early Science with Rubin – Guy, Blum, Marshall

Early Science is defined as any science enabled by Rubin for its community through and including the first data release, Data Release 1 (DR1)

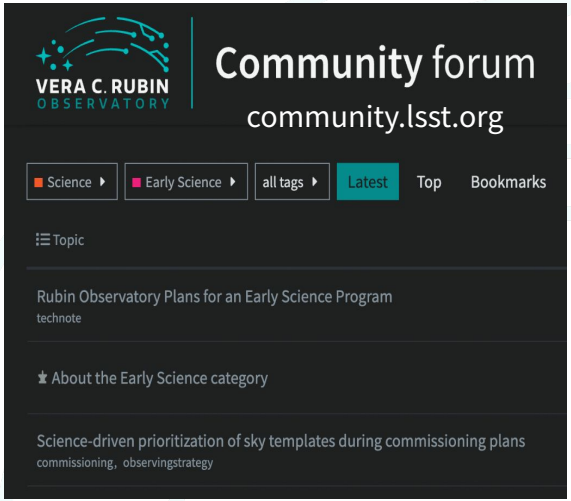


Building a framework to address uncertainty in final project schedule and associated data previews/release (rtn-011).

Content of previews and DR1 depend somewhat on state of readiness at the start of operations. Survey start (WFD) may occur some months after start of operations.

Under all scenarios, a data preview will precede DR1 and nightly image data taken in operations will be made available on RSP.

Work remains with SCOC to define year one strategy to support incremental template generation. We will be communicating on the Forum.

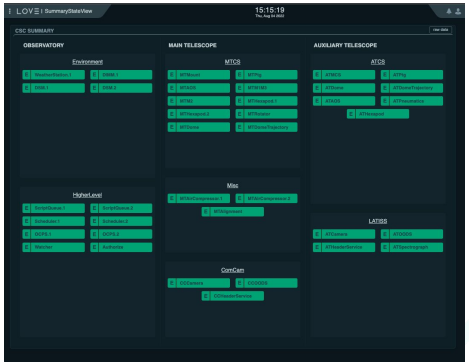


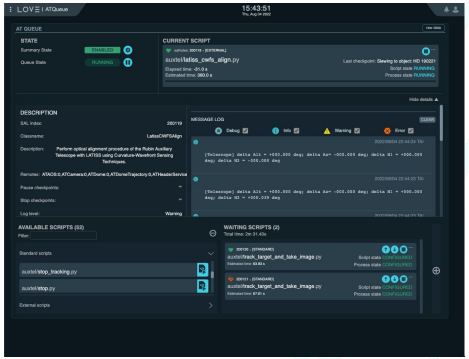
Safety and Environment During Commissioning and Operations – Corvetto

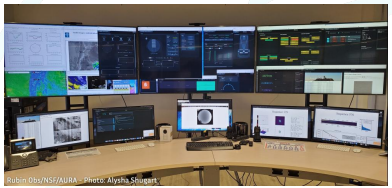
- We continue to enhance our best practices in safety management.
- We are involved and empowered to bring our safety culture into commissioning and operations.

Interacting with the Rubin Observatory Control System: An Overview – Ribeiro

- Lessons learned with AuxTel commissioning that could help us organize activities for the MainTel.
- How we mitigate the complexity of RubinOCS.
- What to expect when interacting with the RubinOCS.
- We spoke about LOVE (💖)… and CSCs, EFD, Logging, Scripts…
- Documentation:
  - https://sitcomtn-019.lsst.io/ - how to propose a test
  - https://obs-controls.lsst.io: General Observatory Control Documentation.
  - https://obs-ops.lsst.io: Observatory Operations Documentation.
  - https://ts-observatory-control.lsst.io: Documentation for the high-level control software package.
  - https://tssw-developer.lsst.io: Telescope and Site Developer guide.



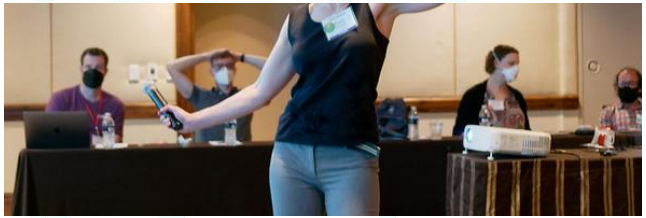




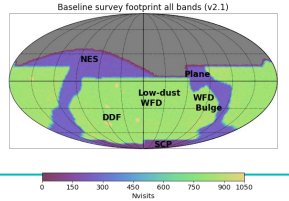
WEDNESDAY

Update from Science Pipelines – AlSayyad

- Live Notes + Session page w/ slides
- Our annual celebration of updates to the pipelines and algorithms… think **scientific release notes**.
- Presentation on how we monitor pipeline quality, new features, incl
  - Prompt processing and alert distribution system demoed at the IDF, Scarlet Lite, PIFF, amp-to-amp matching, analysis_tools and more
- Select topics from the algorithms workshop:
  - Astrometric calibration - Clare Saunders
  - Deblending - Fred Moolekamp
  - Image differencing - Ian Sullivan
  - Real/bogus classification - Nima Sedaghat
  - Solar System Object linking - Ari Heinze
- **Panel discussion** with the Science Pipelines Team



Survey Strategy I – Jones (Olsen)



SCOC to submit recommendation for “Year 1 and a 10 Year Plan” by the end of this year!

- Holding a community workshop November 2-3 (online)

We presented the SCOC current thoughts on the 8 ‘Phase 2’ survey strategy questions:

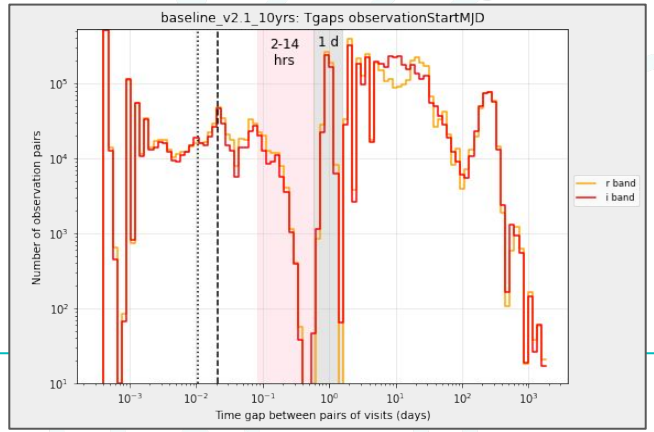
- The footprint and filter balance is pretty good, although Galactic Plane coverage and filters need further work for a better match with community goals
- Rolling cadence should stay, at either 2 or 3 bands and 0.8 or 0.9 strength, and start at year 1
- Modify short-timescale cadence by adding infrequent triplets + pushing ‘extra’ visits into the next night
- Prioritize the twilight NEO microsurvey, increase DDF time, incorporate ToO time
- Not ready to make a DDF strategy choice, but investigating

OpSim & MAF: In-Person Drop-In Discussion – Jones

This was a small informal session where we covered the concerns of the attendees.

- What/how of the scheduler and MAF
- What does someone need to write a new metric? What is a “Metric” anyway?
- Here’s a notebook if you want to skip to it - https://ls.st/metricworkbook
- We have more tutorials and examples at https://github.com/lsst/rubin_sim_notebooks (for MAF and the scheduler and even Rubin photometry) and documentation(ish) at https://rubin-sim.lsst.io

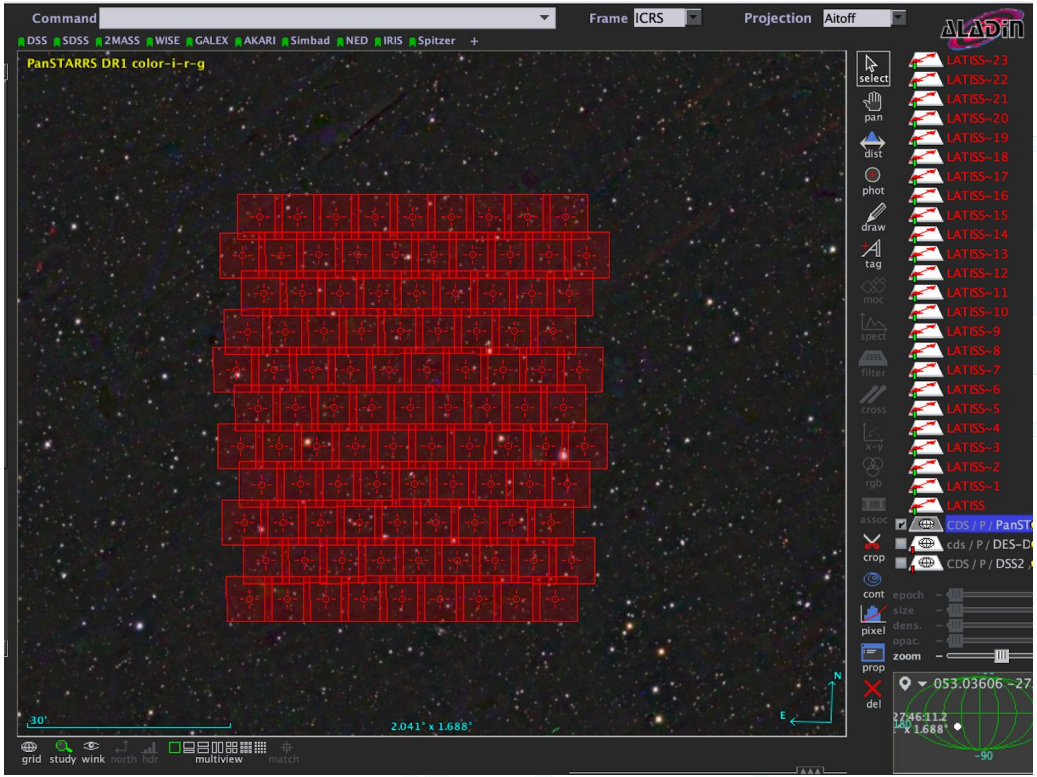
Then we had a nice discussion about how the heck do you measure if a (very lumpy) time series is missing sampling at times you are interested in, if you are really interested in all timescales, and then compare the amount of ‘missing’ between different lumpy time series, and we pondered plots like this:



Introduction to the Auxiliary Telescope (AuxTel), Its Data, and Commissioning – Fisher-Levine

This was an introductory session for the community/people who hadn't heard of the AuxTel.

- We heard about what the AuxTel is, and why it exists.
- We saw the first ever coadd made with real LSST hardware and software!
- We heard about The Scheduler
- And learned about early commissioning/teething problems on the summit



Instrument Signature Removal and Characterization of the LSST Camera – Fisher-Levine

This was a *working session*

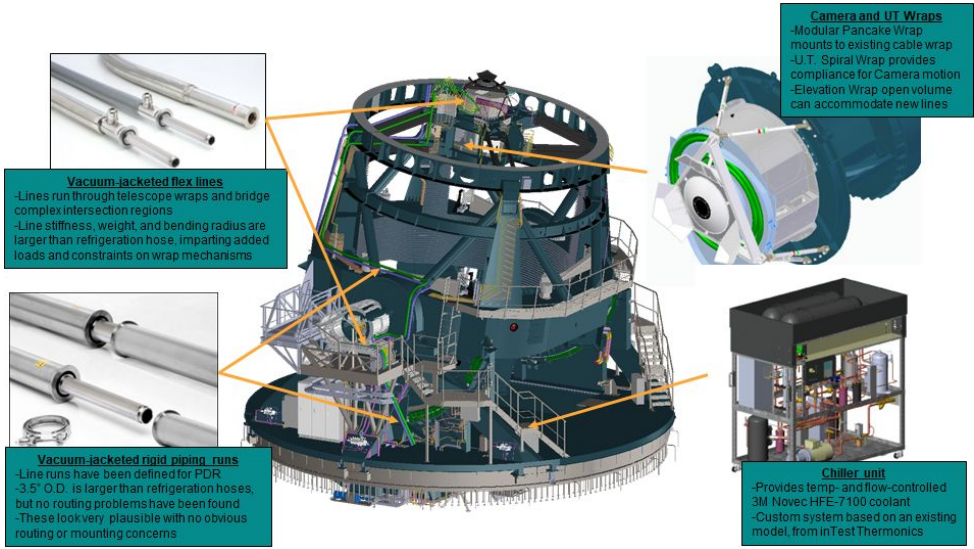
- The camera team, SAWG members and DM all sat together
- We discussed the biggest open concerns about operating the camera and reducing its data.
- We planned how to check that camera team and DM code agrees
- Jira tickets were made!

Camera Pumped Coolant Working Session – Riot

The Agency led Final design review went very well.

The key recommendations will lead to the following:

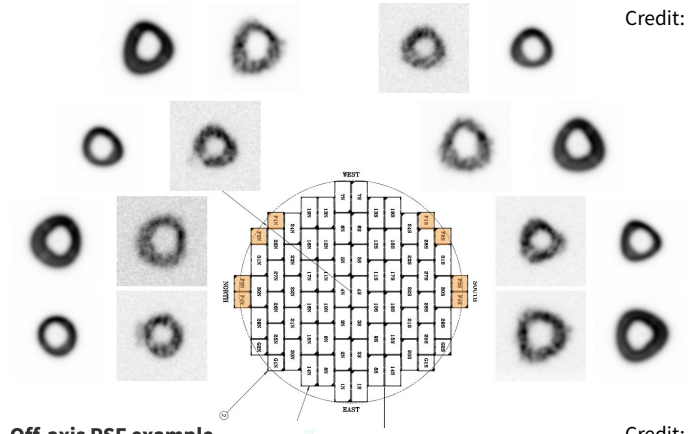
- Update LSE-80 and create a new interface drawing to document the chiller cabinet interface to the TMA
- Structural analysis of the chiller cabinet and TMA trusses will be completed
- We will develop a vacuum line installation storyboard
- We will have an integration readiness review in April 2023
- We will have a spiral wrap early mockup with the real vacuum insulated line



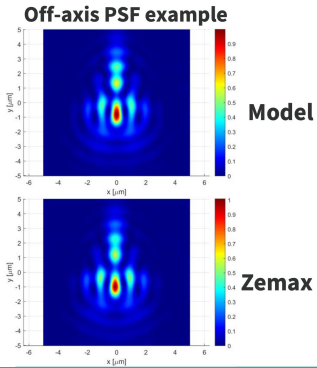
Active Optics Commissioning – ~~Meyers~~ Thomas

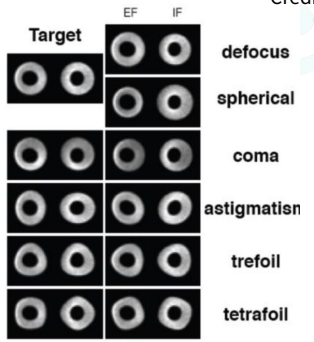
- Lessons learned from Aaron Roodman on DECam and Salvatore Savarese on VST
  - Be data driven!
- Salvatore also presented methods for inferring optical state from in-focus science CCDs.
- Discussion on potential observing programs to commission AOS
  - Sensitivity matrix validation
  - Sky scans for lookup table validation
  - Closed-loop validation
  - Giant donuts!
- Will begin creating jira tickets, confluence pages, and SAL scripts for planned observations in coming weeks.

Credit: Roodman



Credit: Savarese





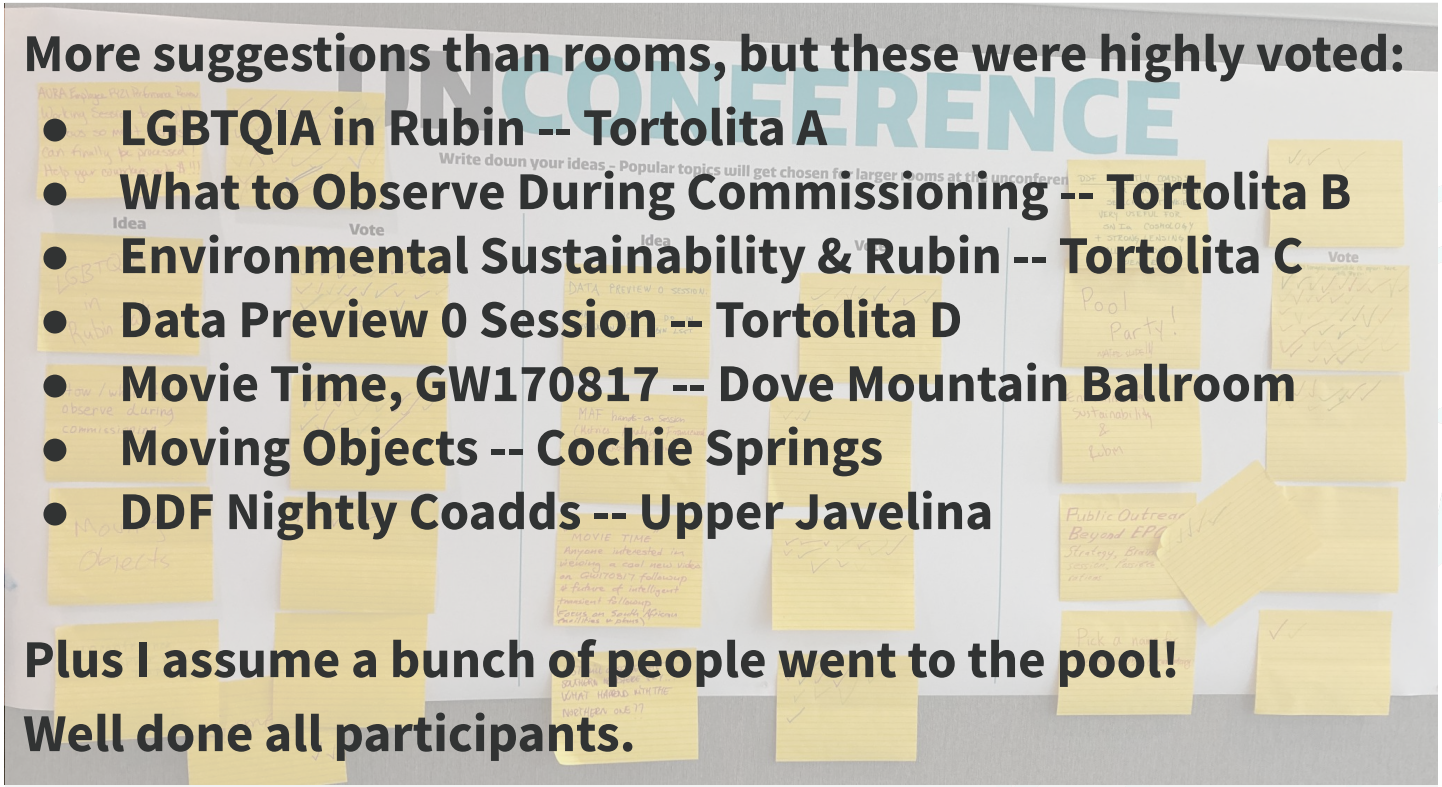
LSST Photometric Redshifts – Graham

- Starting plans for ***photo-z commissioning***
- Will likely observe a field with good spec-z coverage
- Coordinating with DESI to increase coverage over area and redshift
- Heard from extragalactic SCs about their photo-z needs
- Aim to unify per-SC/DM photo-z estimation and validation using RAIL
- Compute and infrastructure synergy with LINCC, LIneA, and DM
- Next step: establish channels to coordinate efforts

Follow-up Facilities for Time-Domain Astronomy – Corsi

- **Summary of presentations**:
  - In-kind program: Overview / NOIRLab facilities / AEON (Norman); South Africa / SALT (Buckley); Taiwan / Trans-Pacific 2-meter Telescope (Ngeow); Italy / VST, LBT, SOXS (Botticella); also possible contribution by Australia / DREAMS (Soon).
  - Follow-up resources: O(N)IR/MSE (Sobeck); Xray/UVO Swift (Kennea); Radio/NRAO (Remijan).
  - Follow-up-enabling software (Lindstrom).
- **Questions / discussion items / key points**:
  - NOIRLab / AEON flexibility in scheduling would encourage submission of follow-up proposals even though start of Rubin survey subject to uncertainty.
  - Community input needed TVS (and other SC) OIR spectroscopic use cases & prioritization (MSE).
  - *Reporting Rubin pointing and upcoming schedule extremely valuable to facilitate follow up.*
  - Swift ready to support Rubin with ToOs, but community coordination needed to cope with potentially overwhelming number of requests.
  - NRAO DDT program currently ~4 proposals per month; plans to establish an interrupt capability for urgent ToOs; strategy for dealing with large number of Rubin alerts/triggers needs work
  - Q: How do we *support* and *effectively coordinate* informative spectroscopic follow-up?

Unconference: Overview – Graham



More suggestions than rooms, but these were highly voted:

- **LGBTQIA in Rubin -- Tortolita A**
- **What to Observe During Commissioning -- Tortolita B**
- **Environmental Sustainability & Rubin -- Tortolita C**
- **Data Preview 0 Session -- Tortolita D**
- **Movie Time, GW170817 -- Dove Mountain Ballroom**
- **Moving Objects -- Cochie Springs**
- **DDF Nightly Coadds -- Upper Javelina**

Plus I assume a bunch of people went to the pool!

Well done all participants.

Unconference – LGBTQIA+ in Rubin

- **Motivation**: The recent initiative to start a LGBTQIA+ counterspace in DESC was very successful and interest for a Rubin-wide equivalent was communicated
  - LGBTQIA+: Lesbian, Gay, Bisexual, Transgender, Queer and/or Questioning, Intersex, Asexual/Aromatic, and all specific queer identities not covered
- **Takeaways**:
  - Lots of stimulating conversation!
  - People now know there is a sizeable LGBTQIA+ supportive community in Rubin!
  - The #lgbtqiaplus_in_rubin LSSTC Slack channel now exists as a **private** space for the LGBTQIA+ community to join.
    - Privacy for comfort discussing sensitive topics and not to out anyone without explicit permission
    - See the APS report on LGBT Climate in Physics for more on the need for counterspaces
  - The **#lgbtqiaplus_and_allies_in_rubin** LSSTC Slack channel is open for all to join and discuss. We look forward to all discussions with the Rubin LGBTQIA+ community and allies!

Unconference – Environmental Sustainability and Rubin

- We recommend that Rubin take a strong public stance on sustainability and the climate crisis.
  - Advocate for sustainability similarly (in strategy and strength) as the astronomy community advocates for dark skies.
  - Work to counteract the “moving to mars/exoplanet” narrative perpetuated by celebrities.
- Incorporate the climate crisis into Rubin’s educational outreach.
  - As astronomers, we are in an excellent position to communicate with the public about this. Our expertise is immediately relevant, and it’s easy for us to catch and hold the attention of a group (everyone loves space!). We should leverage this.
- Reduce conference travel (specifically, air travel).
  - Preference to multiple concurrent conferences such that *everyone* is either a hybrid or virtual attendee.
  - Prioritize in-person conference attendance for scientists at early career stages, people looking to hire or find a job, and essential personnel.
- On an administrative/design/planning level, consider carbon budget as well as $$$ budget. Tie funding to this quantity.
- Further reading: Jahnke et al. 2020, Wynes et al. 2019, Arsenault et al. 2019, Klower et al. 2020, Aujoux et al. 2021, Lannelongue et al. 2021.

Unconference – Data Preview 0

- Some missing sources (e.g., AGN, strong lensing, solar system, and young stellar objects), but good opportunities to:
  - learn how to handle the Rubin Data Products through the Rubin Science Platform (RSP)
  - test the LSST science pipelines
- Even if the science case is different, many analysis tools are in common
- Big community to work and learn together (**DP0 delegates**)
  - DP0 Delegate Assemblies (biweekly on Fridays from 9am to 11am US Pacific - alternating with Stack Club)
- Interested in Time Domain? Join the **TVS DP0 Task Force**!
  - co-chairs: Sara (Rosaria) Bonito, Vincenzo Petrecca
  - slack channel **#tvs-dp0**
  - monthly telecons (last Thursday of the month at 9am US Pacific / 6pm CET)
  - tutorials on both notebook and portal aspects
  - planning science using DP0 data

Unconference – Moving Objects

- Discussed finding Kuiper Belt Objects with LSST
  - To get good orbits need to recover them over longer timescales (~years)
  - DM will find them by linking sources found in pairs of visits over different nights
  - Digital tracking methods will also be useful for finding even fainter objects
    - Also known as “shift-and-stack” these methods use stacks of images shifted along possible trajectories to find sources below the single visit detection threshold.
- Also discussed NEO follow-up
  - LSST will find many times more NEOs for follow-up than current era. How do we handle that?

Unconference – DDF (Gautham Narayan)

Discussed building DDF nightly-coadds for faint transient discovery

Rationale: N_visits/filter/night in DDF = 8 x *u*, 10 x *g*, 20 x *r*, 20 x *i*, 26 x *z*, 20 x *y* (baseline 2.1 - thanks Lynne!) each 30s. **Lots of images each night -> co-adds give depth/volume**

Why?: DESC Time Domain finds **20% gain in DE EoS Figure of Merit** (Mitra, Kessler et al., in prep). Also useful for **lensed SNe + rare/fast/faint/serendipitous time-domain discovery**

How?: DPDD considers nightly-coadds (pg. 57, bullet iii) for special programs but **not currently a project requirement**. **DESC will prototype pipetask and submit to DM.**

Gotchas?: Wouldn't be prompt processing but **hours latency is fine for DDF co-adds**. AP can treat DDF co-add alerts and detections consistently with flag to indicate from co-add. **Need to examine if better to have images back-to-back or spread.**

Unconference - Commissioning Observations

Discussed plans for data-taking during phases of commissioning for both ComCam and LSSTCam, going into more detail on the purpose/motivation of observations and potential science validation studies across the LSST science drivers

- First priority for Rubin Obs construction team is to acquire the necessary data to deliver a functional observatory verified to meet specifications and hand over to Operations
- Where flexibility exists, we aim to take observations that would enable science validation studies across the LSST Science Drivers

Reviewed “Commissioning Notes” submitted by SSSC, TVS + SMWLV, Galaxies, SLSC, and DESC in 2020 with suggestions for the on-sky observing strategy during commissioning

- Many well motivated concepts for scientific and technical investigations that could be done using commissioning data; summary presented in Parallel Session at PCW 2021
- Rubin Observatory is using these inputs to help design the on-sky observing strategy during commissioning to select a menu candidate fields

Unconference – Movie Time

Viewing & discussion of video "*New Discoveries Through Intelligent Observations at the South African Astronomical Observatory*"

- The story of South Africa's efforts to observe the GW170817 kilonova and one of the first spectroscopic observations done by SALT
- Gravitational Wave astronomy
- Covering the importance of automated transient follow-up using Machine Learning & AI
- The future of transient follow-up networks in the era of Big Data projects like Rubin LSST and SKA
- Synergies in other sciences, like early epidemiology research of COVID-19

See:
https://www.saao.ac.za/wp-content/uploads/2022/06/saao_final_2.mp4


NEW DISCOVERIES THROUGH
INTELLIGENT OBSERVATIONS
at the South African Astronomical Observatory

THURSDAY

From Data to Software to Science – Connolly

Discussion on developing software for science with Rubin as part of LINCC Frameworks

- A lot of common software needs that cross different science cases (see arxiv:2208.02781)
- Heard about RSP tools to access time series data and a set of measured predefined features
- Identified areas that still need development (e.g. batch processing of light curves and possible approaches). LINCC software engineers are available to help with this
- TAKEAWAYS: (1) We should create a venue where DM, LINCC and SCs can discuss software they are working on (2) training in software development is something SC are looking for where LINCC could contribute

	Cross-matching	Photo-z	Selection functions	Time series	Image reprocessing	Image analysis
Cosmology	✓✓	✓✓	✓✓	✓✓	✓	✓
Extragalactic static	✓✓	✓✓	✓✓		✓✓	✓
Extragalactic transient	✓✓	✓✓	✓	✓✓	✓	✓
Extragalactic variable	✓✓	✓	✓	✓✓	✓	✓
Local Universe transient & variable	✓✓		✓	✓✓		
Local Universe static	✓✓		✓✓		✓	✓
Solar system	✓		✓✓	✓✓	✓	✓✓

Table 1. Table highlighting the connection between scientific and technical areas discussed at the workshop. Rows are science areas while columns are for infrastructure capabilities. A double checkmark (✓✓) signifies that some infrastructure capability is essential to enable a particular scientific area, while a single checkmark (✓) signifies that the infrastructure capability would enhance or expand scientific discovery within that area but is not necessary to enable all of it.

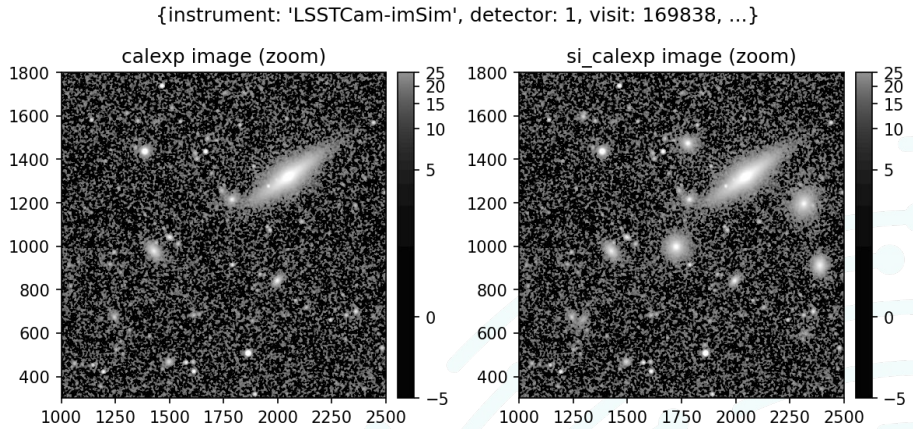
Source Injection in the Rubin Pipelines – Reed

Missing your favourite celestial objects in DP0? Use our framework to add them yourselves!

New modular SSI pipeline will be available soon to add sources to your favourite data.

We'll be regularly running this to generate plots and metrics automatically

We promise to think about the variance planes



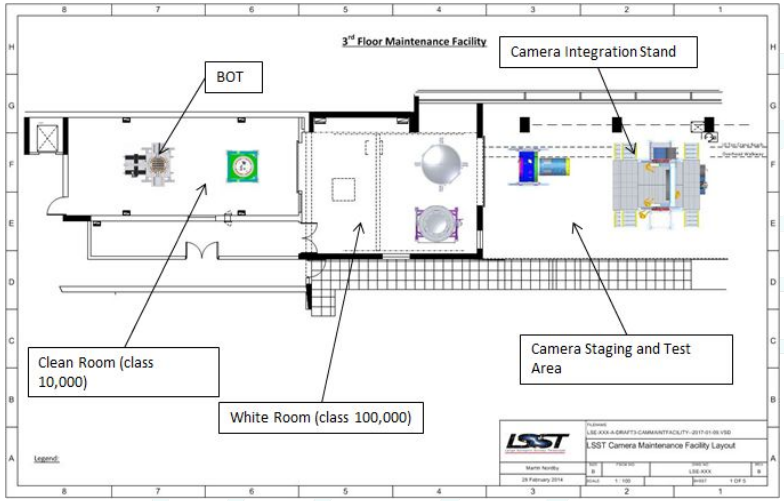
Thanks everyone for coming! Reach out to us on slack: dm-source-injection on lsstc slack

[Discussion and Requests] [Recording and Slides] [Slides with Demo Links]

Camera Re-Assembly on the Summit – Riot

Several key items have been identified needing attention:

- Need for rails to move the saddle stand in and out of the white room
- Storyboarding needs to be updated in the next several months
- Investigating weather L1-L2 gets re-installed in the white rom or on the integration stand
- Investigating having a clean tent available to cover the integration stand
- Investigating ways to address the schedule conflict between the M1M3 mirror work and the camera reverification (3 month potential project delay):
  - Swap M1M3 work (to occur early) with M2 work
  - Try to get the camera early in the white room and delay installation of the integration stand
  - De-scope some camera re-verification



Camera Removal From The Telescope During Operations – Riot

We have found that camera removal and re-installation, NOT Including the servicing activities (either M2 removal for coating or camera special maintenance) requires **44 business days** from start to ready to operate again

Step #	Description	Location	Estimator	Duration (days)
1	Lock up and tag out the TMA horizon pointing. Daily safety check for each step forward.	TMA		0.1
2	Warming up the camera - cold and cryo semi sequentially (still under vacuum) - 24hrs Prep and deploy platform at the same time while warming up - 24 hrs Add the L1 cover while warming up - 8hrs	TMA at horizon		1
3	Vent and purge with N2 the Cryostat, Hex Ca	TMA at horizon		0.25
4	Remove the Calibration screen reflector (need a place to put it)	TMA at horizon		0.5
5	Preparation for refrigeration Cryo disconnection - up to 3 days if full recovery can we leave the liquid refrigerant in or need to recover? Is recovery before or after disconneting	TMA at horizon		3
6	Preparation for pumped coolant disconnection - 1 day or less for the pumped coolant	TMA at horizon		1
7	Disconnect all camera utilities, power and fibers	TMA at horizon	Reil	2
8	Disconnect all Integrator utilities	TMA at horizon	Andrew	1
9	Preparation for the lift - Install scaffolding in front and back (2 days) - Add guide rails and rollers (0.5 days) - needs the scaffolding for part of it - Bring the lift fixture from 5 to 8 (1 day) in parallel with scaffolding - Bring Cart from 3 to 8 (1 day), sequential with lift fixture but in parallel with scaffolding	TMA at horizon	Barr	3
10	Extract camera integrating structure and load on cart	Level 8		1
11	Move lifting fixture back to level 5	Level 5		1
12	Bring camera integrating structure to level 3	Level 3		1
13	Service Time - includes camera disconnected and ready on the cart at level 3 - assumes the TMA remains locked During servicing, the cryo lines should be kept dry using dry N2. (How to get the N2 is not clear)			
14	Move lifting fixture from level 5 to 8	Level 8		1
15	Bring camera integrating structure from level 3 to 8	Level 8		1
16	Insert camera integrating structure on TMA	Level 8		1
17	Connect all Integrator utilities and re-start and check for leaks and functional check	TMA at horizon	Andrew	2
18	Connect all camera utilities, power and fibers (clean fibers) and bring the pump cart to the extended platform	TMA at horizon	Reil	2
19	Camera turn on an testing of camera functionality (dynalene was checked at time of integrator) - Phase 1: Protection, dynalene, power distribution, Environmental core control (purge) - 2 days - Start Pumping down while Path 2 occurs (1 day) - Phase 2: Funtional testing of sub-systems except CCDs (Carousel, shutter, auto-changer) - 1 day	TMA at horizon	Marshall	3
20	Connect Pumped coolant lines and N2 purge and pressure test and fill at room temperature	TMA at horizon	Nordby	1
21	Turn pumped coolant on and cool down the cold plate In parallel connect the cryo lines.	TMA at horizon	Marshall	1
22	Dry down the cryo lines (need additional system to help parallel processing) to ensure the dew point temperature is correct. Review durations with Boyd. Conduct REB aliveness test in parallel	TMA at horizon		3
23	Charge the cryo systems (2 circuits per day) - Check duration with Boyd	TMA at horizon		3
24	Cool down Cryo plate - Pre-Conductioning (35C step) - 0.5 day - Conditioning (40C) sequence and actual cool down - 2 days	TMA at horizon	Utsumi	3
25	Turn on the CCDs	TMA at horizon	Utsumi	1
26	Remount calibration screen projector and check initial alignment	TMA at horizon		1
27	Remove scaffolding	TMA at horizon	Reil	1
28	Remove L1 cover (0.5) and return TMA to operational state (includes retracting the platform, pump cart, etc.)	TMA at horizon		2
29	Run deluxe daily calibration	TMA at horizon	Roodman	3
	TOTAL			**44**

Camera Verification and Re-Verification Activities – Riot

Camera remaining verification at SLAC

- Optical Alignment of L1+L2 and Filter
- Functional Testing of Purge system, Shutter & Filter Exchange
- Modal & Thermal Testing
- Electro-Optical Testing
- repeat basic EO image collection with Full Camera & Pumped Coolant
- Throughput testing with CCOB narrow-beam projector
- Reflections test with CCOB narrow-beam to check Optical Alignment
- Pin Hole Filter for Persistence & Xtalk
- see Wed morning meeting page

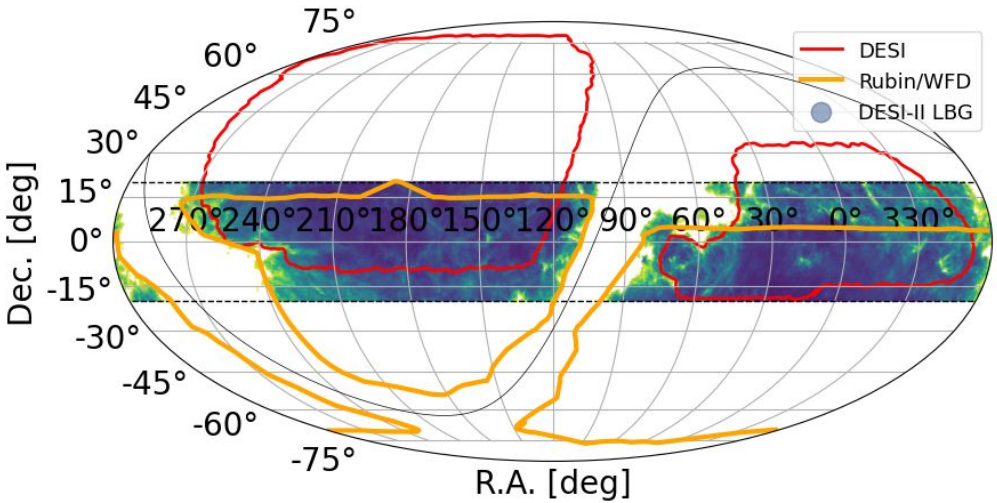
Camera reverification on the summit

- both CCOB flat illuminator & CCOB narrow beam available
- run DM ISR, cpPipe & eoTask_Gen3
- CCOB Wide Beam:
  - repeat B-Run, Gain Stability, Dense PTC to reestablish basic EO performance
  - repeat or augment Flat Pairs, Open Shutter Flats, Pin Hole Filter images if necessary
- CCOB Narrow Beam:
  - repeat or augment Throughput measurements from I&T if necessary
  - repeat Reflection test if necessary to reestablish Optical Alignment
- CCOB flat illuminator & CCOB narrow beam provide a flexible set of EO capabilities to allow additional testing if needed & if time permits

The Dark Energy Spectroscopic Instrument (DESI): LSST Synergies – Guy, J.

- DESI - DESI-II will be in operation during LSST survey.
- Today: >14 million extra-galactic redshifts, >4 million stars
- We need to maximize the footprint overlap to maximize the science return of both projects. Example: **10,000 deg2 in Dec range [-20,+20]**

- Beneficial for multiple science cases
- Dark Energy: (BAO, galaxy-galaxy lensing, photo-z, intrinsic alignments, SNe Ia)
- Dark Matter: (strong lenses, radial velocities of stars in Milky Way, local dwarf galaxies, stellar streams)
- Variable stars / transients
- Optical counterpart of Gravitational Wave events



Exploring the Solar System with Rubin EPO I & II – Herrold

This two part workshop introduced the first to be publicly released classroom investigation. Local area teachers were invited in addition to PCW participants.

Part 1

An overview of the formal ed program and all the instructional materials associated with an investigation, including features on the new Rubin website.

Educators were invited to join the community of practice.

Part 2

Participants worked through the Solar System investigation.
Discussion focused on assessments and classroom implementation.

Summary

Helpful feedback and high customer satisfaction.

Connecting the Community to IDAC and SPC Resources – Olsen

The transformative LSST dataset will be accompanied by unprecedented access to computing resources

- We have ~12 Independent Data Access Centers (IDACs) and a Scientific Processing Center through the international In-Kind program
- IDACs and SPCs expand the computational, software, data, and human resources available to the Rubin community
- But they are generally not simply alternate access portals to Rubin data
- Pairing IDACs and SPCs with community-developed use cases is a critical step
- LINCC Frameworks workshop “From Data to Software to Science with LSST” provides good starting point, looking to develop more specific to IDACs
- Several IDACs developing use cases and making other development plans
- Need to continue discussion with community and with Rubin, and learn from other projects – virtual workshop coming (thanks to LINCC Kickstarter program)

Bootstrapping Photometric Calibration – Rykoff

- Productive discussion on how to be ready on Day 1 of commissioning through Year 1 to get rapid (approximate) photometric calibrations
- The u-band is particularly challenging
  - Synthesized u-band from Gaia DR3 only at bright end
  - 4500 deg^2 from VHS ATLAS catalog.
  - Synthesize as best we can from g-r otherwise
- Create Frankenstein's Monster reference catalog over southern sky in synthesized LSST passbands (can be improved over time).
- Effort (incl. in-kind) to be directed from new Photometric Calibration Commissioning Unit (see Bechtol slides)

Rubin-related Initiatives Toward Diversity, Equity, and Inclusion – Bianco

Slide by Fed Bianco - Speaker: Will Clarkson

So many groups are working to improve Diversity Equity and Inclusion in Rubin!

We heard from 11 groups (a *non-exhaustive* list the Rubin DEI groups!) on their focus, long and short term goals, and what their sphere of influence is.

Get to know each other to hopefully grow better by working together

Alysha Shugart - NOIRLab DEI Officer/Rubin Operations Diversity Advocate
Sandrine Thomas - Kindness program & workplace advocate program
Sara Bonito (online) - TVS JEDI (Justice, Equity, Diversity, and Inclusion group)
Yuanyuan Zhang - DESC EDI
Will Clarkson - DEI Council of the Science Collaborations
Andres Plazas (online) - 2021 Facilitated Antiracism Workshop
Sierra Villarreal - LGBTQIA+ In Rubin unconference
Ranpal Gill - Monthly inclusion meetings
Rachel Street - HSF grant "Leveling the Playing Field"
Jeno Sokoloski - LINCC / Catalyst DEI Initiatives
Dara Norman - Rubin Observatory Research Inclusion Group

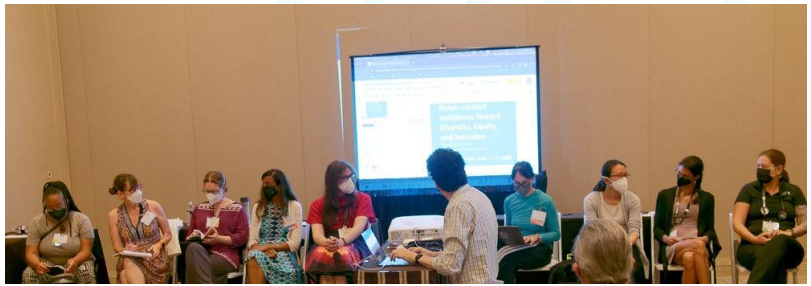


Photo credit: Will O'Mullane

Rubin In-Kind Program Community Session – Verma

- Wide ranging resources and facilities are being made available to the Rubin Operations and Science Community
- Including availability of open telescope time on 1-10m class facilities, managed through NOIRLab Time Allocation System
- Data rights agreements are progressing
- Contributions have started and moving forward, with the annual evaluation coming up in Q1 FY23

Questions, comments?

Email the help desk: JIKH@lsst.org

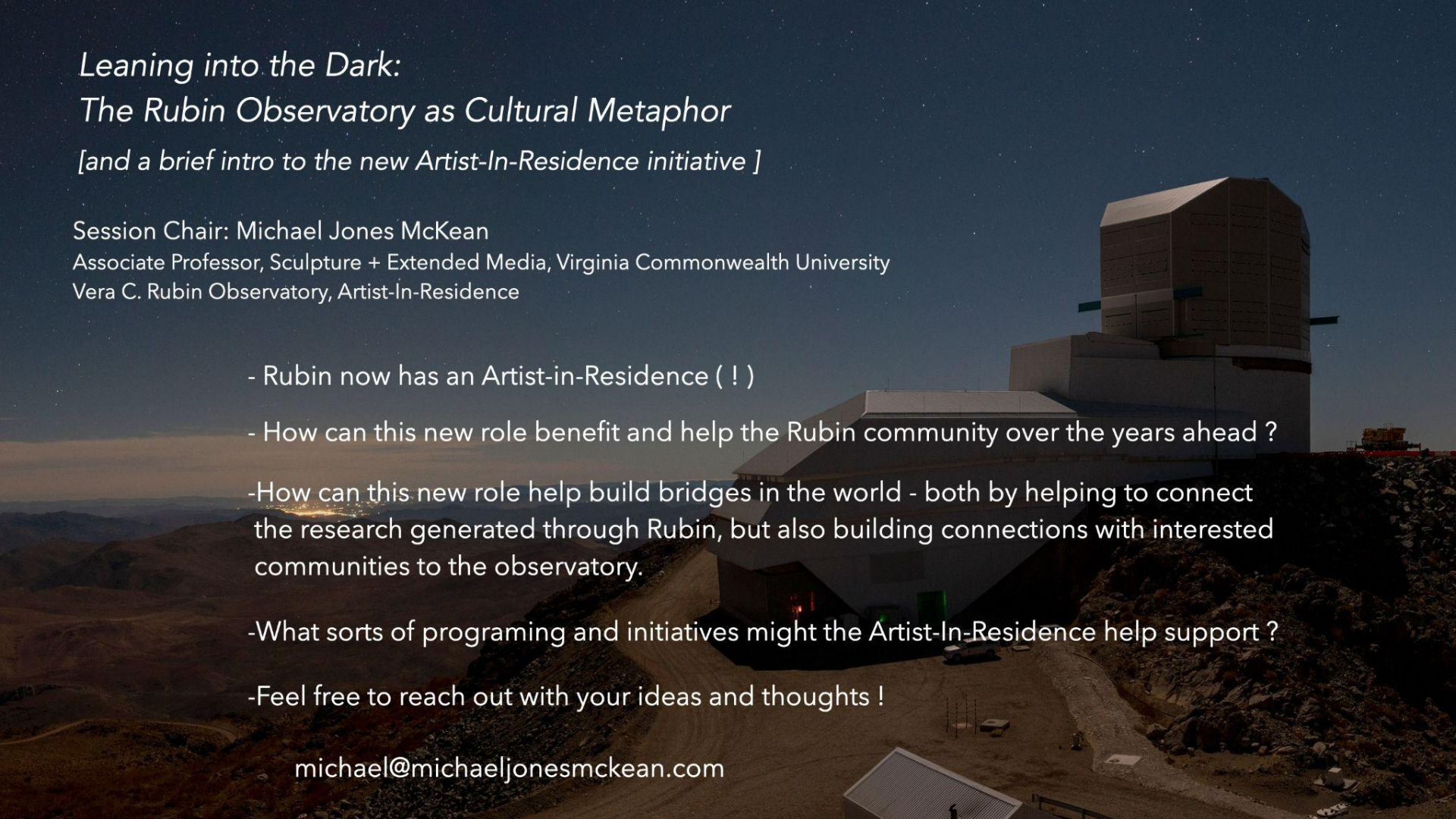
Read the in-kind FAQs, Book an office hour slot

Deblending: Plans and Challenges – Buchanan

- Blending will affect a large fraction of objects we see, and can substantially degrade our science
  - Effect of Unrecognized Blends on Cosmic Shear Inference: Nourbaksh et al 2022
- The community has stepped up to build better tools for deblending, making deblended measurements, and precisely studying the effects of blending
  - Scarlet Lite now in DM Science Pipelines
    - Highly optimized version of Scarlet for LSST
  - MultiProFit development well underway
    - Multi-band parametric galaxy fitting, to replace CModel/meas_modelfit
  - BlendingToolKit v1.0 released, lots of projects in progress
    - Tools for simulating blends and studying deblenders

Reach out to the Blending Working Group in DESC!

LSSTC Slack: #desc-blending



Leaning into the Dark:
The Rubin Observatory as Cultural Metaphor

[and a brief intro to the new Artist-In-Residence initiative]

Session Chair: Michael Jones McKean
Associate Professor, Sculpture + Extended Media, Virginia Commonwealth University
Vera C. Rubin Observatory, Artist-In-Residence

- Rubin now has an Artist-in-Residence (!)

- How can this new role benefit and help the Rubin community over the years ahead ?

-How can this new role help build bridges in the world - both by helping to connect the research generated through Rubin, but also building connections with interested communities to the observatory.

-What sorts of programing and initiatives might the Artist-In-Residence help support ?

-Feel free to reach out with your ideas and thoughts !

michael@michaeljonesmckean.com

All About NOIRLab Communications, Education and Engagement – Kocz (not present)

- CEE is the NOIRLab Communications, Education and Engagement group
- We cover internal and external communication, education and engagement activities, and web and graphics services
- CEE and Rubin EPO will unify from April 2024
  - Aim to enable as much synergy and cooperation as possible
  - Safeguard the delivery of the Rubin education and communication products
  - Make the Rubin and CEE staff as happy as possible.

Rubin Observatory/NSF/AURA/B. Quint

@NOIRLabAstro

noirlab.edu

FRIDAY

Users Committee Meeting – Holman

The Rubin Users Committee is charged with soliciting feedback from the science community (LSST "users") about the LSST data products and Rubin Science Platform, and recommending improvements in their twice-yearly reports that are delivered to the Rubin Operations director.

Website: lsst.org/scientists/users-committee

Contact: via the Rubin Community Forum (Community.lsst.org; direct message to individuals or to the @Users-Committee group) or via email to RubinObs-Users-Committee@lists.lsst.org

The Rubin Users Committee looks forward to hearing from the Rubin science community.

Igor Andreoni*	Dominique Boutigny*	Alejandra Muñoz Arancibia*	Alessandra Corsi
Qingling Ni	Markus Rabus	Francisco Javier Sanchez Lopez	Matthew Holman*
V. Ashley Villar	Anja von der Linden	Matthew P. Wiesner*	Michael Wood-Vasey*

**Are at the PCW in-person; the rest are attending remotely.*

Many thanks to Melissa Graham and the rest of the CET! Thank you to the users who have given feedback!

Computerized Maintenance Management System (CMMS) Workshop – Jeff Barr/Holger Drass

This workshop was a brief rollout of the Rubin CMMS

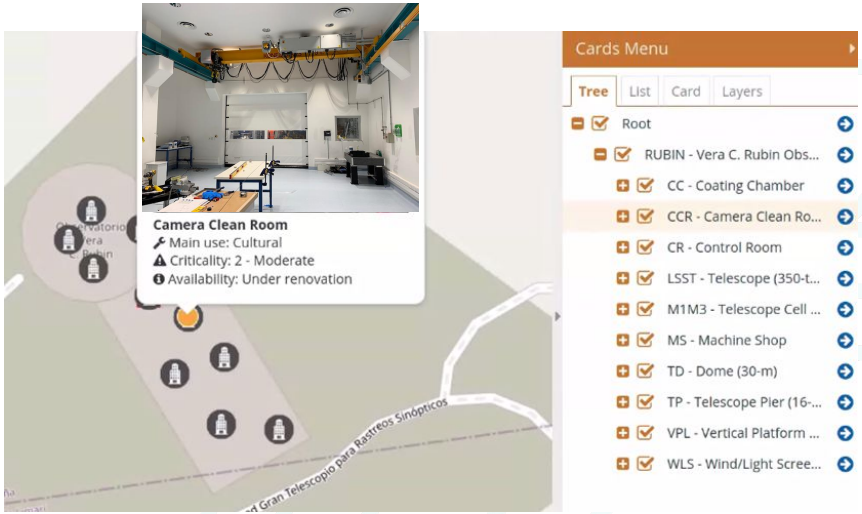
Well attended remotely from Chile - good :-) & recorded

Critical need for a reliable user-friendly system to manage the periodic, preventative, and repair maintenance of all Rubin Obs. equipment on the Summit and beyond.

More than two years invested in development by a broad-based committee: (T&S, SE, SITCom, SLAC, IT, Software)

- Defining requirements and use cases,
- Identifying commercially available tools
- Evaluating alternatives: rating on criteria, shortlisting, attending vendor demos, selection & Purchase Order for:

Tecnoteca PM Alberto Pittolo did a demo showing the functionality and features of openMAINT



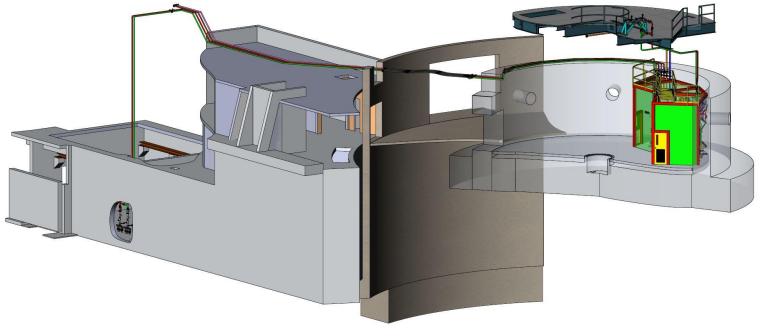
You will all be hearing more about this soon!

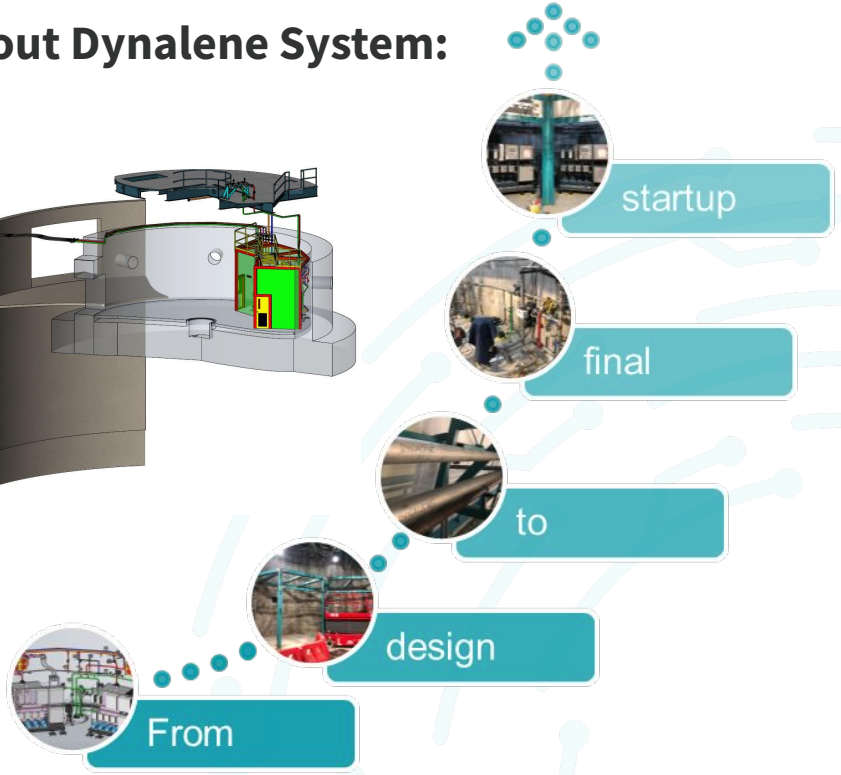
openMAINT powered by CMDBuild https://www.openmaint.org Developed & Supported by TECNOTECA https://www.tecnoteca.com/

Dynalene System: From the original scope to startup, going through the design. – Jiménez

You will be able to know the following points about Dynalene System:

- What/Why/How is it?
- Design process.
- Progress along last year
- Next steps





Early Career Astronomers: Networking and Tools – Annis

This was the community discussing experiences, a collection of notes, ideas, and suggestions:

Seeking Jobs:

- The first author paper-focus is still strong on people's minds.
- People's lives interact with their career search in interesting ways.
- Self-doubt about graduate school experience is a thing- imposter syndrome starts early
- One of the reasons we think our routes are very particular is the small number statistics of which grad school and position we take
- Be prepared to explain your story to prospective employers- there is no certainty they understand!
- For certain positions (context matters!) getting teaching experience is very useful, it opens doors.

Networking:

- *Working inside a big collaboration provides focused networking opportunities.*
- Big collaborations and networking in them is a two edged sword- what if you are not very social?
- What if you aren't in a big collaboration? Or don't know how to begin in a big collaboration?
- One idea is to use full-virtual conferences to maximize participation with senior people paying attention
- "Knowing people" is a problem across oceans.
- Giving colloquia is important- what if Rubin and Sci Collaborations kept track of colloquia and seminar opportunities? The big collaborations keep track of conference talk opportunities. Also talk tours, if possible
- Having big collaborations in regions distant from the US/Canada/Europe centers would maximize the possibility of people disadvantaged from access .
- Aggressively emailing professors can work! (JTA says- oh yes.)

What does pursing jobs mean?:

- Making it possible for others to do science is a valid and respected way to proceed in science (even if this is not widely known)
- Our lack of connection to our people who have chosen to go to industry is a problem: *when do we invite them to give talks?*
- If one doesn't want to be a professor- because of pay and/or family- and pay matters, there are data scientist routes- that use your science chops!
- There are options in national labs which are different than universities or teaching- perhaps not well known how this work

Coffee with the Rubin Science Platform Developers – Economou

- Great room, lots of questions on RSP from users, developers and current and future partners
- Confusion between RSP-the-aspects and RSP-the-service-infrastructure noted, look out for some new naming to help disambiguate
- Rubin is committed to the development of the platform and we are fully staffed to continue growing the technical basis and the services in operations
- Priority is being given to requirement-driven needs in the short term, but all the issues raised are our roadmap for Ops
- We are aware that the introduction of the IDAC problem has placed new needs on both the authentication infrastructure as well as the policies surrounding data rights. We have solutions to at least the former in our Ops roadmap
- DM and DM-adjacent developers look out for a session during JTM bringing you up to date with status and plans

END