



W. M. Keck Observatory Report

Subaru Users' Meeting 2021

Hilton Lewis
Director

March 2, 2022

THE NOBEL PRIZE IN PHYSICS 2020



Roger Penrose

"for the discovery that
black hole formation
is a robust prediction
of the general theory
of relativity"

**Reinhard
Genzel**

"for the discovery of a
supermassive compact object
at the centre of our galaxy"

**Andrea
Ghez**

THE ROYAL SWEDISH ACADEMY OF SCIENCES

Returning to Work On-Site

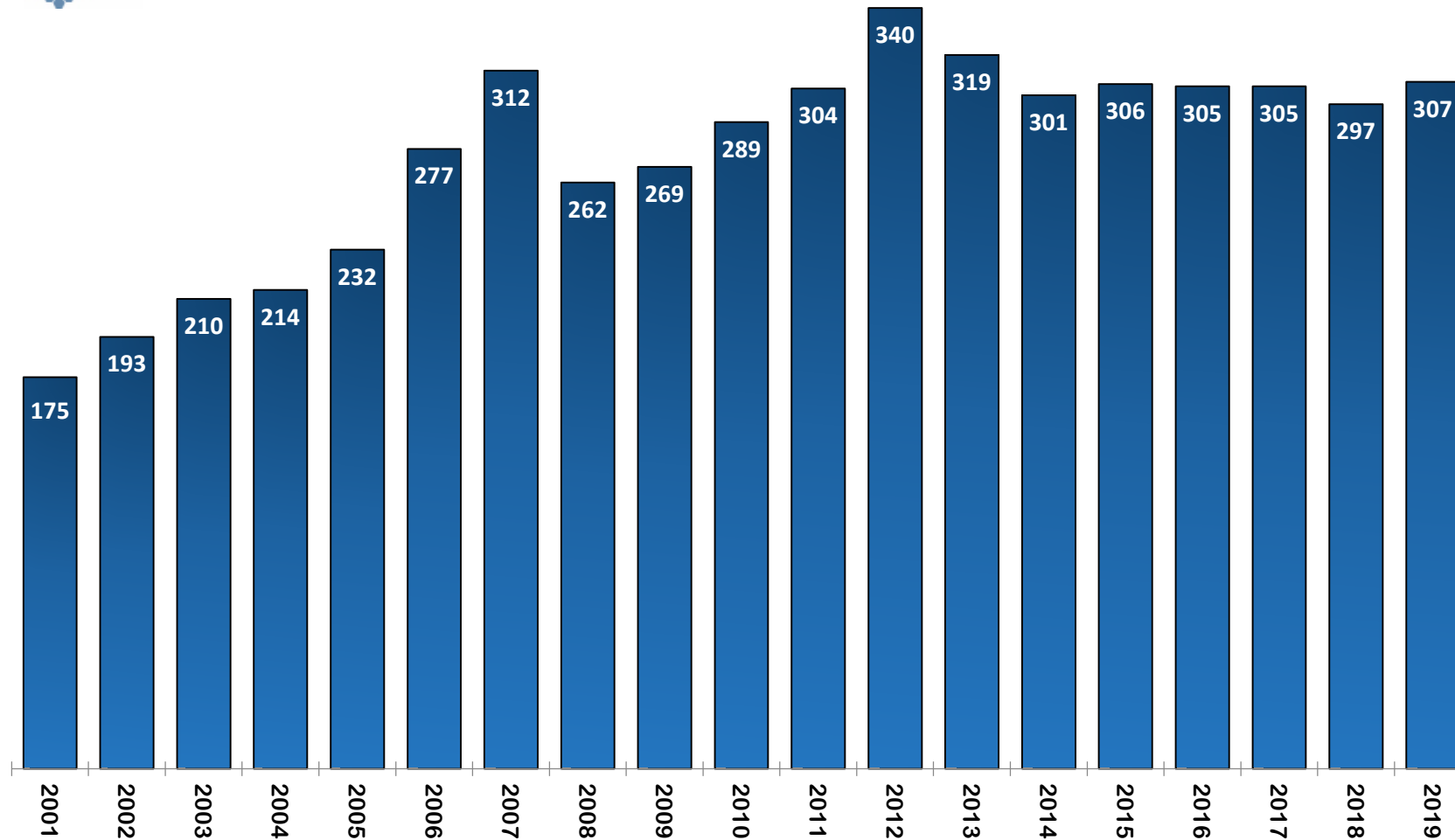
- Currently averaging ~30 daily staff at HQ, ~15-20 day crew on summit.
- COVID safety mitigations at Summit and HQ complete:
 - Air Conditioning: UV sterilization, filtration
 - CO2 monitoring
 - Plexiglas dividers
 - External work areas
- Addressing IT productivity issues with working both at home/office
- Establishing vaccine policy and post-COVID hybrid work policy



Refereed papers using WMKO data

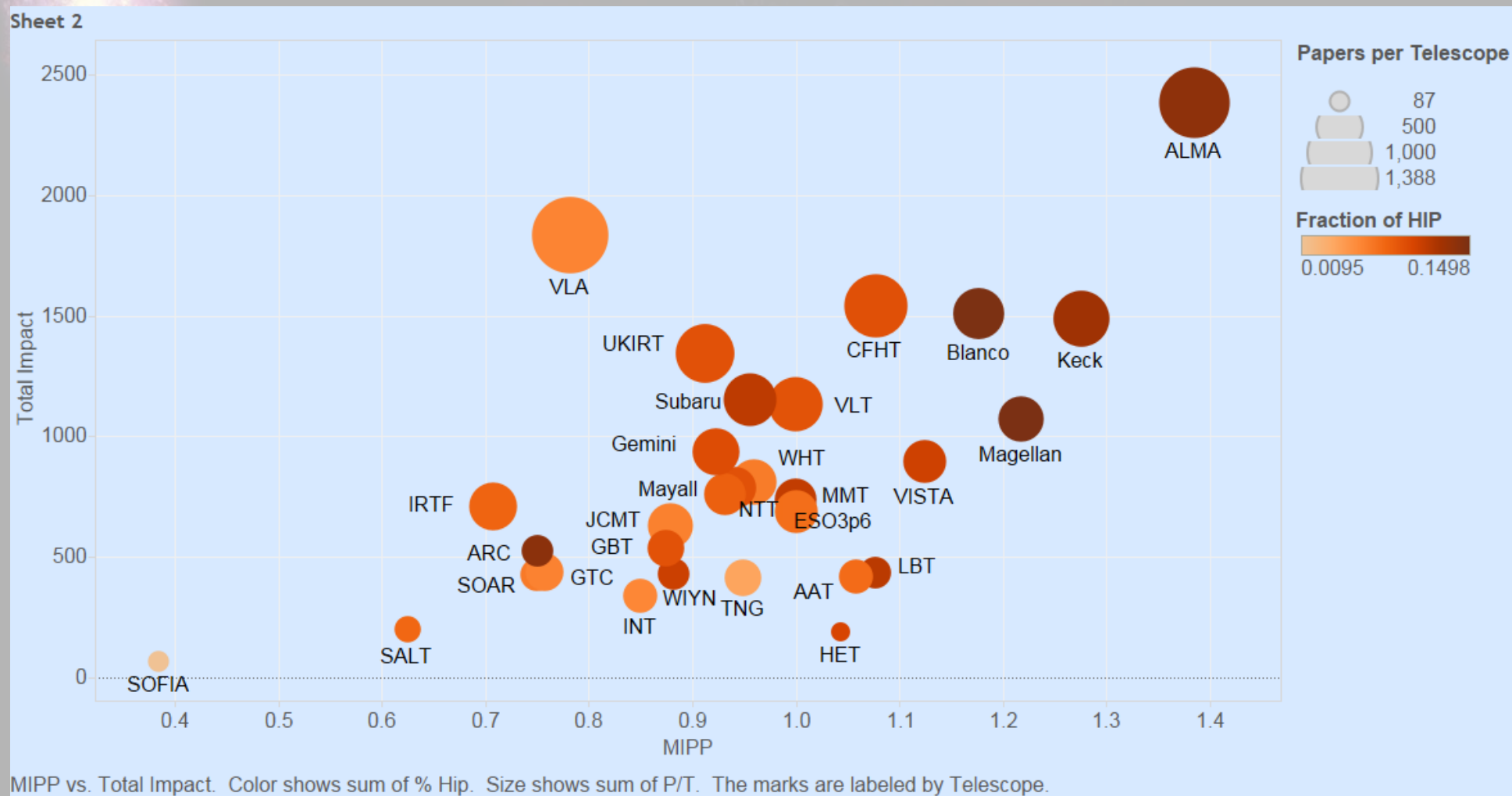


Refereed Articles: using WMKO data

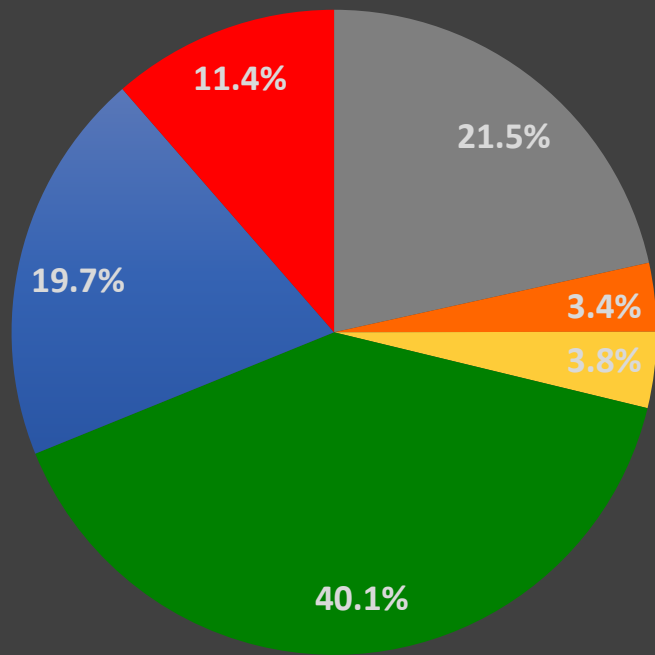


Overall Performance

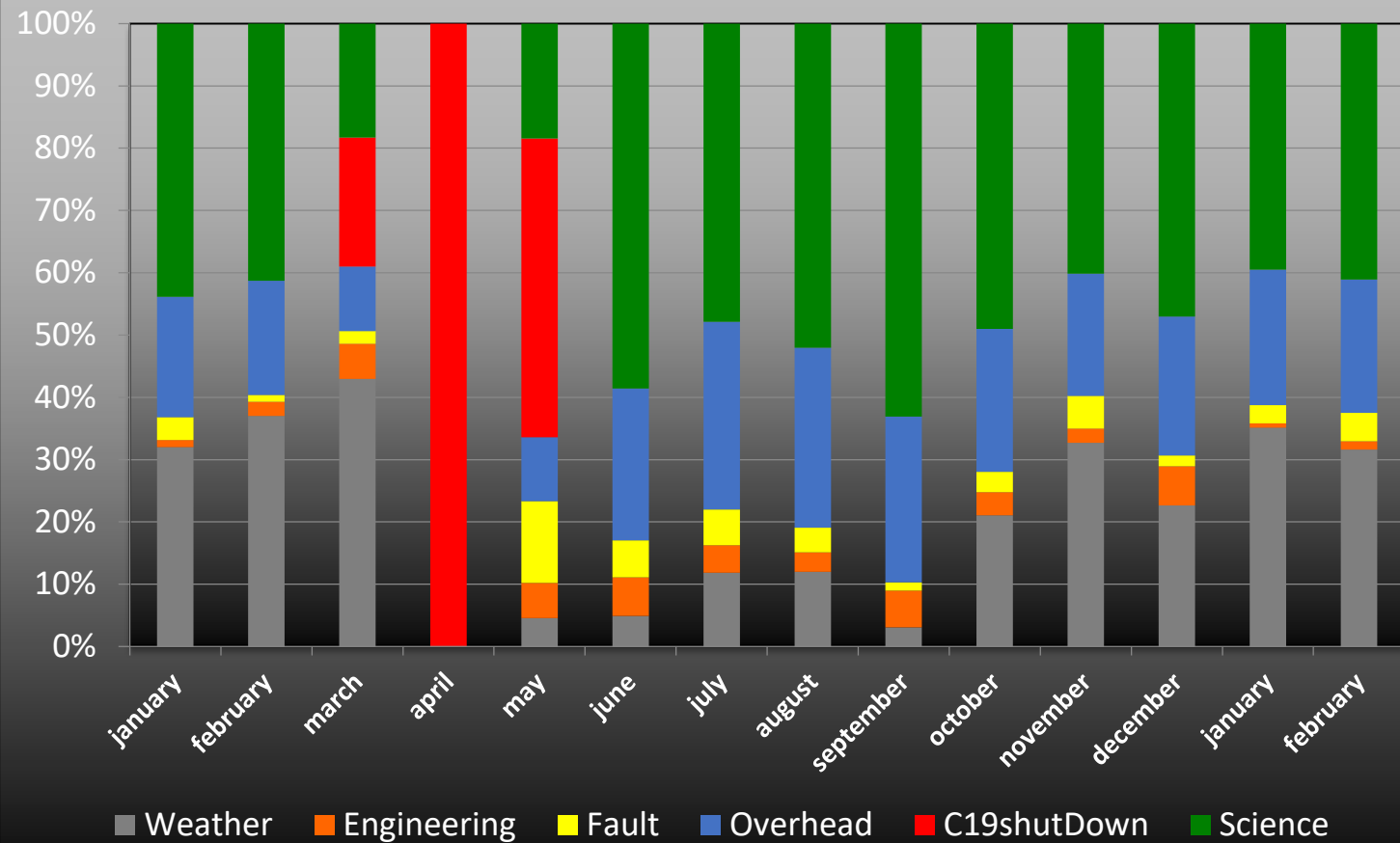
This slide shows a summary of telescope performance. The two axes are MIPP and Total Impact, while the size of the points represent the total papers per telescope for 2013-2017. The color of the circles represents the fraction of papers in the top 10% of cited papers in the complete sample.



Observing Metrics: Past Year



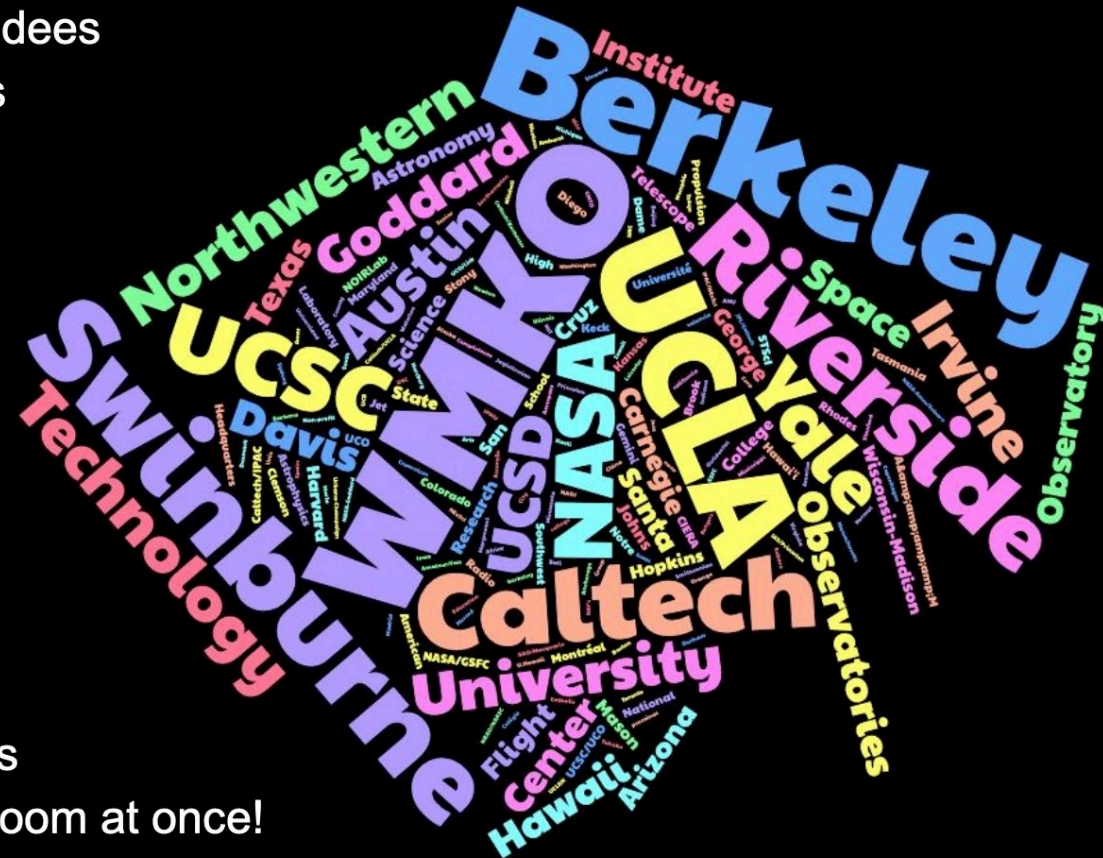
■ Weather ■ Engineering ■ Fault
■ Science ■ Overhead ■ C19shutDown



Keck Science Meeting 2020

This was the Largest Keck Science Meeting Ever

- Over 450 registered attendees
- More than 110 institutions
- At least 12 time zones



- Lively Slack conversations
- Up to 180 attendees on Zoom at once!

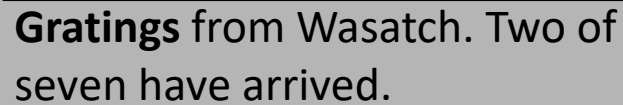
Segment Repair Project Completed

- Project to repair the small cracks found at the attachment points to the primary mirror segments. Affected all segments.
- Genesis of problem was design error and fabrication issues.
- 84 segments repaired over 5 years; all repairs performed onsite at our headquarters.
- Pathfinder segment removed after 4 years in service and carefully inspected. Everything stable and no new problems detected
- A problem that threatened the very viability of the observatory has been successfully addressed

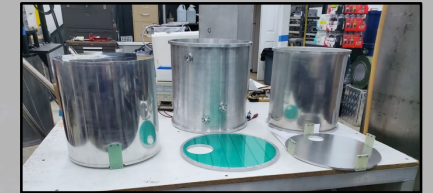
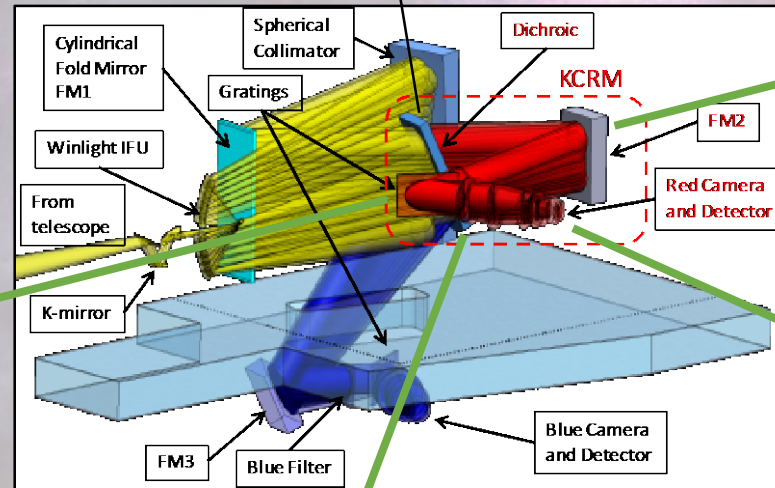


- Optics and hardware arriving for AIT
- Mechanisms are being fabricated and delivered

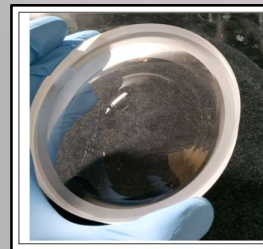
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- Mechanisms are being fabricated and delivered



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Detector electronics and software developed with test dewar.

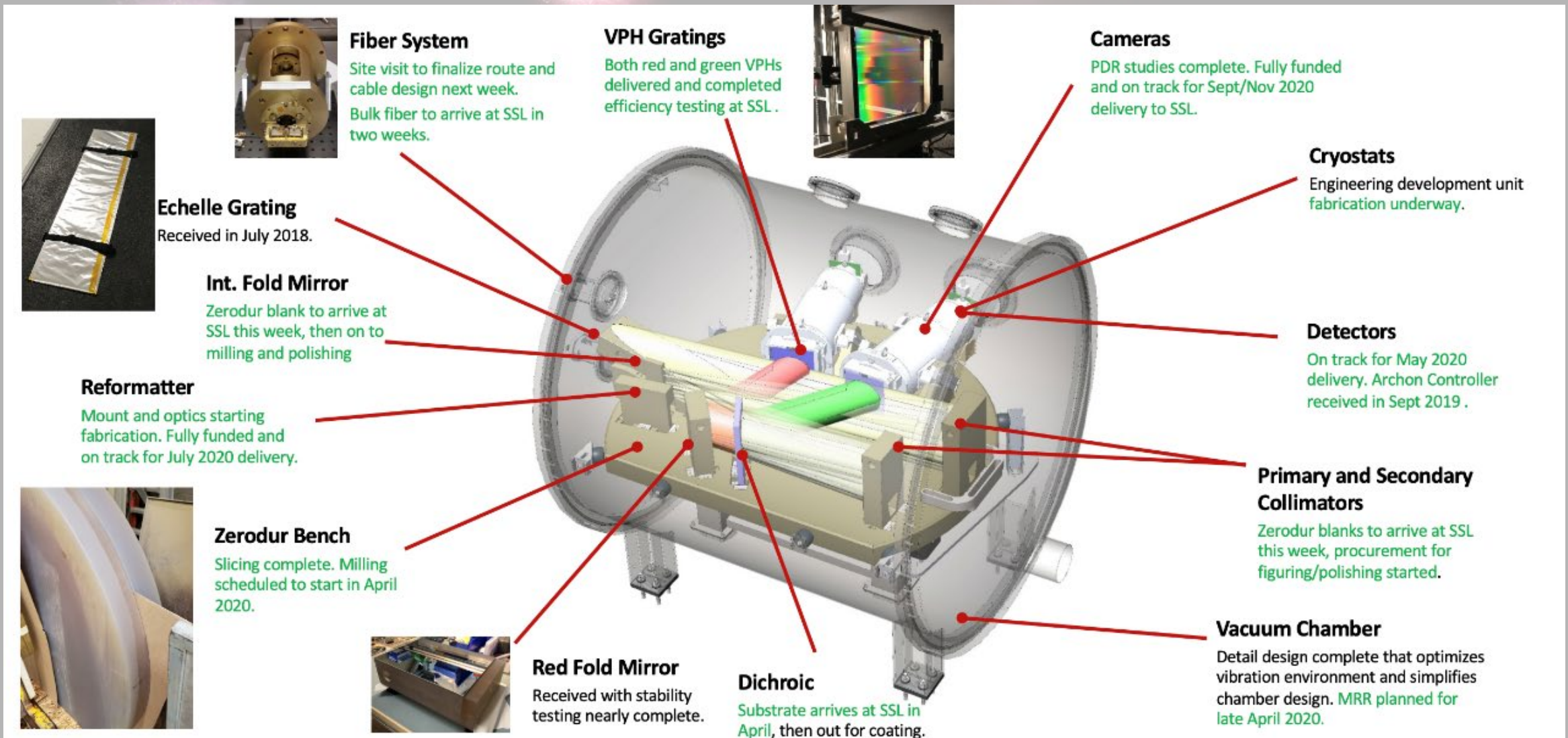


Camera Lenses under
fabrication with Winlight.
Field flattener completed.

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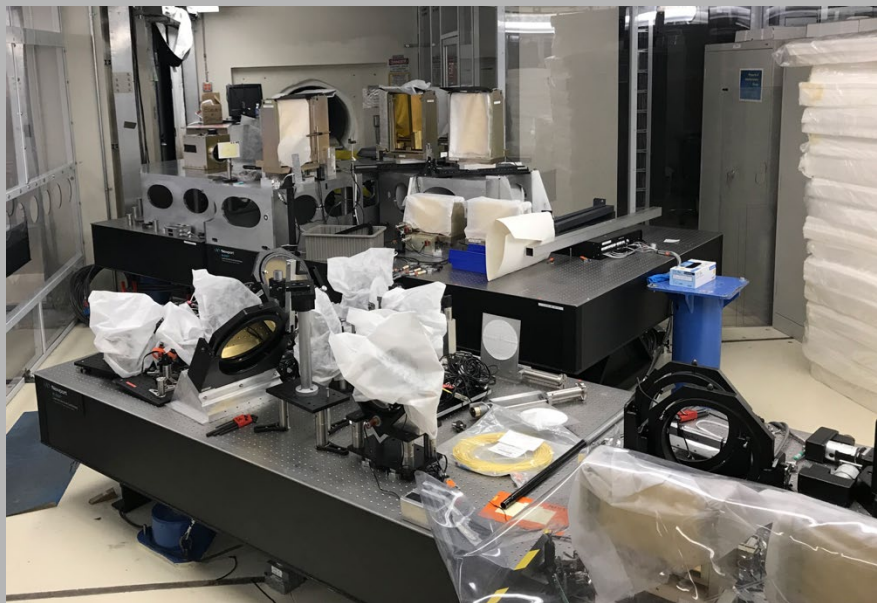


Keck Planet Finder (KPF) (2022)



KPF Zerodur Optical Bench Machined





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Basement Cleanout for KPF

- Interferometer
hardware removed

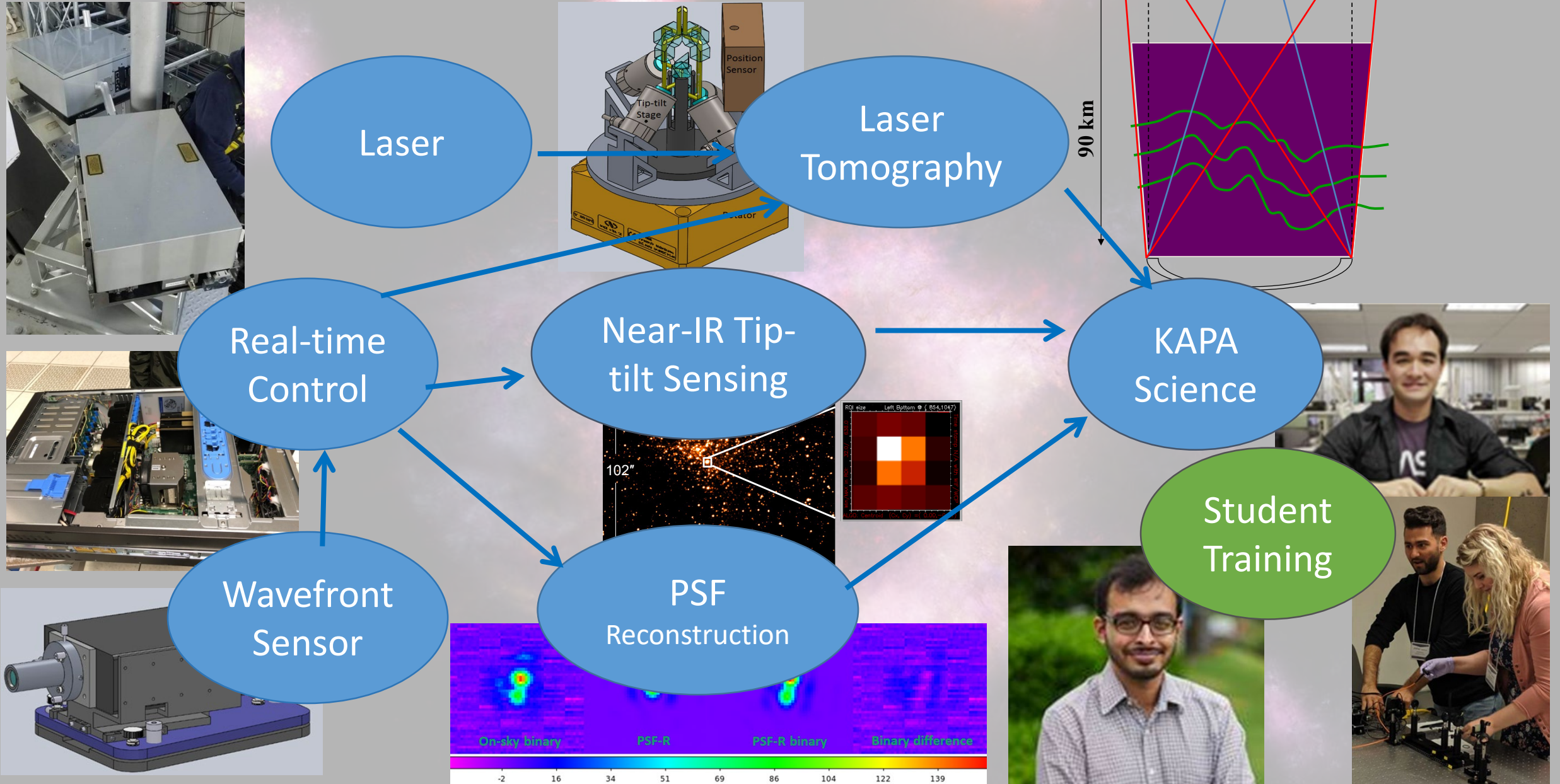


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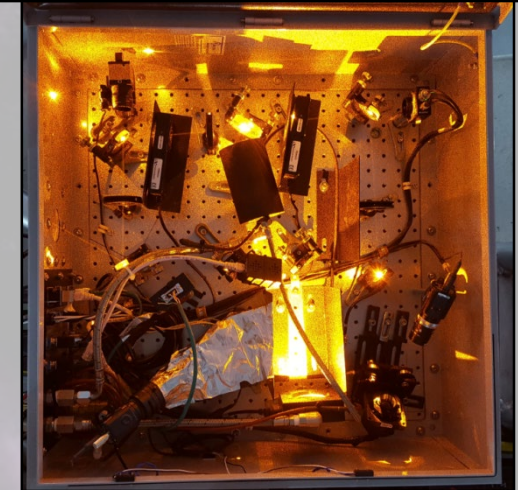
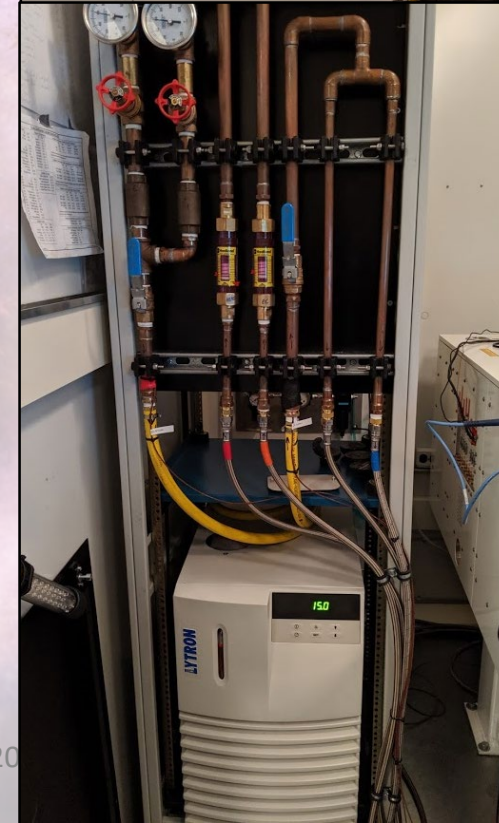
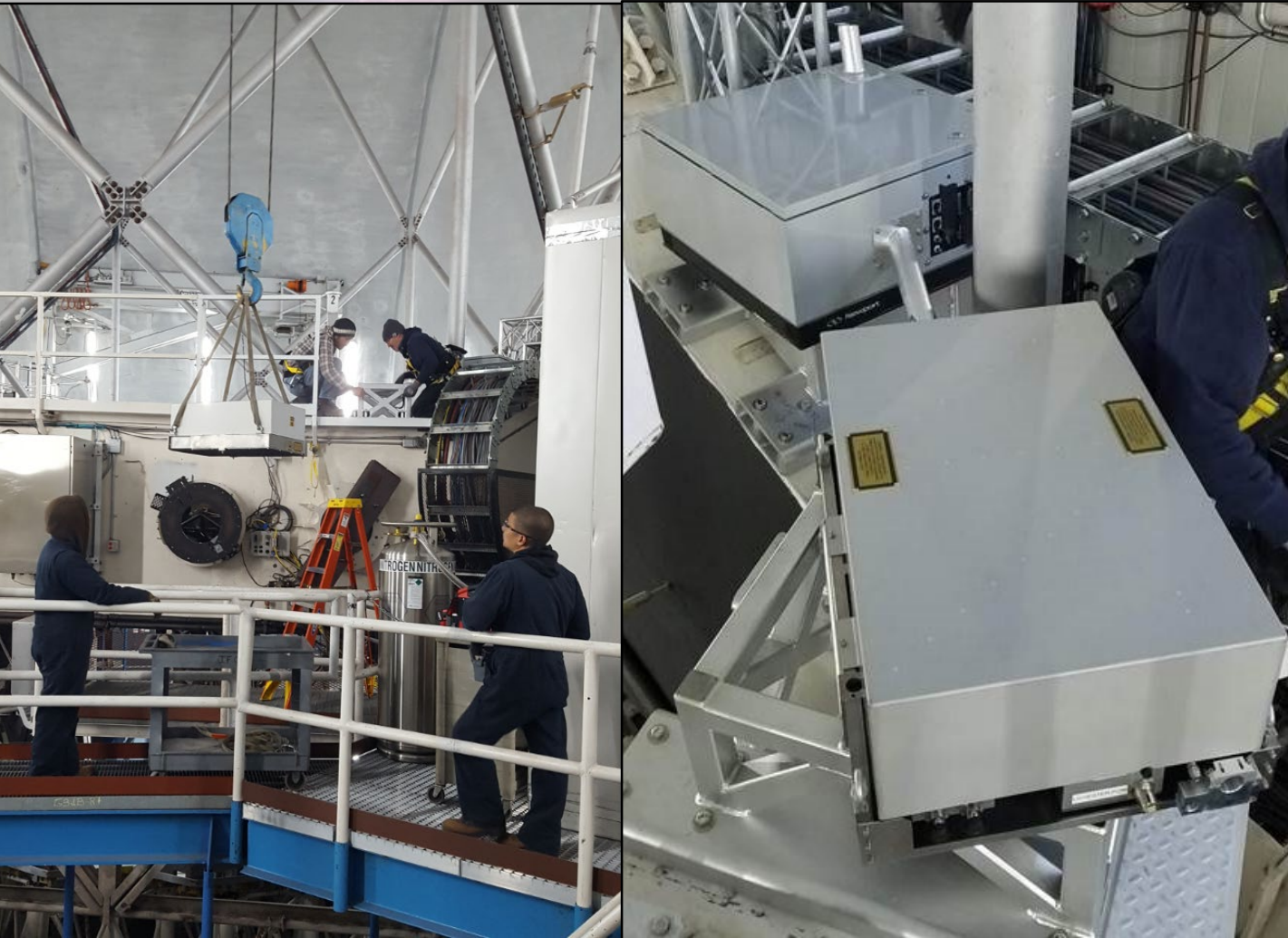


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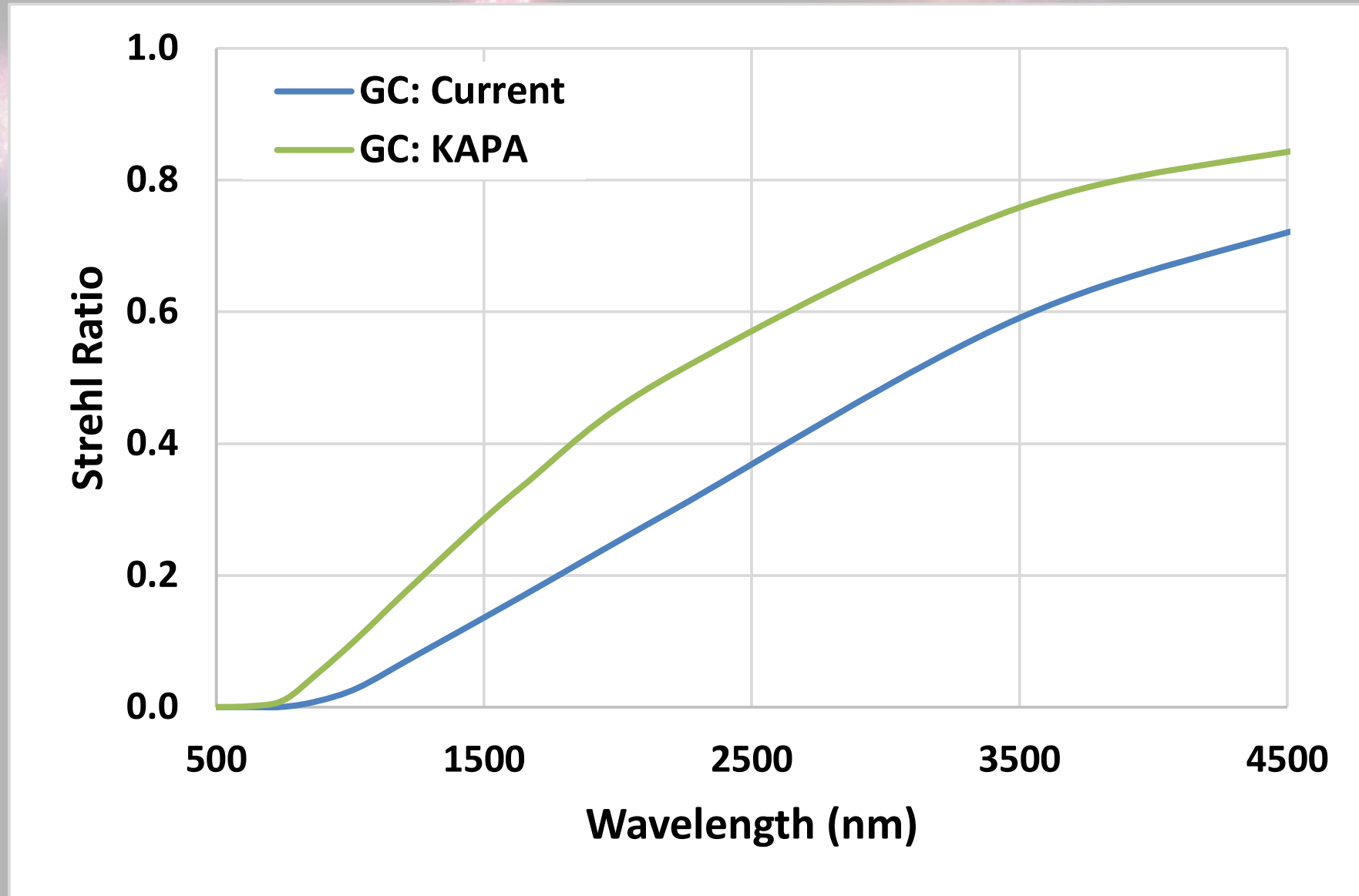
Keck All Sky Precision Adaptive Optics (KAPA)



New Toptica Laser (for K1) Replaces 2nd gen Diode Laser

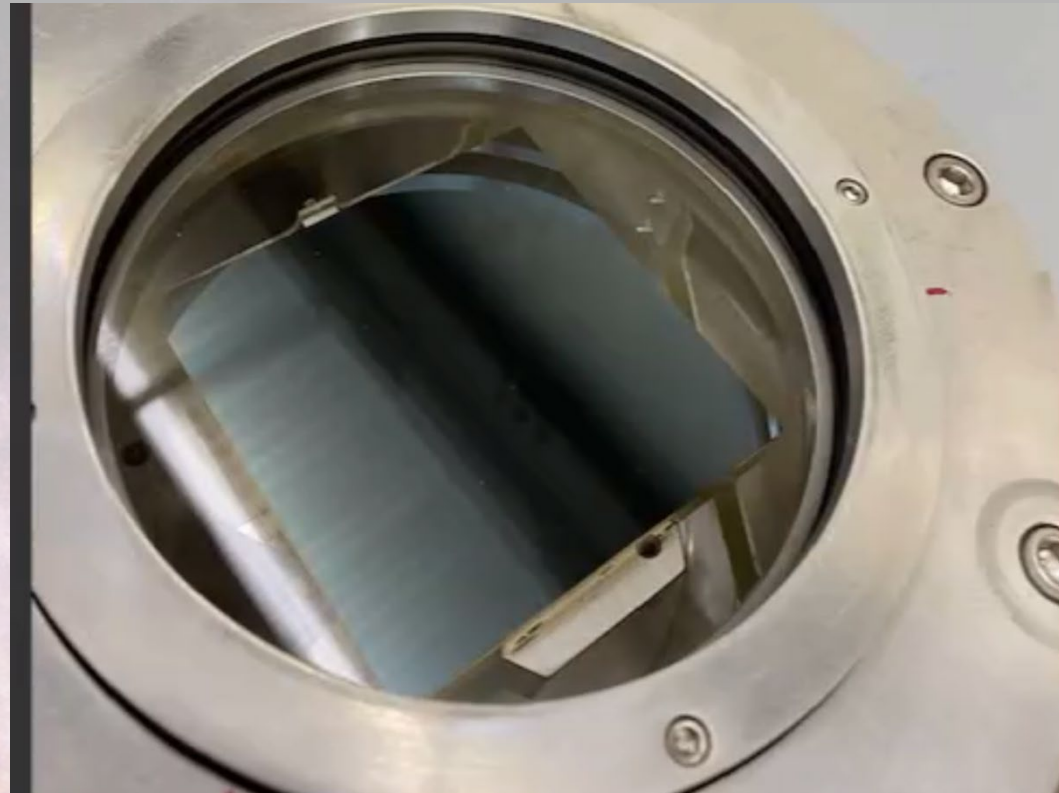


KAPA Performance Gains

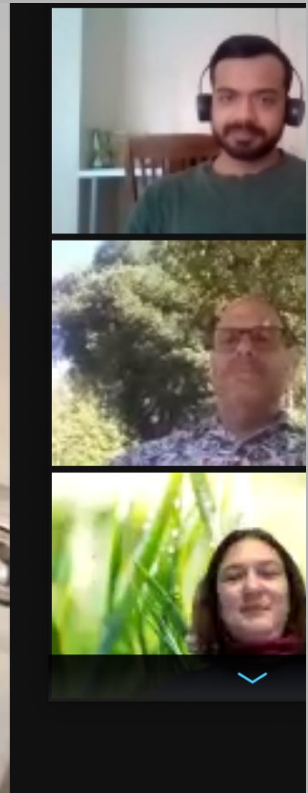


LRIS Red Detector Upgrade

- Current LRIS Red side continues to decline
 - Two middle amps 1 & 4 are not responding normally
 - Single amp mode gets half field.
- Replacement detector system being fabricated at UCSA. Delivery in late Mar 2021
- Engineering April and May 2021

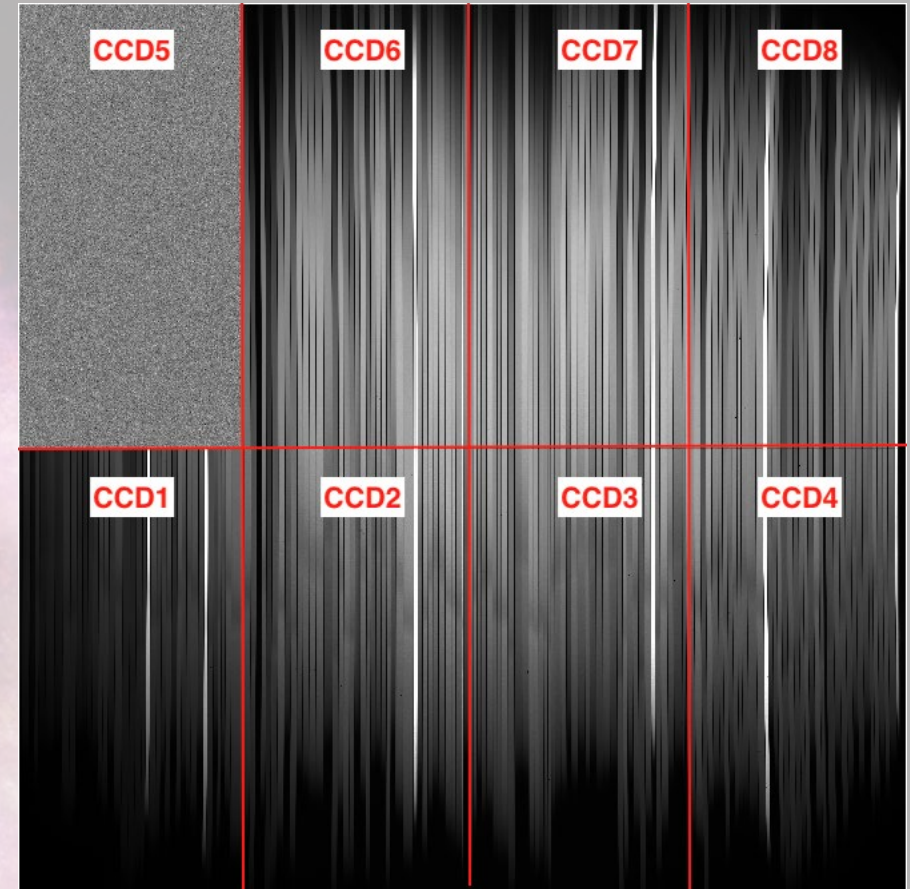


- Engineering detector in the test dewar
- Student involvement



DEIMOS Detector Continuing Issues

- Impacts to spectroscopy:
 - CCD5 is dead. Problem internal to dewar
- Impacts to imaging mode
 - CCD3A bias frames have a horizontal noise pattern.
 - CCD8A has a lower gain than the rest of the CCD mosaic.
- June 2020: CCD2 recently exhibited bad bias. Replaced the A/D on the video board to fix.
- Developing proposal to replace detector system in its entirety



DSI: The Data Services Initiative

- Program to change the end-to-end way the observatory manages data
- Strategic goals:
 - Increase observing efficiency
 - Increase science efficiency
 - Increase science yield

Other Projects

- Building a laser frequency comb for NIRSPEC for eventual use with future high resolution infrared spectrometer (HISPEC)
- SCALES: in preliminary design, seeking construction funding
 - Low-spectral-resolution microlens-based 3-5 micron IFU for use behind facility AO system, with vortex coronagraph
- HISPEC: seeking funding; concept design completed
 - Diffraction-limited, fiber-fed high-resolution infrared spectrograph covering the Y to K band spectral range in one shot (part of TMT MODHIS)
- FOBOS [DEIMOS replacement]: seeking funding for preliminary design phase
- LIGER [OSIRIS replacement]: preliminary design underway

The background of the image is a deep space scene. It features several bright, colorful galaxies and nebulae. In the upper left, there's a small, bright, yellowish-white core surrounded by a purple and blue nebula. To its right, another similar but slightly dimmer core is visible. In the upper right, a larger, more complex galaxy with a bright yellow core and surrounding purple and blue clouds is present. The central part of the image is dominated by a large, diffuse, and colorful nebula with shades of purple, blue, and yellow. The overall background is a deep black, suggesting the vastness of space.

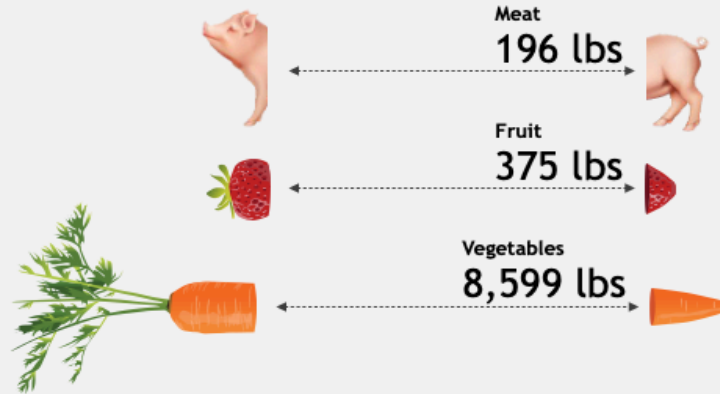
Community Support

Farms 2 Families F2F

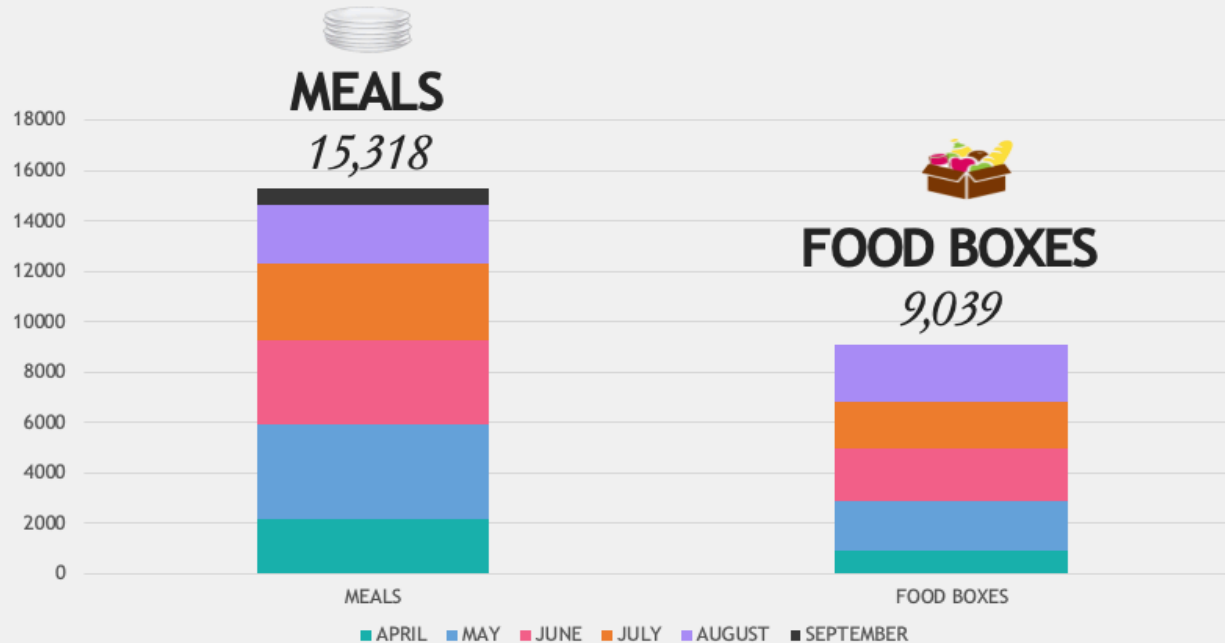
"The number [of community members in need] continues to go up weekly and we wonder what the future holds for our program. It has more than tripled since the pandemic hit our state. Thank you so much for your thoughtfulness and generosity, and for being part of the community pulling together."

-Miles Okumura, Honokaa Hongwanji Peace Committee, Friday Community Meal Program

Final as of
SEPT 30



F2F Donated Produce Has Gone Into:



Received \$131,795 from foundation grant,
WMKO + MKO, staff and astronomer donations

14 Local Farms

- 4-H Program, Hawaii State
- Ano`ano
- Hawaii Farming
- Hawaii Ulu Producers
- Hawaiian B Naturals
- Hirabara
- HL
- Honopua
- Huluhulu
- JA
- Kawamata
- Mother Nature's Miracle
- Olakino Hawaii
- Tess's Gardens

8 Food Distributers

- Annunciation Catholic Church Food Pantry
- Big Island Giving Tree
- Honokaa Hongwanji Peace Committee
- Kokua Christian Ministries Food Pantry
- NHERC Food Basket Ohana Drop
- Sacred Heart Food Basket
- St. Columba Community Meal
- St. James Community Meal

Financial Support for 12 Community Programs

- Annunciation Catholic Church Food Pantry
- BRIDGES
- Food Basket/KTA DA BUX program
- Foodland Kupuna Hour
- Hawaiian Community Assets
- Honokaa Hongwanji Peace Committee
- Kohala Center Full Calabash Fund
- Kokua Christian Ministries Food Pantry
- KTA Kupuna Hour
- Rescue Food Program
- St. James Community Meal
- Umeke Ai

Building Community Resilience & Sustainability



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The background of the slide is a deep space image featuring several galaxies. A large, prominent galaxy with a complex, multi-lobed structure is centered in the lower half, displaying a mix of purple, magenta, and yellowish-white light. Above it, three smaller, more compact galaxies are visible, each with a bright central core and a diffuse, glowing halo. The overall color palette is dominated by dark purples and magentas against a black background, with bright yellow and white highlights from the galactic cores and star-forming regions.

Questions?