



NSF's National Optical-Infrared
Astronomy Research Laboratory



NSF's OIR Astronomy Lab

A New Vision for a National Center for Optical IR Astronomy

Patrick McCarthy

Director

Beth Willman

Deputy Director

AAAC Meeting - Jan 23, 2020



NSF's National Optical-Infrared
Astronomy Research Laboratory

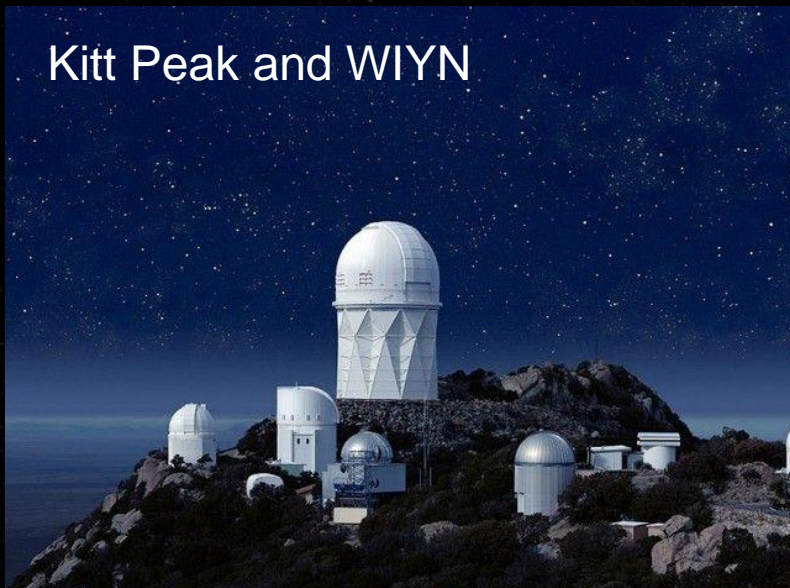
Our Mission



Enabling breakthrough discoveries in astrophysics with state-of-the art ground-based observatories, data products and services for a diverse and inclusive community

OIR Lab Domains

Kitt Peak and WIYN



Cerro Tololo and SOAR



Gemini North and South



Rubin Operations



Directorate



Organizational Goals



- Promote diversity and inclusion in everything we do
- Provide state-of-the-art capabilities on the largest telescopes
 - Gemini adaptive optics and instruments
- Continue to lead in wide-field big-data OIR Astronomy
 - DECam, DESI, Rubin Observatory
- Be the US center for data intensive OIR Astronomy
 - Community Science and Data Center
- Build a world-leading time domain astronomy capability
 - Alert systems, event brokers
 - Rubin Observatory



NSF's National Optical-Infrared
Astronomy Research Laboratory

Key Team Members



Lori Allen
MSO



Bob Blum
LSST Ops



Beth Willman
Deputy Director



Jennifer Lotz
Gemini Obs



Adam Bolton
CSDC



John MacLean
Center
Operations



Michiel van der Hoeven
Engineering



Lars Christensen
Communications



New Capabilities

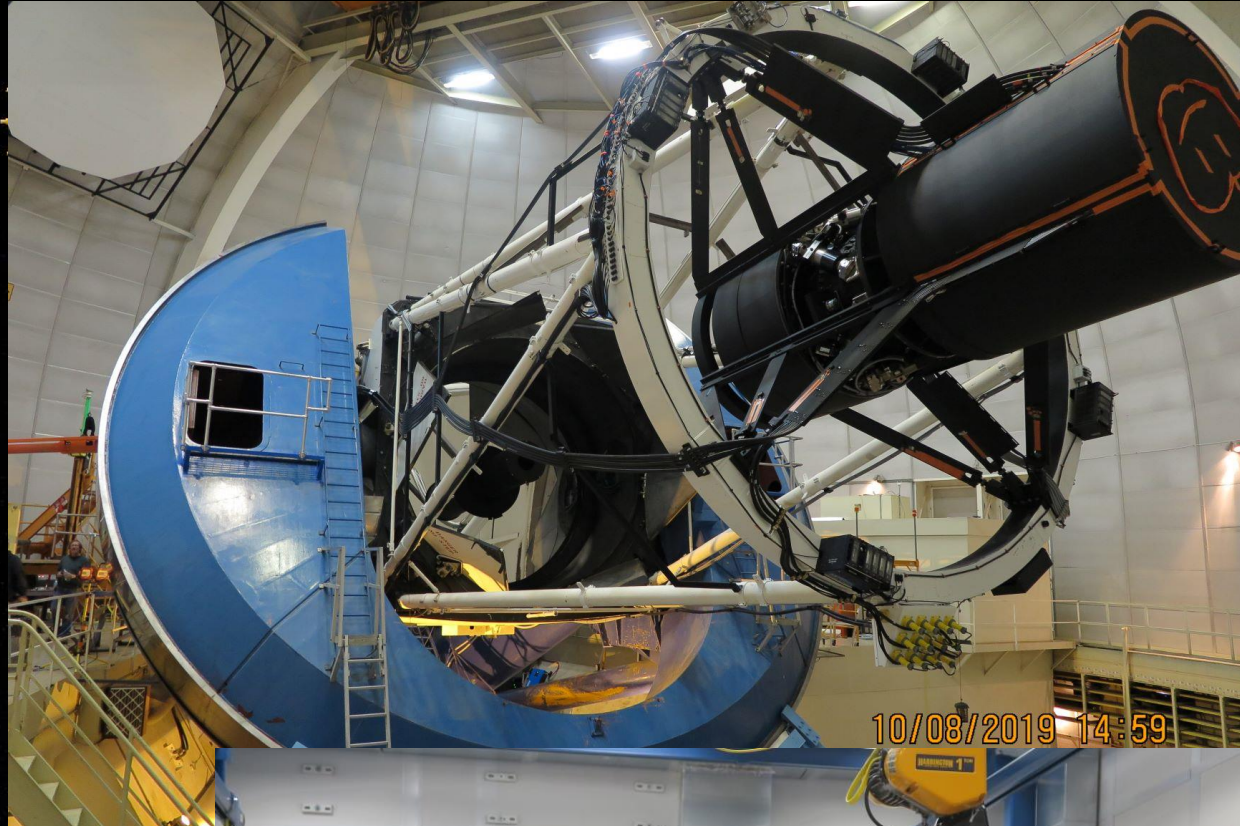
- Revitalization of adaptive optics at the national center
 - Gemini North Multi-Conjugate Adaptive Optics
 - Upgrades to GeMS & GPI
- Stage IV Dark Energy Experiments
 - Dark Energy Spectroscopic Instrument
 - Rubin Observatory Legacy Survey of Space and Time
- Precision Radial Velocities
 - NEID at WIYN
 - MAROON-X at Gemini
- Data Intensive Astronomy & Astrophysics
 - Rubin Obs. Operations, with specialized Science Platform (2023)
 - Astro Data Lab & ANTARES

NSF

DOE & NSF

NASA & NSF

NSF & DOE



DESI@Mayall



Dark Energy Spectroscopic Instrument

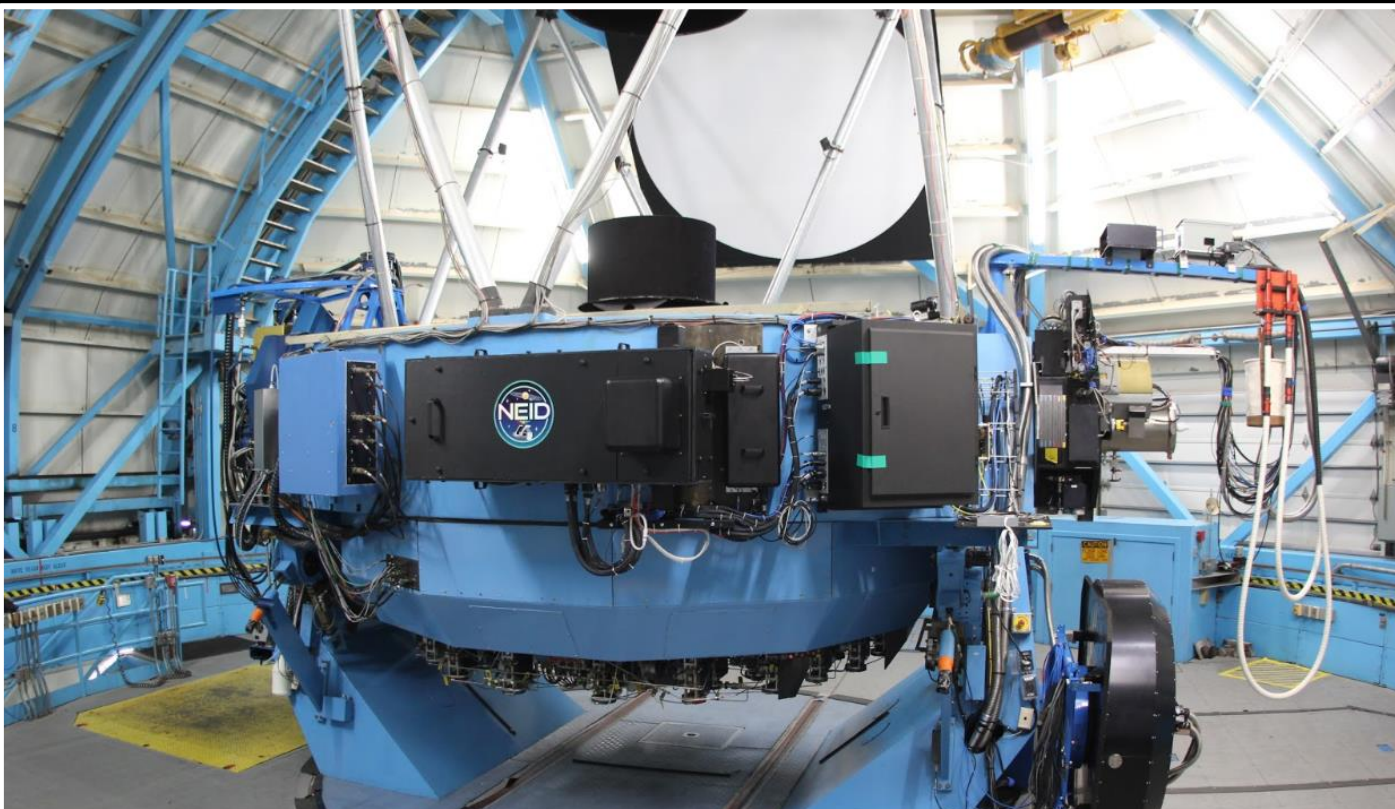


erse Together

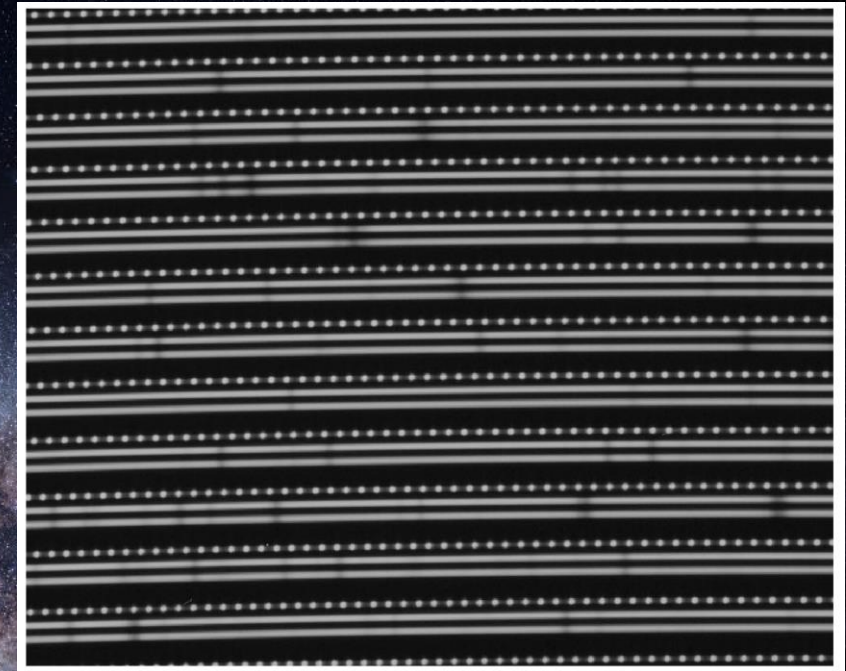
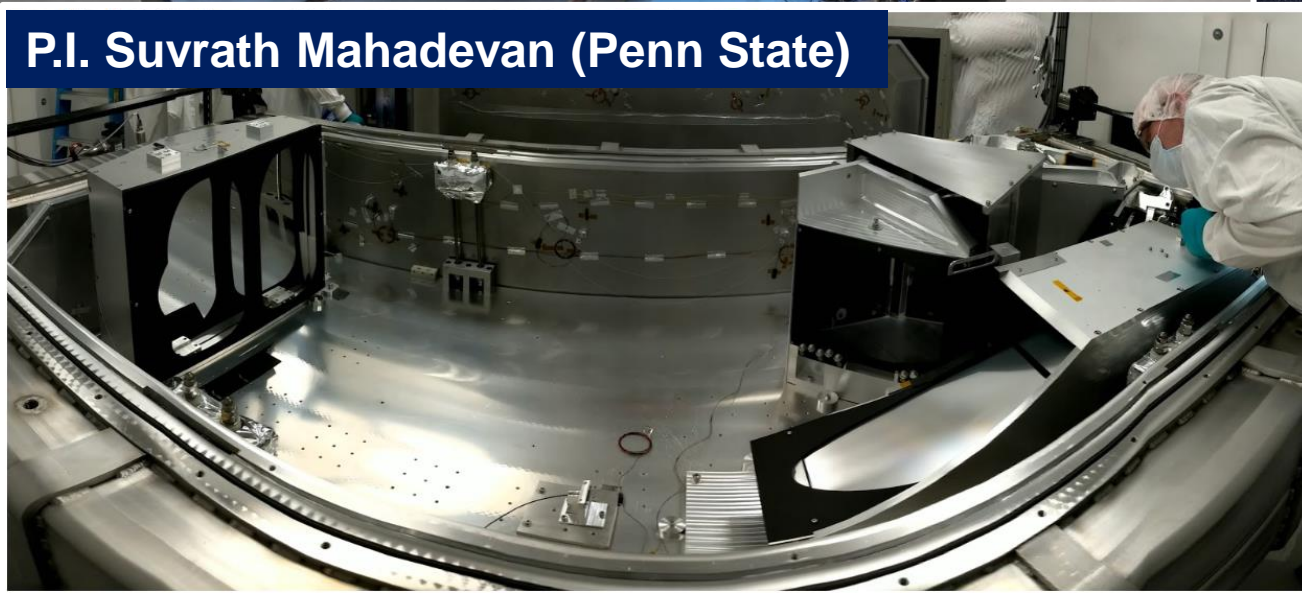
NEID@WIYN



NEID is Tohono O'odham for "to see"



P.I. Suvrath Mahadevan (Penn State)



Illuminated science, sky, and calibration filters

Together



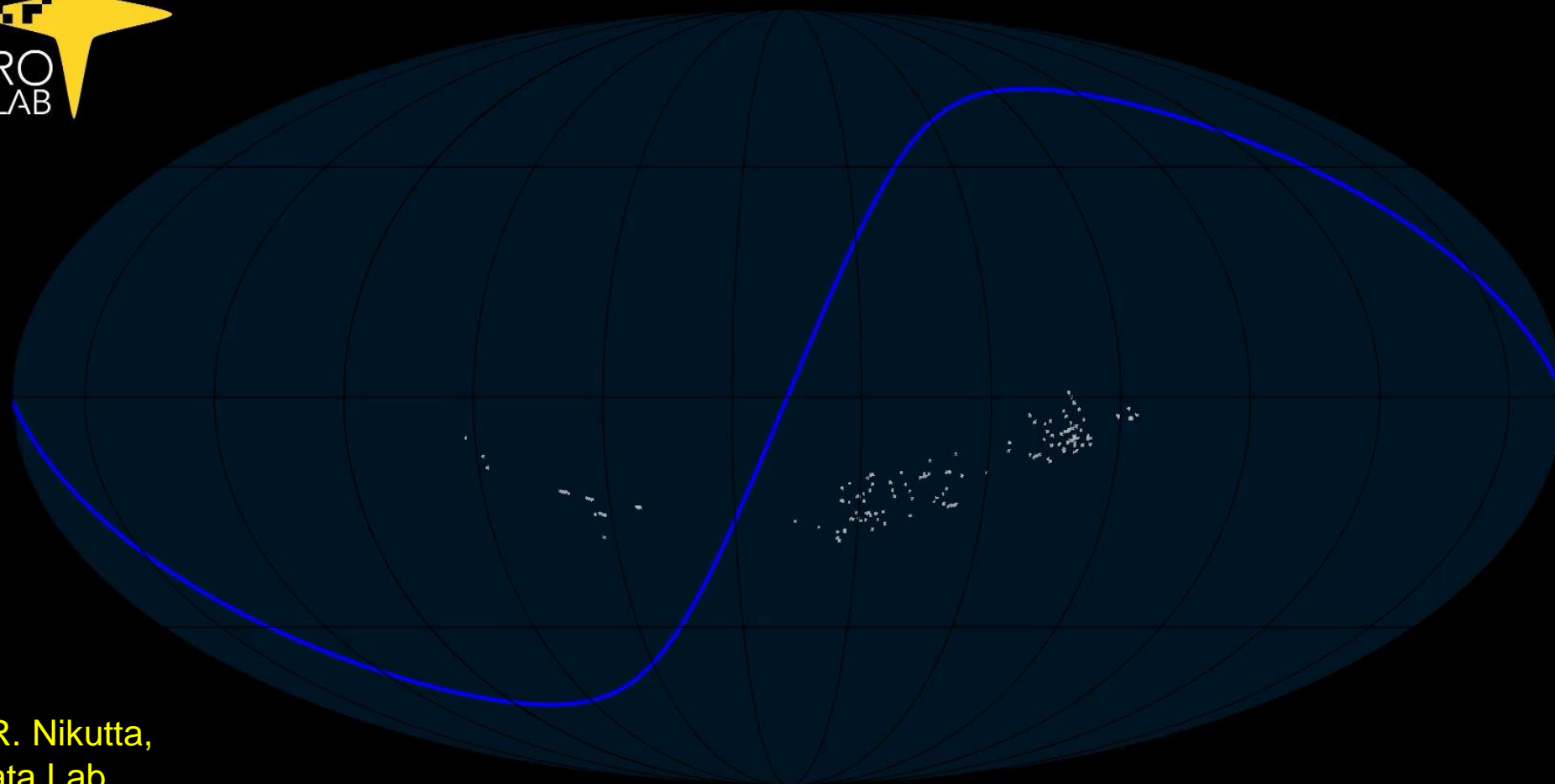
NSF's National Optical-Infrared
Astronomy Research Laboratory



Towards an all-sky digital archive



2004.6



Video Credit: R. Nikutta,
K. Olsen, & Data Lab

Exposure time at 2-4m telescopes in NSF's OIR Lab Science Data Archive



Starlink Mega Constellation

Telecon with Elon Musk in December

Committed to ensuring that Starlink does not inhibit our ability to study the universe

Tony Tyson, Pat Seitzer, and others engaged in dialog with the SpaceX team

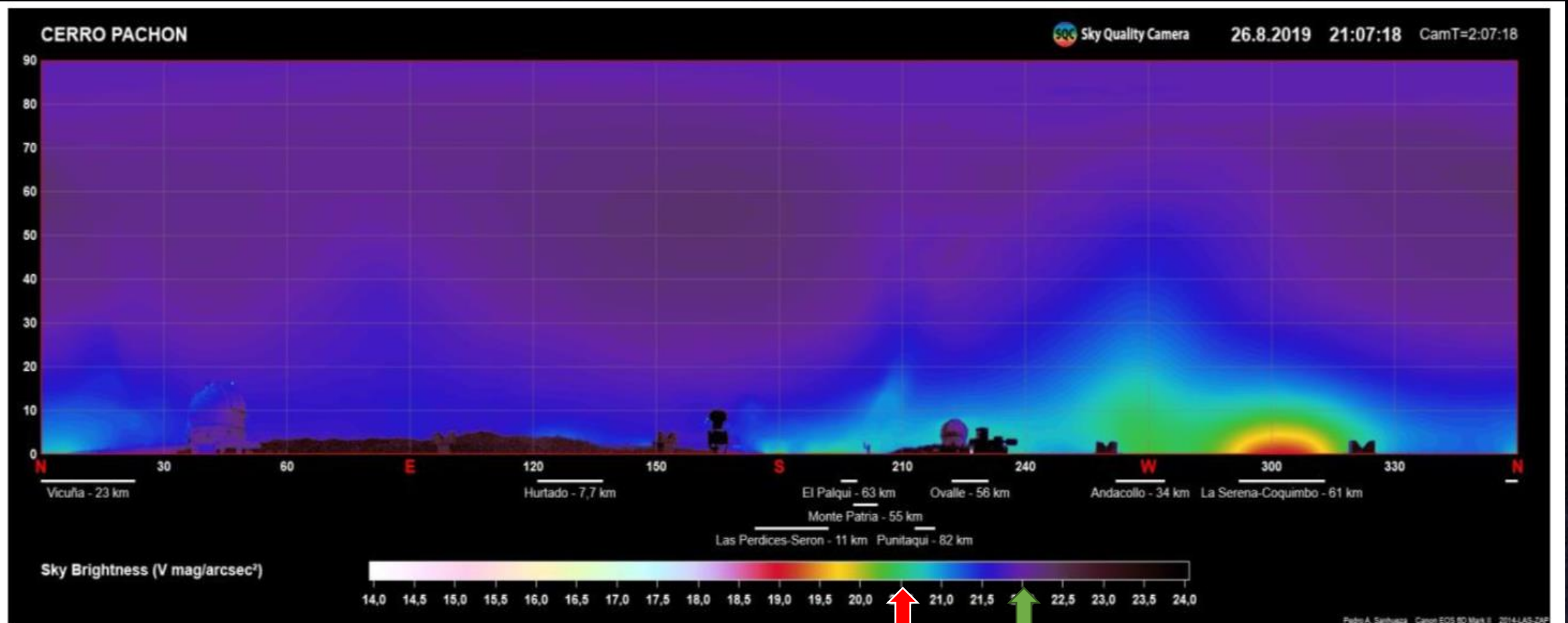
NSF has asked the OIR Lab to convene a discussion among experts and concerned parties (planning underway)

LSST is the most at-risk project – if we can mitigate the impact on LSST, everyone else is better





Light Pollution





What are we doing?



- OPCC – Office for the Projection of the Quality of the Skies of Northern Chile
 - Non-Profit charged with working with the government of Chile to address light pollution and related issues
- Foundation for the Chilean Skies
 - Works independently, but coordinated with, the OPCC
- Chilean Norms
 - Regulate lighting in regions near observatories
 - Not enforced as rigorously as desired
- OPCC working with local governments and lighting concessions
 - Replacing fixtures along the Pan American Highway



OIR Lab by the Numbers



- 12+ observing platforms with $D \geq \sim 1$ meter
- 220 m² collecting area (*1300 m² with the ELTs*)
- Full sky coverage with all aperture classes
- 30 instruments available in 2020
- 15-hour continuous time span
- Over 1,000 nights allocated in 2019
- Investigators from more than 300 institutions
- 5 Petabytes of archived data
- 800+ publications in 2019



Our Mission



What Does the OIR Lab Do For Your Science?

- Provide peer-reviewed access to a broad suite of capabilities
- Support state-of-the-art instrumentation
- Provide platforms for large surveys and experiments
- Serve data bases supported by modern Python-based software tools
- Provide User support tailored to user's experience level and needs
- Open a path to growth & competitive capabilities for decades to come

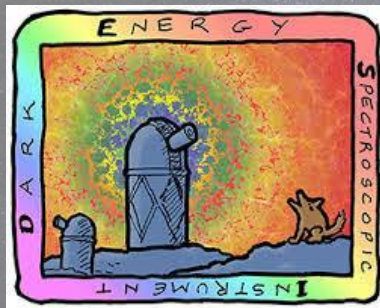
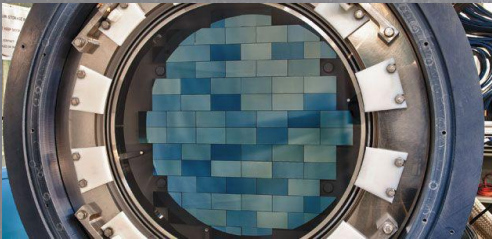
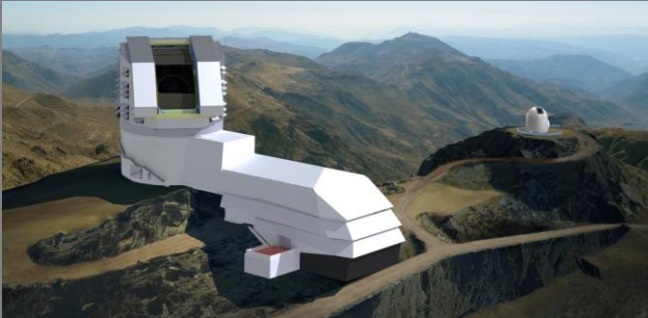


NSF's National Optical-Infrared
Astronomy Research Laboratory

Leadership in Big-Data Astronomy



From generation...



... to analysis...



DRAGONS

... to follow-up

