

NOIRLab Report

Patrick J. McCarthy, Director
Stuartt A. Corder, Deputy Director

NSF's NOIRLab



Topics



- New People, New Roles
- Today's Science and Capabilities
 - Science Highlights
 - New Instruments and Software
- Building Tomorrow's Science Capabilities
 - Data Science
 - Time Domain and Multi-Messenger
 - Interferometry and the Quantum Revolution
 - US ELTP Update
- Sustainability Update

New Faces, New Roles



Wendy Swartz
Associate
Director for
Administration
and Finance



**Prentiss
Jackson**
DEI Manager



Lucas Macri
US ELT
Program
Director



Scott Dahm
Interim Gemini
Director

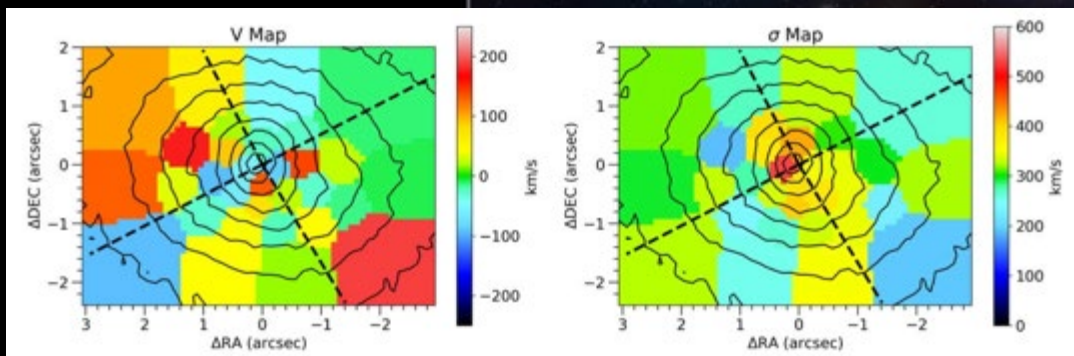


Dara Norman
Interim CSDC
Director

Heaviest Supermassive Binary Black Hole

In elliptical galaxy B2 0402+379

A 'fossil cluster' merged into one single massive galaxy



Best Fit Mass
 $2.8^{+0.8}_{-0.8} \times 10^{10} M_{\text{sun}}$

4C +37.11
 $Z = 0.055$

GMOS IFU Observations

Observed by Gemini North's Gemini Multi-Object Spectrograph (GMOS), operated by NSF's NOIRLab

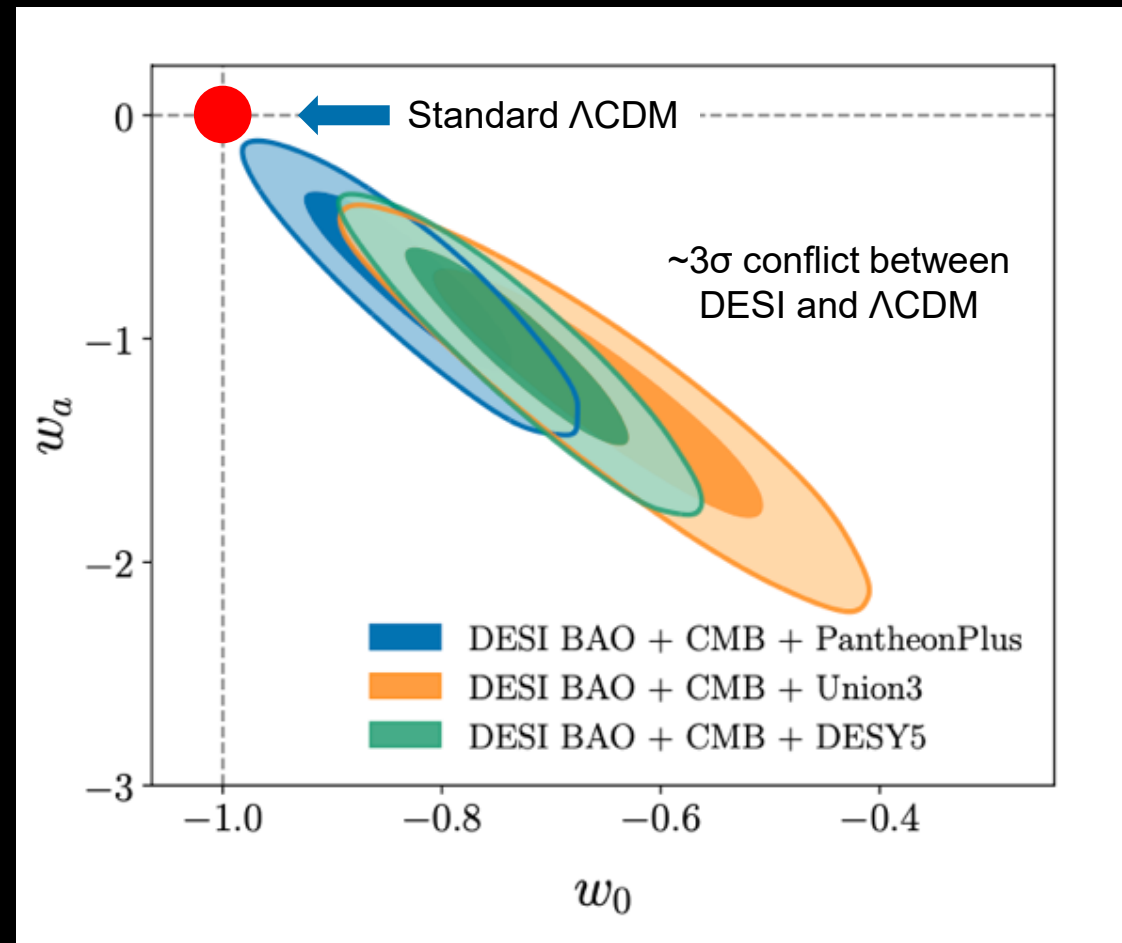
7.3 parsecs:
 Smallest binary black hole separation
 ever directly measured

28 billion solar masses:
 Largest combined mass

Surti et al., 2024
 ApJ 960, 110



DESI Year 1 Science Results

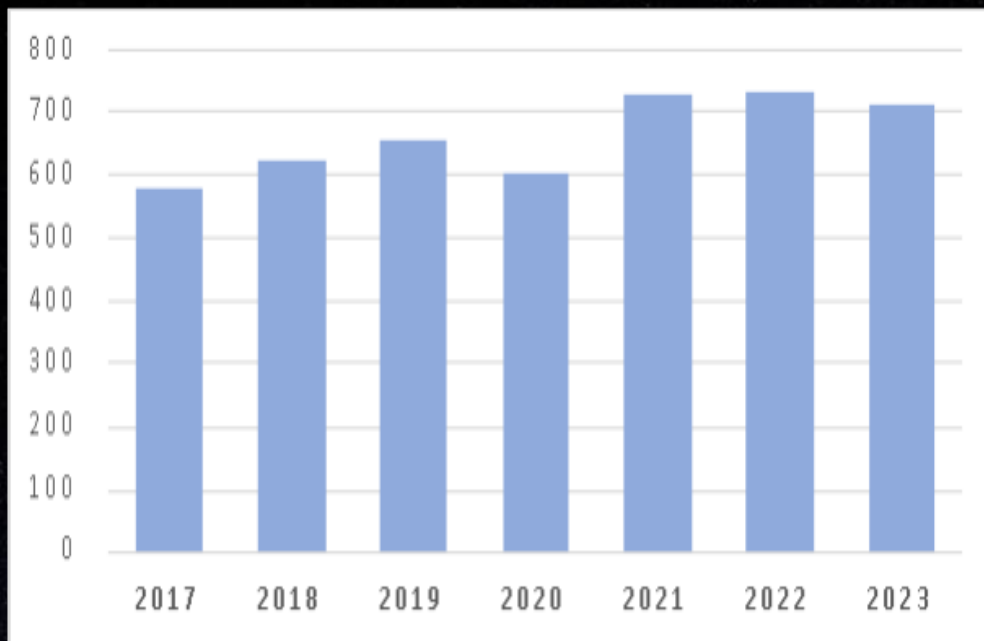




Science Reach

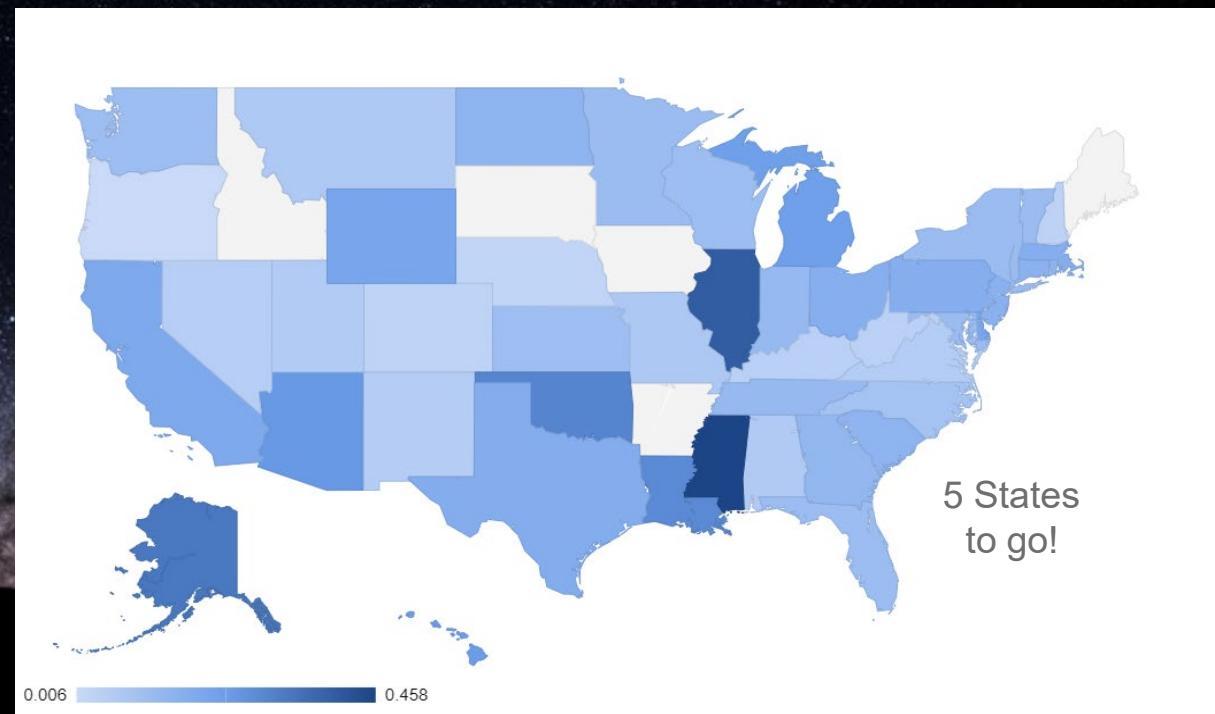


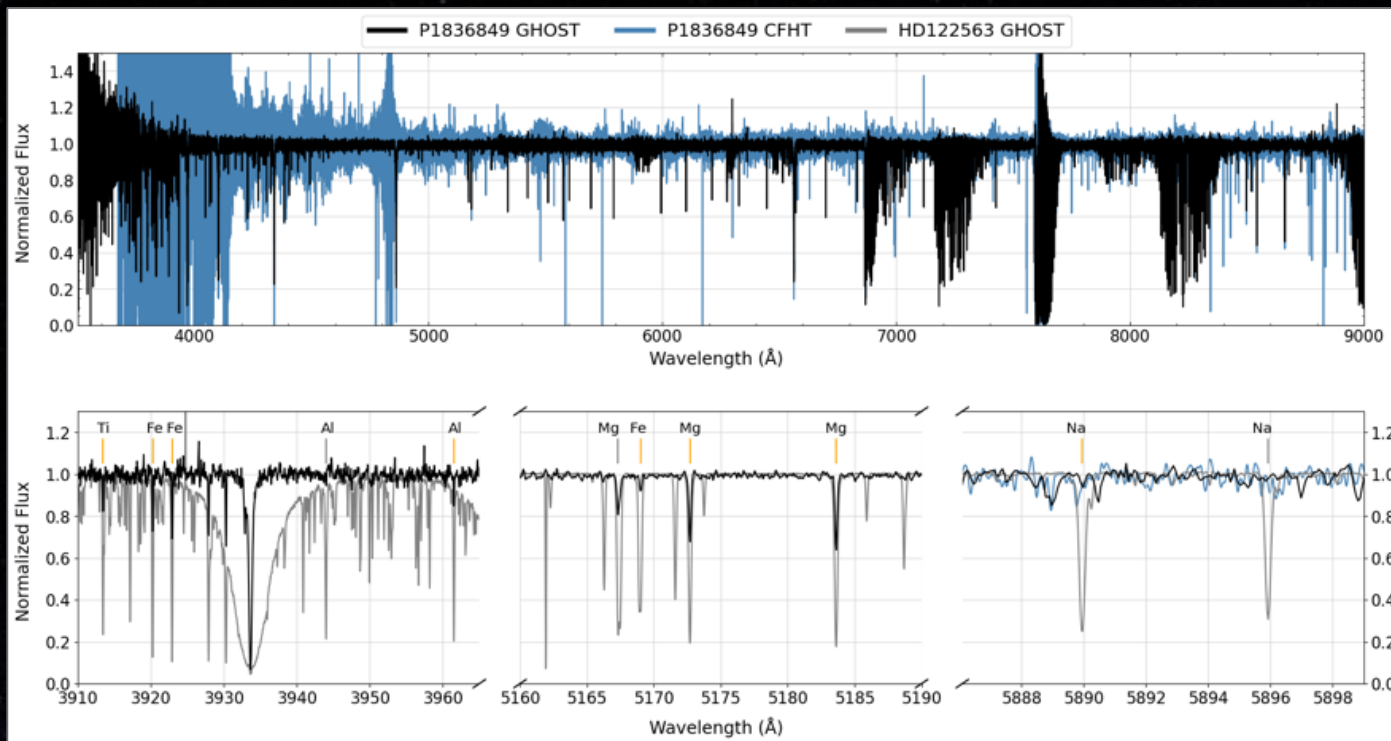
Refereed Papers



Publication Numbers remain strong

Normalized NOIRLab Proposer Locations 2020-2023

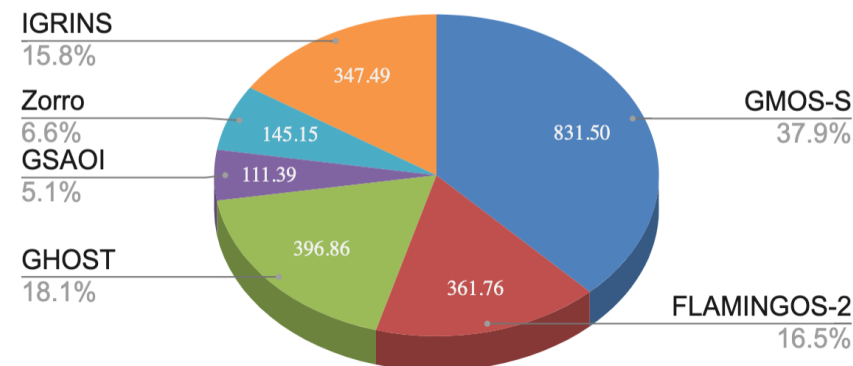




Dovgal et al., 2024, MNRAS, 527, 7810

- GHOST now provides a high dispersion spectroscopic capability for the community!
- GHOST is working as expected.
- Demand in 2024A was high!

Fraction of Time by Instrument: Gemini South 2024A





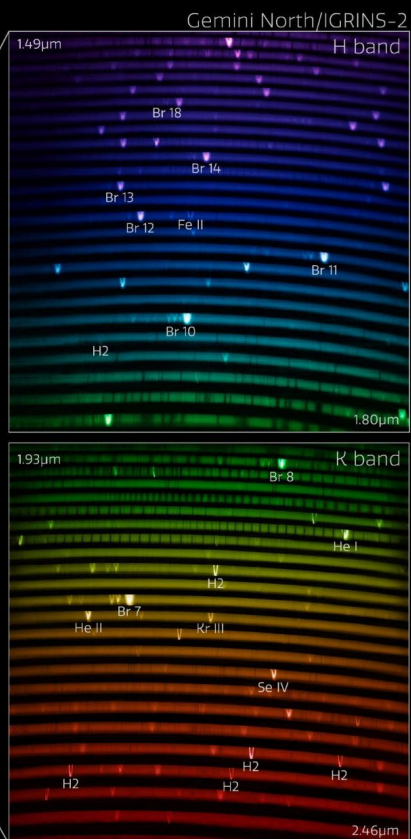
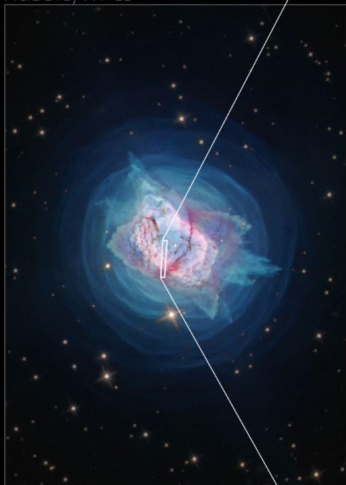
IGRINS-2 First Light at Gemini-N



IGRINS-2 First Light
Spectrum of Planetary Nebula NGC 7027



Hubble/WFC3

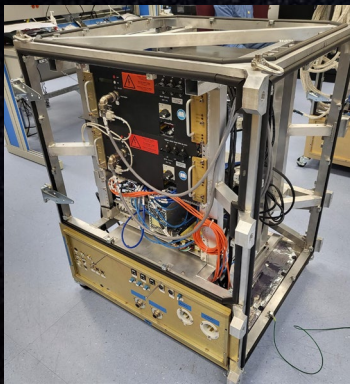


Colors seen in here represent chromatic order of near-infrared light observed by IGRINS-2; not colors in visible light.

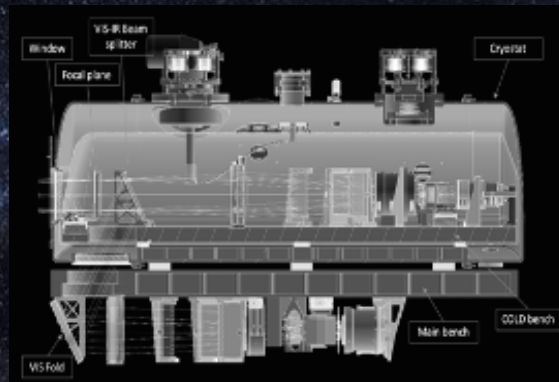
- Immersion GRating INfrared Spectrograph-2 (IGRINS-2) achieved first light at Gemini North!
- Designed and fabricated by the Korean Astronomy and Space Science Institute (KASI).
- Science verification expected in summer 2024.



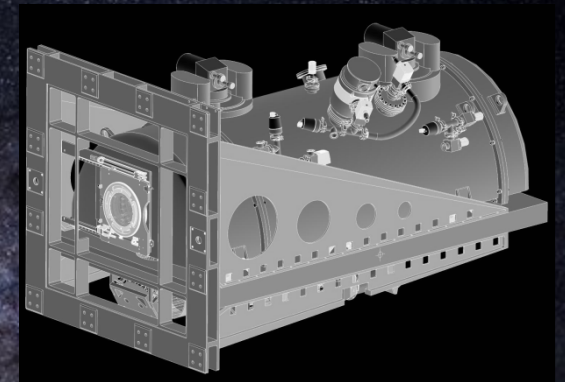
- 8 channel imager/spectrograph
- Core of Gemini's Rubin follow up capability
- All parts now in hand - Integration starting soon
- Delivery date to Gemini South in late 2025.



Electronics Box

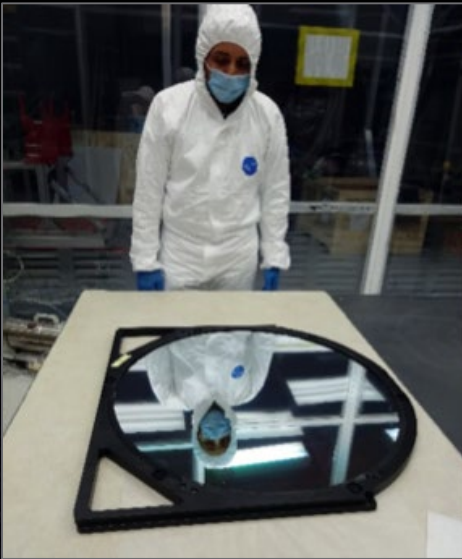


Cryostat with cold bench





Wide Field Imaging



**New Narrow Band
Filters on DECam**



**NEWFIRM is now
available on Blanco**



Future of Astrophysical Data Infrastructure



3-16 February 2023, at the Flatiron
Institute in New York City
75 participants

- Framing community expectations for data science
- Informing our Data Management Strategy

- NSF AI Institute Proposals
- Four proposals with NOIRLab participation under review

Community Meetings

- Helped shape the NSF MMA call for proposals
- Proposals due May 15



WINDOWS ON THE UNIVERSE

Establishing the Infrastructure for a Collaborative Multi-messenger Ecosystem

16-18 October 2023 • Tucson, Arizona

Photo: Pete Marenfeld

Big Data !
May 23-25, 2024
In Tucson



RARE GEMS in BIG DATA

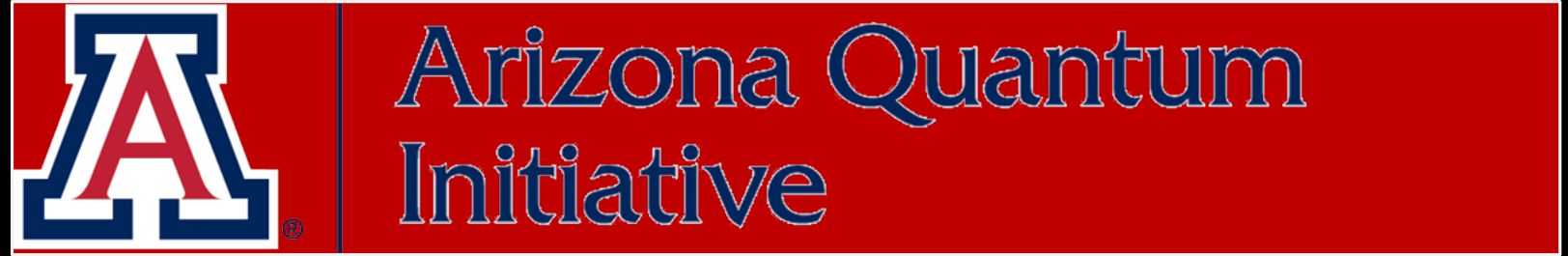
THE DISCOVERY POTENTIAL OF LARGE ASTROPHYSICAL SURVEYS:
 SCIENCE OPPORTUNITIES, TOOLS, AND TECHNIQUES

20-23 May 2024 | Tucson, AZ, USA | <https://noirlab.edu/gems>

SURVEYS, TIME-DOMAIN AND MULTI-MESSENGER ASTROPHYSICS, GALAXIES, COSMOLOGY, MILKY WAY AND NEARBY GALAXIES, STELLAR POPULATIONS, EXOPLANETS, SOLAR SYSTEM OBJECTS, TECHNIQUES AND TOOLS.



Astronomers and Quantum experts working together to open the door to micro-arcsecond astronomy



Charging Quantum Horizons: Establishing a Road Map for Microarcsecond Astronomy, Tucson - March 11, 2024

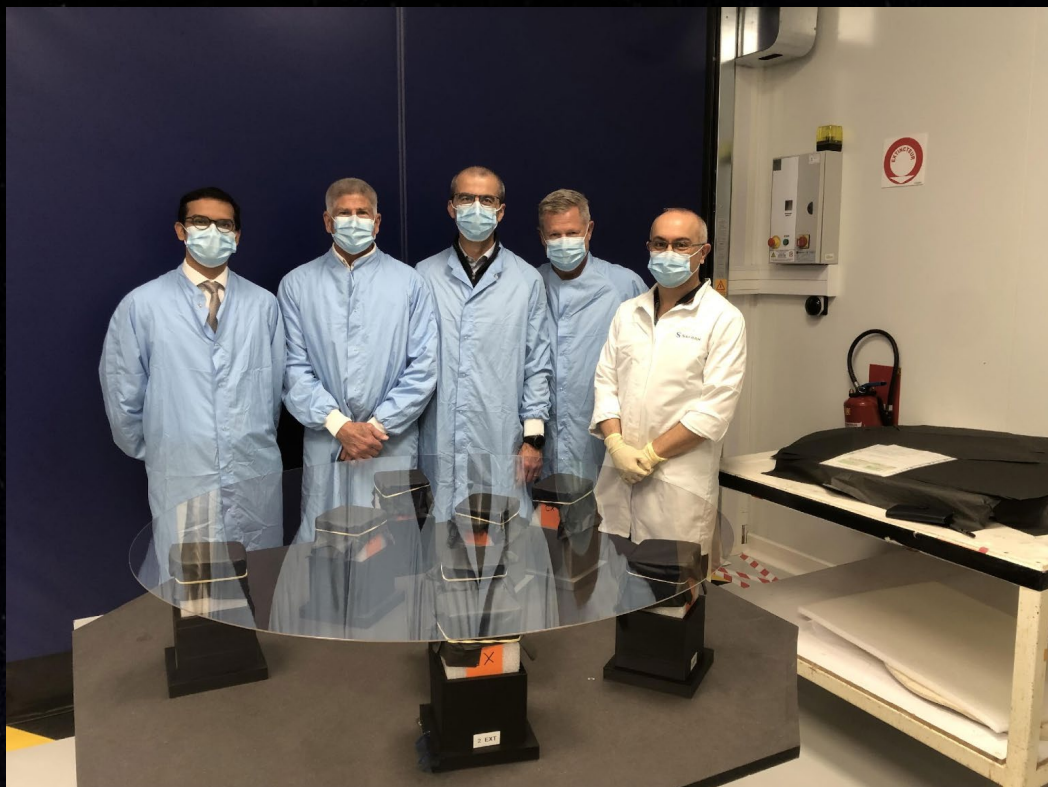


CHARA Science Meeting, Tucson – March 12-14, 2024

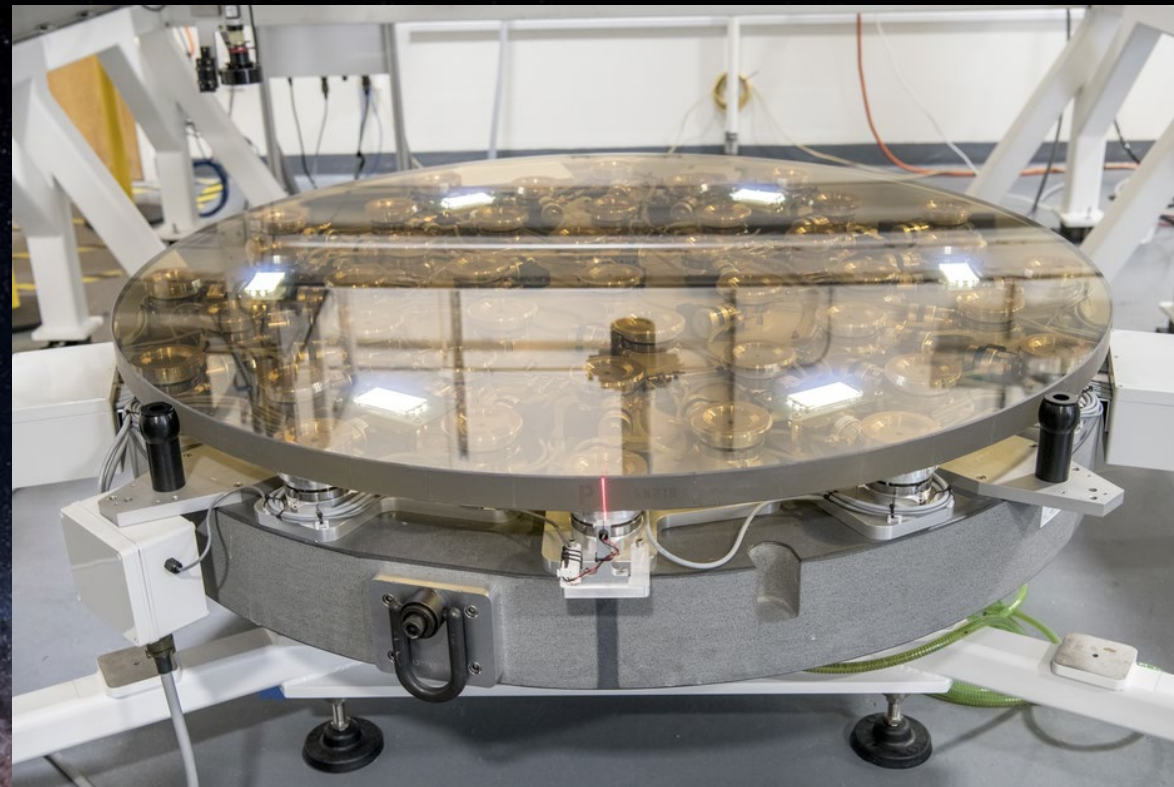


- Successful NSF review in February
 - First NSF review of the program
- On track for Conceptual Design Review in December
 - The team is working well together

US ELTP Status



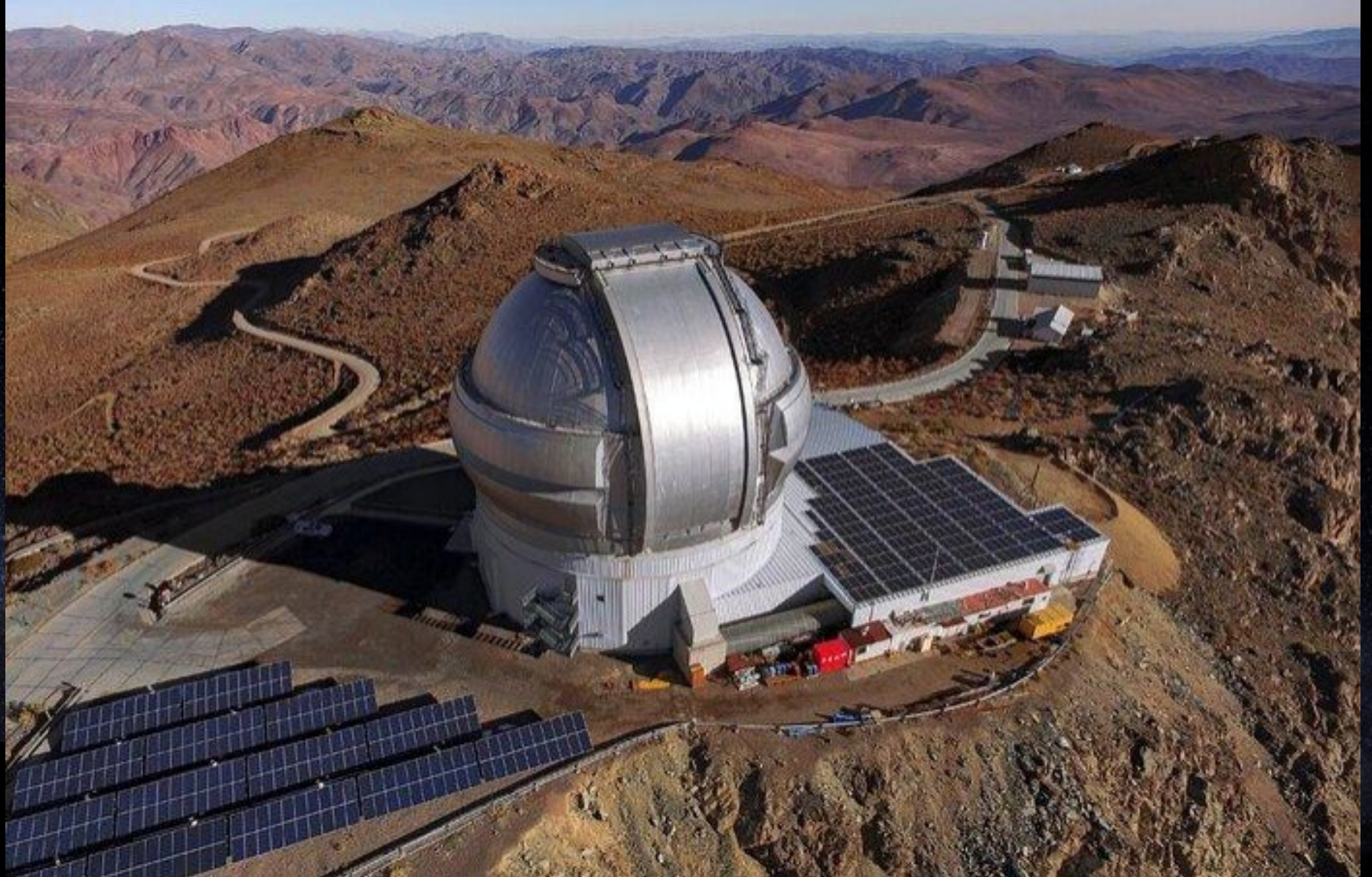
GMT first off-axis ASM thin shell face sheet at Safron/REOSC



TMT has polished its 100th mirror!

**4.5MW Solar
Power Plant**

**Sufficient to
power all of
Cerro Pachon,
including Rubin**





View from the NMOC



- The NMOC met with the NOIRLab leadership team in Tucson on Feb 27-29, 2024.
- Our overall assessment: “Despite the challenges faced by NOIRLab last year, NOIRLab continues to fulfill its mission to “enable breakthrough discoveries in astrophysics,” contributing to many high impact astronomical breakthroughs in 2023.”
- Key Observations from the NMOC Meeting
 - The NOIRLab Directorate is moving aggressively to fill key senior leadership positions in the organization: Gemini Director, Environmental/Health/Safety Lead, Chief Technical Officer (Integrated Data Management).
 - The NOIRLab matrix management model is evolving to better meet NOIRLab needs as lab operations mature.
 - There is continuing progress toward integration of Rubin Observatory into NOIRLab Operations.
 - NOIRLab’s work in the US ELT program is proceeding well (despite uncertainties in the path forward).



NMOC Perspectives II



- Key Findings from the NMOC Meeting
 - *The interface between NOIRLab and AURA Services (budget management, procurement, contract development/monitoring, human resources, ...) is not yet optimal.*
 - The compliance culture is well-established. Both NOIRLab and AURA Services should work more closely to ensure compliance along with improving efficiency and effectiveness in carrying out critical tasks.
 - *Continuing challenges remain with Gemini Instrumentation develop, particularly with the SCORPIO instrument.*
 - Very high probability that SCORPIO won't be on sky when the the Rubin LSST survey begins
 - *NOIRLab management of the tenant telescopes on Kitt Peak places a high burden on NOIRLab and MSO directorates as well as AURA Corporate staff.*
 - This is due to the lack of a stable (year over year) funding model; a better funding model is needed.
 - *The development of a NOIRLab Integrated Data Management/Software System is moving slowly.*
 - The IDMSS is a key NOIRLab deliverable, however consensus on the scope and organizational structure of the IDMSS hasn't been reached

Thank you
Mahalo
Sap'e
Gracias