University of Hawai‘i Institute for Astronomy Overview

Doug Simons, IfA Director

UH Institute for Astronomy – 3 Islands, 1 Program

IfA-Hilo – A Nexus for Astronomy

Maunakea Shared Services – Hale Pohaku & Visitor Information Station

Community Outreach

UH Hilo Astronomy Program

Graduate Students

NASA IRTF Operations

UH 88” Operations

UKIRT Operations

Research & Education

Advanced Tech Development (Labs & Machine Shop)

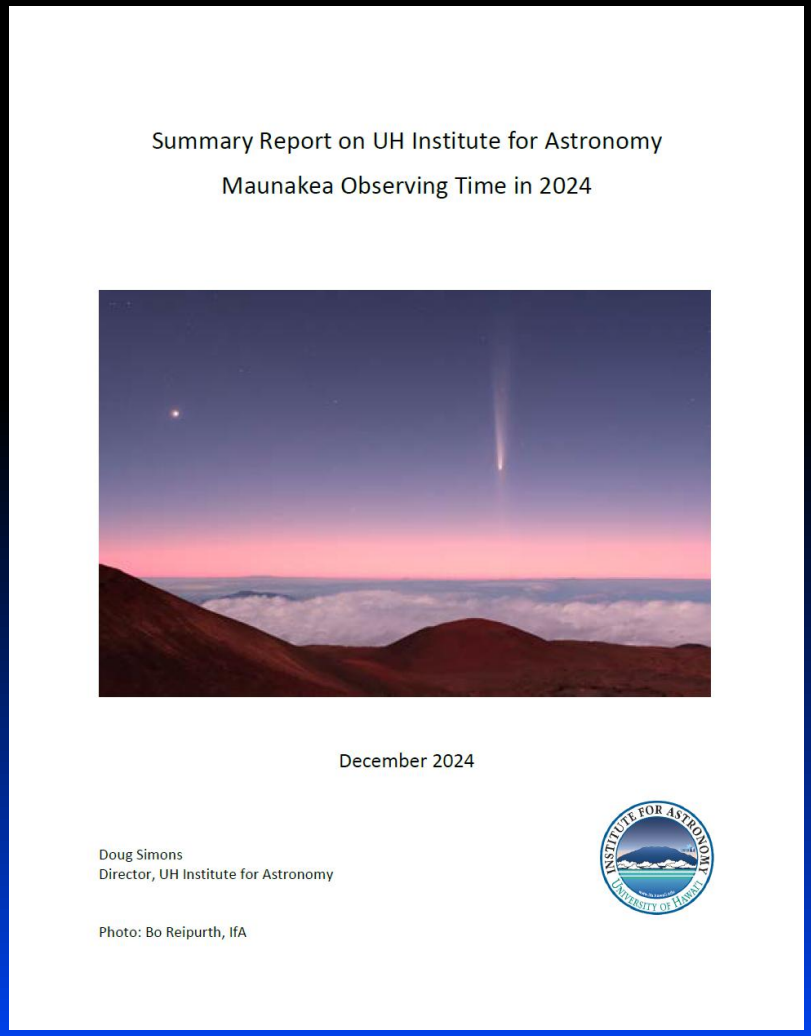
UH Institute for Astronomy – 3 Islands, 1 Program


Maunakea Observatories


Haleakalā Observatories

With major facilities on 3 islands the UH Institute for Astronomy
is among the largest university astronomy programs in the world

Research Product


Summary Report on UH Institute for Astronomy

Maunakea Observing Time in 2024

December 2024

Doug Simons
Director, UH Institute for Astronomy

Photo: Bo Reipurth, IfA

- 299 papers published involving IfA faculty and students in 2024
  - About half include MKO data and of those, ~30% involve IfA graduate students
- Access to MKOs to conduct research is one of the key distinctions for IfA graduate students, helping them succeed in a competitive employment arena after graduation


IfA Education Program
Photo: Don Mitchell

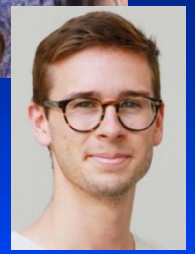
Undergraduate and Graduate Programs

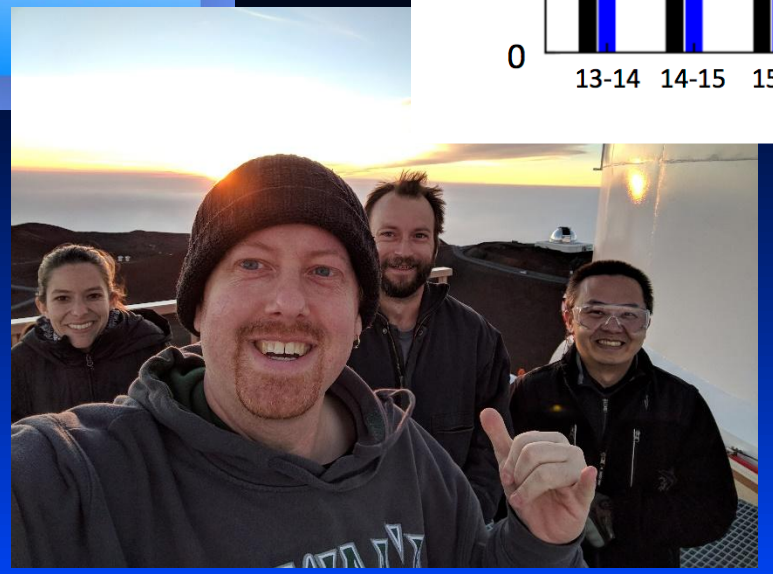
IfA Education Programs

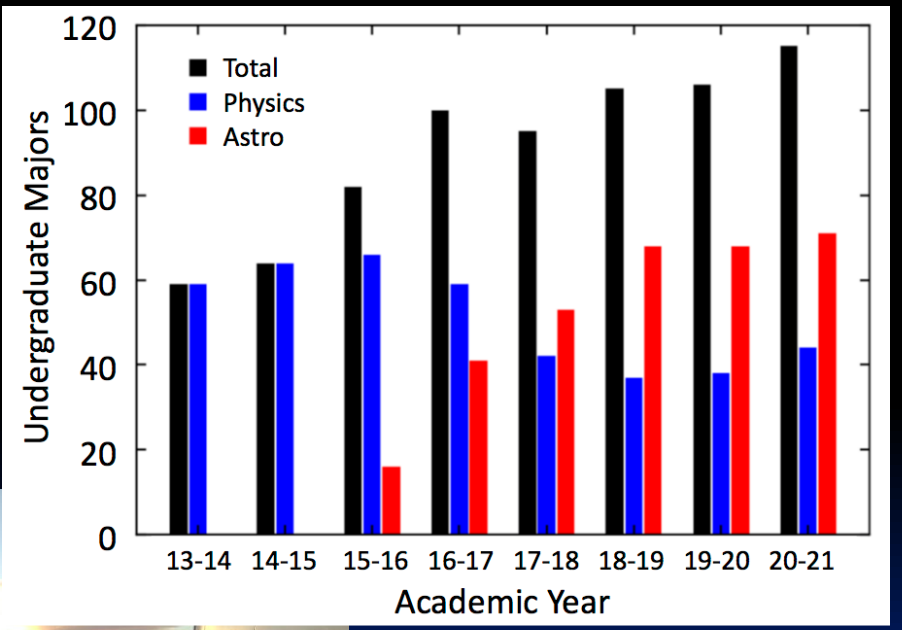
WE OFFER ASTRONOMY EDUCATION PROGRAMS

Programs for those pursuing degrees in Astronomy & Astrophysics

- Astronomy Graduate Program
- BA in Astronomy
- BS in Astrophysics
- Undergraduate Research Program

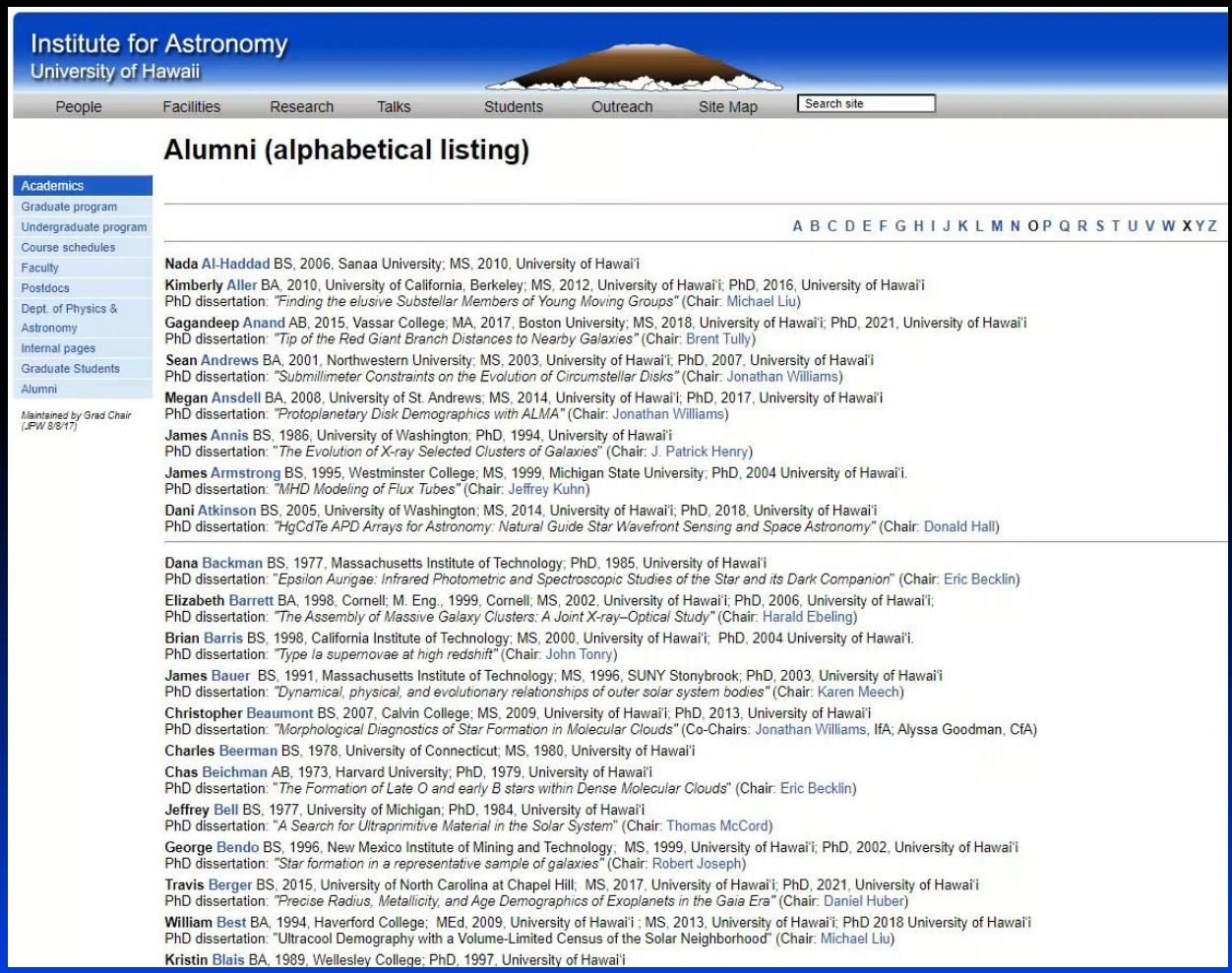






50+ Years of Advancing the Future of Astronomy Through our Graduates

- ~200 graduate students educated at IfA over the past ~50 years, influencing international astronomy
  - Graduates now have important roles around the world including NASA, National Science Foundation, leadership roles at universities, etc.
- Today IfA has ~170 staff, faculty, and grad-students distributed across our 3 sites
- Annual base budget ~$10M generating ~$20M each year in extramural funds



Institute for Astronomy
University of Hawaii

People Facilities Research Talks Students Outreach Site Map Search site

Alumni (alphabetical listing)

Academics
Graduate program
Undergraduate program
Course schedules
Faculty
Postdocs
Dept. of Physics & Astronomy
Internal pages
Graduate Students
Alumni

Maintained by Grad Chair (JFW 8/8/17)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Nada Al-Haddad BS, 2006, Sanaa University; MS, 2010, University of Hawai'i

Kimberly Aller BA, 2010, University of California, Berkeley; MS, 2012, University of Hawai'i; PhD, 2016, University of Hawai'i
PhD dissertation: *"Finding the elusive Substellar Members of Young Moving Groups"* (Chair: Michael Liu)

Gagandeep Anand AB, 2015, Vassar College; MA, 2017, Boston University; MS, 2018, University of Hawai'i; PhD, 2021, University of Hawai'i
PhD dissertation: *"Tip of the Red Giant Branch Distances to Nearby Galaxies"* (Chair: Brent Tully)

Sean Andrews BA, 2001, Northwestern University; MS, 2003, University of Hawai'i; PhD, 2007, University of Hawai'i
PhD dissertation: *"Submillimeter Constraints on the Evolution of Circumstellar Disks"* (Chair: Jonathan Williams)

Megan Ansdell BA, 2008, University of St. Andrews; MS, 2014, University of Hawai'i; PhD, 2017, University of Hawai'i
PhD dissertation: *"Protoplanetary Disk Demographics with ALMA"* (Chair: Jonathan Williams)

James Annis BS, 1986, University of Washington; PhD, 1994, University of Hawai'i
PhD dissertation: *"The Evolution of X-ray Selected Clusters of Galaxies"* (Chair: J. Patrick Henry)

James Armstrong BS, 1995, Westminster College; MS, 1999, Michigan State University; PhD, 2004 University of Hawai'i.
PhD dissertation: *"MHD Modeling of Flux Tubes"* (Chair: Jeffrey Kuhn)

Dani Atkinson BS, 2005, University of Washington; MS, 2014, University of Hawai'i; PhD, 2018, University of Hawai'i
PhD dissertation: *"HgCdTe APD Arrays for Astronomy: Natural Guide Star Wavefront Sensing and Space Astronomy"* (Chair: Donald Hall)

Dana Backman BS, 1977, Massachusetts Institute of Technology; PhD, 1985, University of Hawai'i
PhD dissertation: "*Epsilon Aurigae: Infrared Photometric and Spectroscopic Studies of the Star and its Dark Companion*" (Chair: Eric Becklin)

Elizabeth Barrett BA, 1998, Cornell; M. Eng., 1999, Cornell; MS, 2002, University of Hawai'i; PhD, 2006, University of Hawai'i;
PhD dissertation: *"The Assembly of Massive Galaxy Clusters: A Joint X-ray–Optical Study"* (Chair: Harald Ebeling)

Brian Barris BS, 1998, California Institute of Technology; MS, 2000, University of Hawai'i; PhD, 2004 University of Hawai'i.
PhD dissertation: *"Type Ia supernovae at high redshift"* (Chair: John Tonry)

James Bauer BS, 1991, Massachusetts Institute of Technology; MS, 1996, SUNY Stonybrook; PhD, 2003, University of Hawai'i
PhD dissertation: *"Dynamical, physical, and evolutionary relationships of outer solar system bodies"* (Chair: Karen Meech)

Christopher Beaumont BS, 2007, Calvin College; MS, 2009, University of Hawai'i; PhD, 2013, University of Hawai'i
PhD dissertation: *"Morphological Diagnostics of Star Formation in Molecular Clouds"* (Co-Chairs: Jonathan Williams, IfA; Alyssa Goodman, CfA)

Charles Beerman BS, 1978, University of Connecticut; MS, 1980, University of Hawai'i

Chas Beichman AB, 1973, Harvard University; PhD, 1979, University of Hawai'i
PhD dissertation: "*The Formation of Late O and early B stars within Dense Molecular Clouds*" (Chair: Eric Becklin)

Jeffrey Bell BS, 1977, University of Michigan; PhD, 1984, University of Hawai'i
PhD dissertation: "*A Search for Ultraprimitive Material in the Solar System*" (Chair: Thomas McCord)

George Bendo BS, 1996, New Mexico Institute of Mining and Technology; MS, 1999, University of Hawai'i; PhD, 2002, University of Hawai'i
PhD dissertation: *"Star formation in a representative sample of galaxies"* (Chair: Robert Joseph)

Travis Berger BS, 2015, University of North Carolina at Chapel Hill; MS, 2017, University of Hawai'i; PhD, 2021, University of Hawai'i
PhD dissertation: *"Precise Radius, Metallicity, and Age Demographics of Exoplanets in the Gaia Era"* (Chair: Daniel Huber)

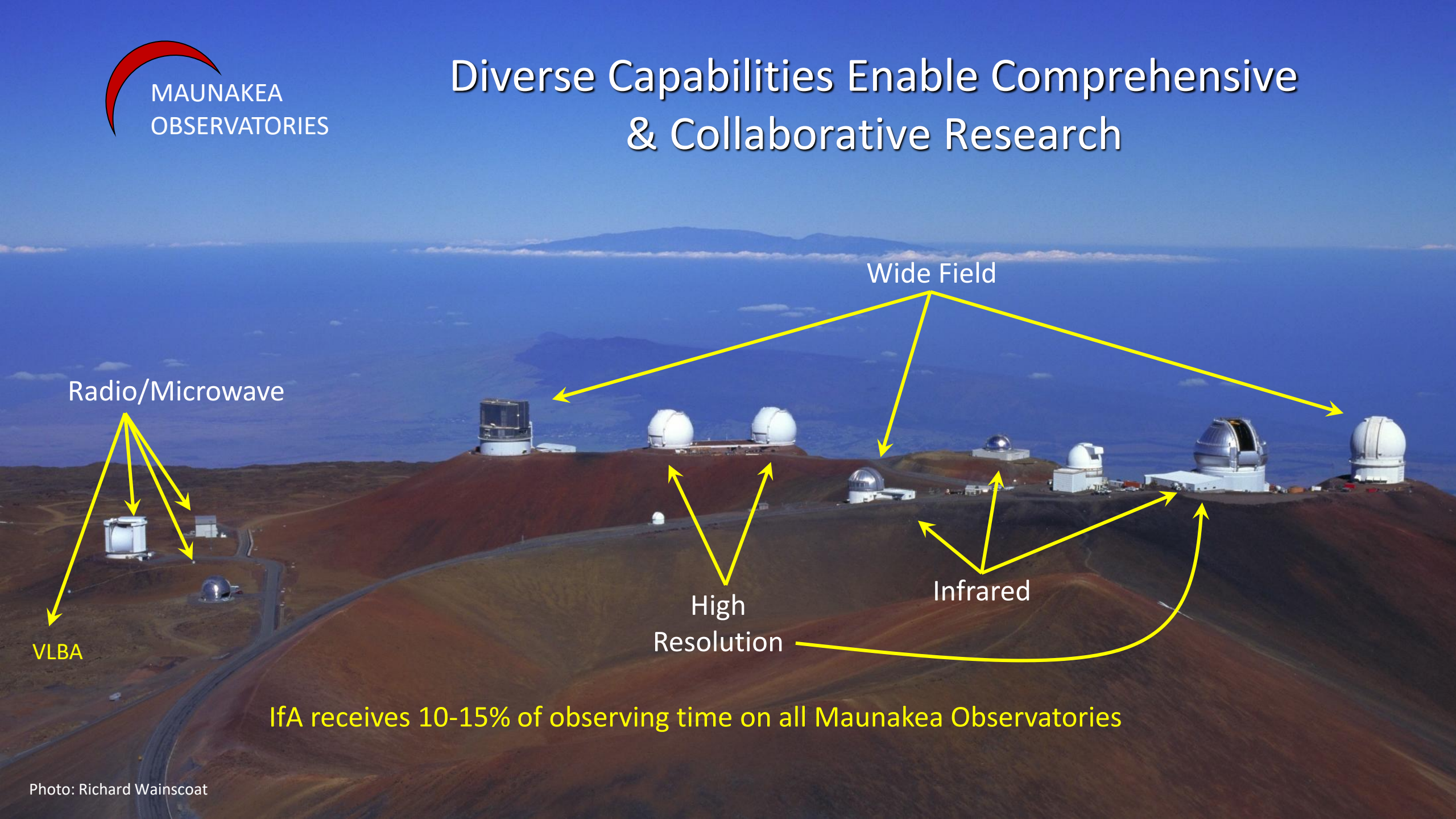
William Best BA, 1994, Haverford College; MEd, 2009, University of Hawai'i ; MS, 2013, University of Hawai'i; PhD 2018 University of Hawai'i
PhD dissertation: "Ultracool Demography with a Volume-Limited Census of the Solar Neighborhood" (Chair: Michael Liu)

Kristin Blais BA, 1989, Wellesley College; PhD, 1997, University of Hawai'i


IfA Research

MAUNAKEA OBSERVATORIES

Diverse Capabilities Enable Comprehensive & Collaborative Research

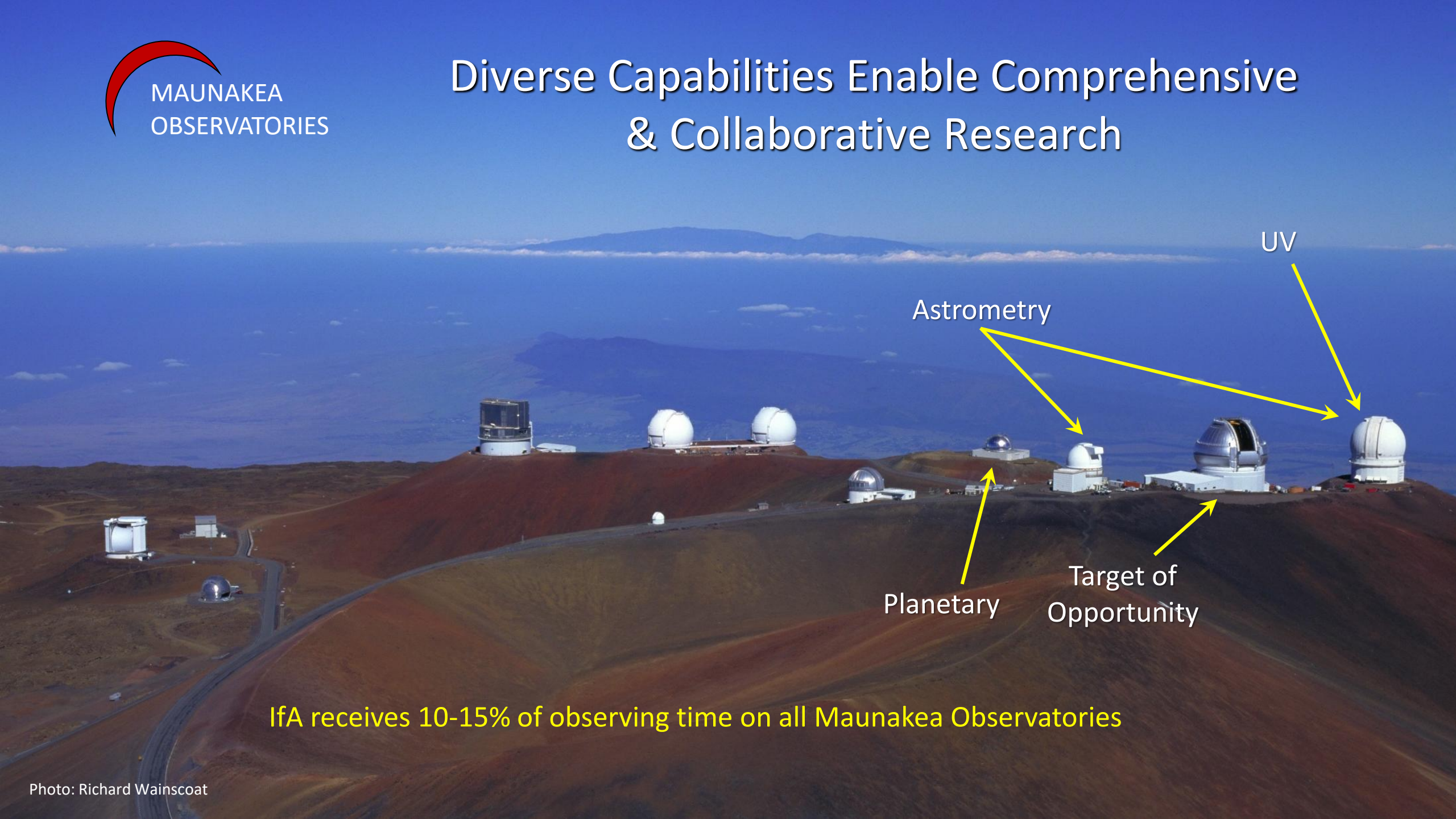


IfA receives 10-15% of observing time on all Maunakea Observatories

Photo: Richard Wainscoat

MAUNAKEA
OBSERVATORIES

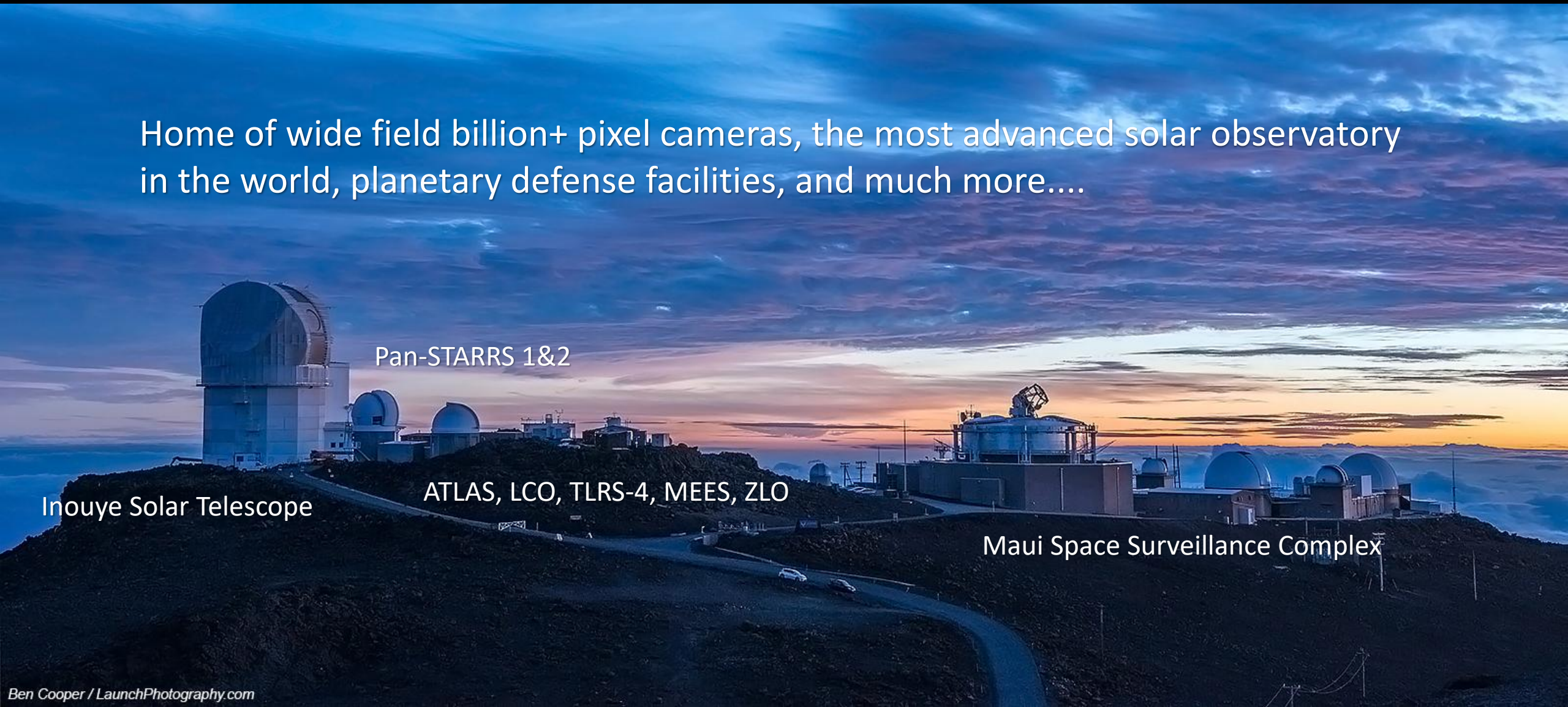
Diverse Capabilities Enable Comprehensive & Collaborative Research



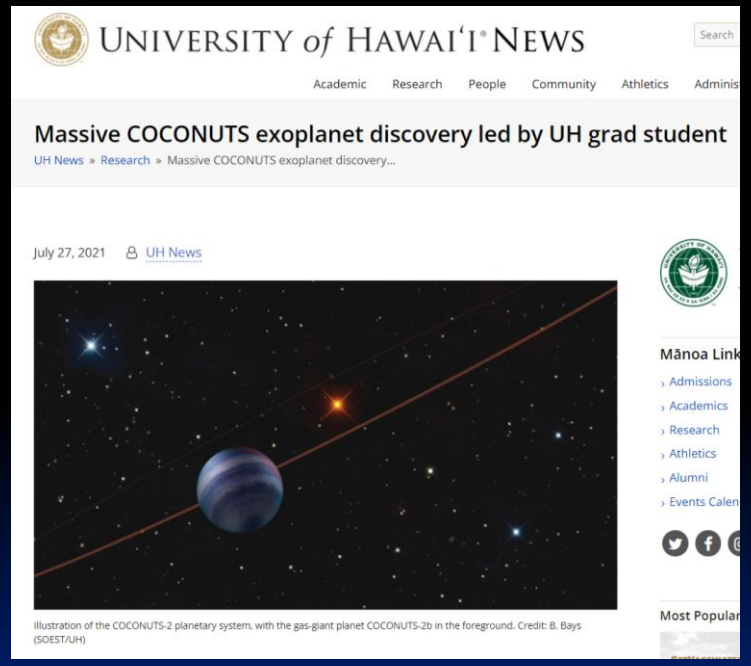
IfA receives 10-15% of observing time on all Maunakea Observatories

Photo: Richard Wainscoat

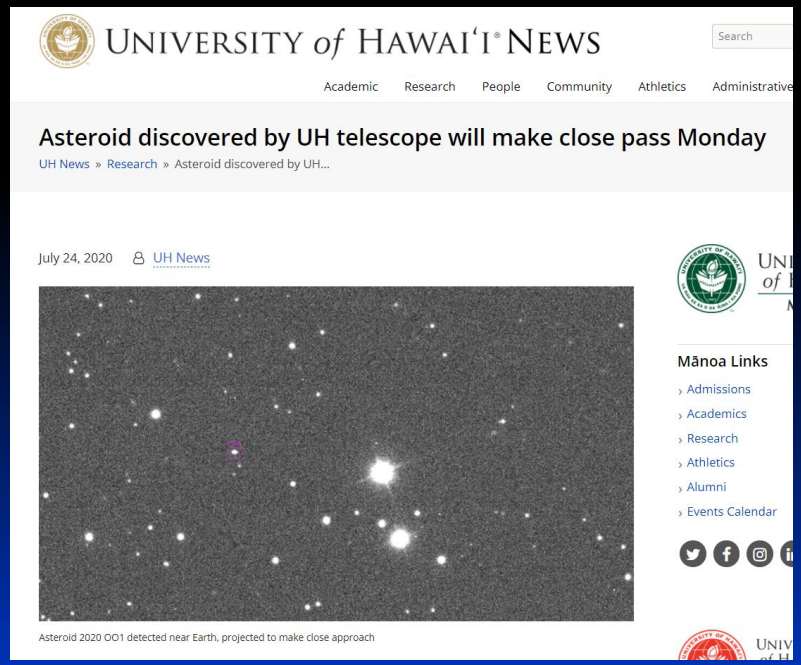
Haleakalā High Altitude Observatory



Fantastic Research…



Exoplanets

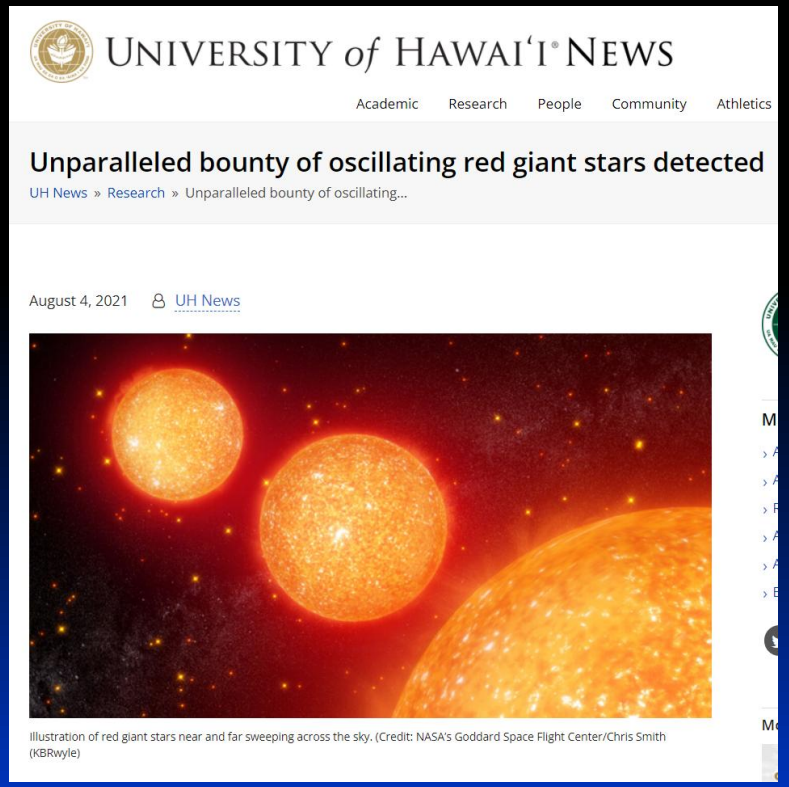


Asteroids – Planetary Defense

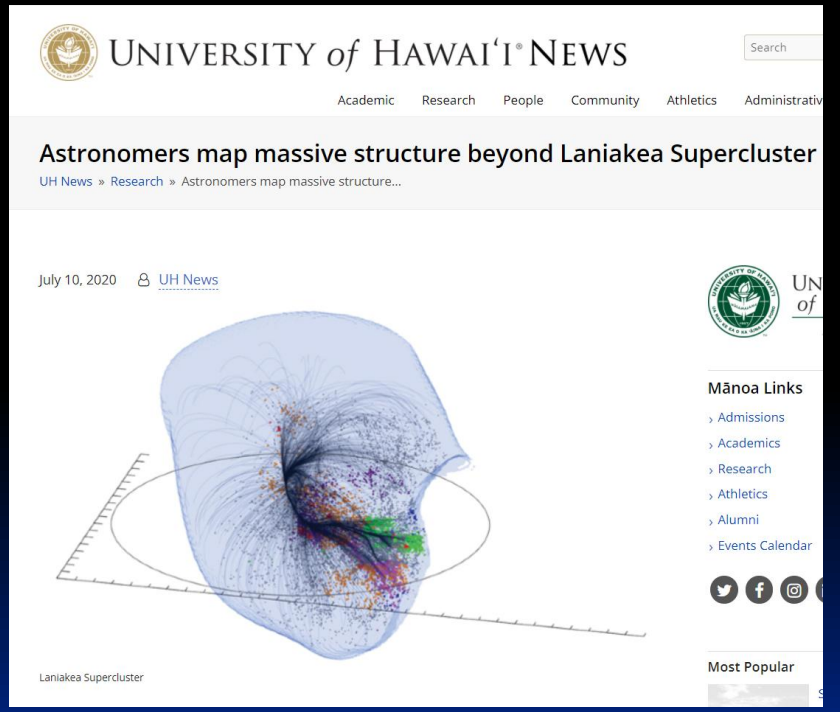
Solar System

Fantastic Research...

Stellar Remnants



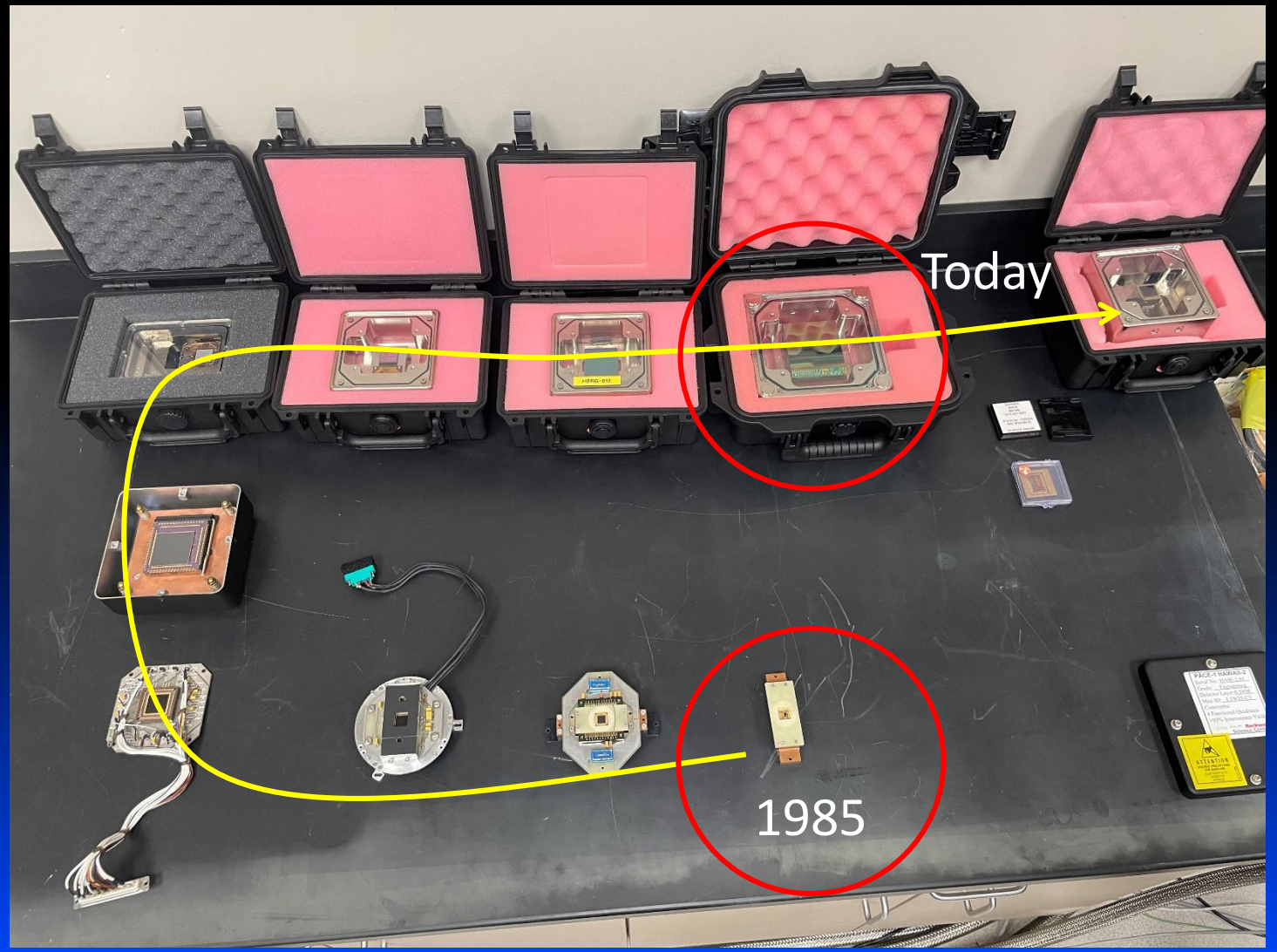
Pulsating Stars



Large Scale Structure
in our Universe


IfA Technology Development

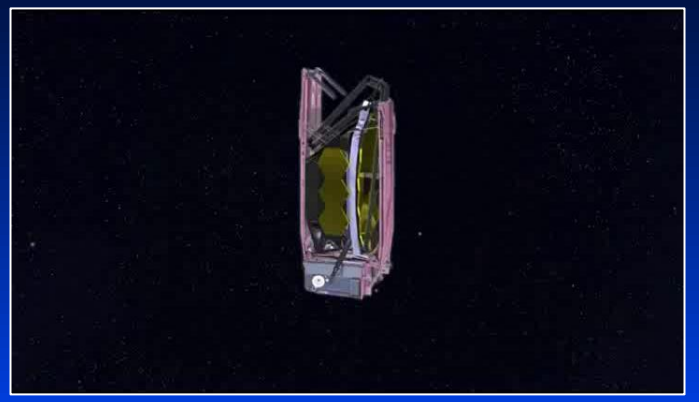
35 Years of Infrared Array Development at IfA



Applying this Technology Around the World & in Space

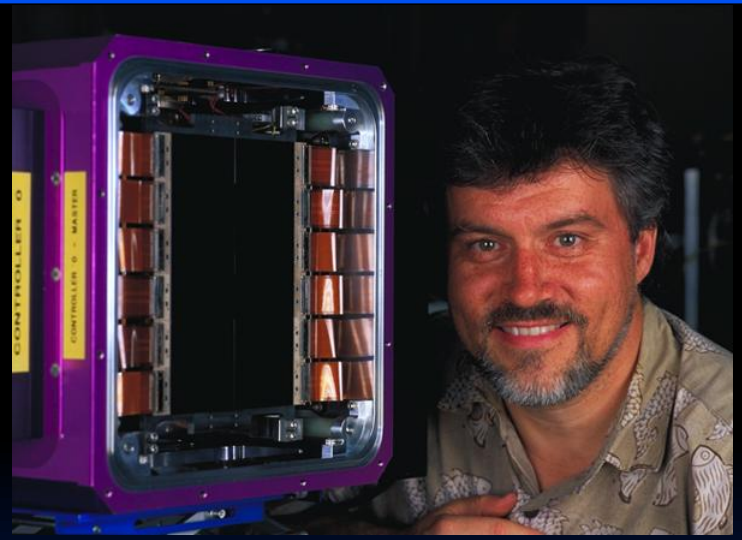
- SPIRou is CFHT's latest instrument – a near infrared ultra-stable (1 m/s) spectropolarimeter designed to search for exoplanets in the habitable zones of nearby stars
  - It is the first instrument to use a 1-2.5 µm H4RG near-infrared sensor and infrared transmitting fiber optics (transmits out to 2.5 µm)
  - SPIRou is being used to conduct a very large scale search for exoplanets from Maunakea -
    - 300 nights via the Large Program CfP out now
    - Likely >500 nights of observing time over it's lifetime
- James Webb Space Telescope - $10B satellite probing deeper into the early universe than any telescope built to date, searching for biomarkers in the atmospheres of exoplanets, and much, much more...

SPIRou Being Assembled at CFHT

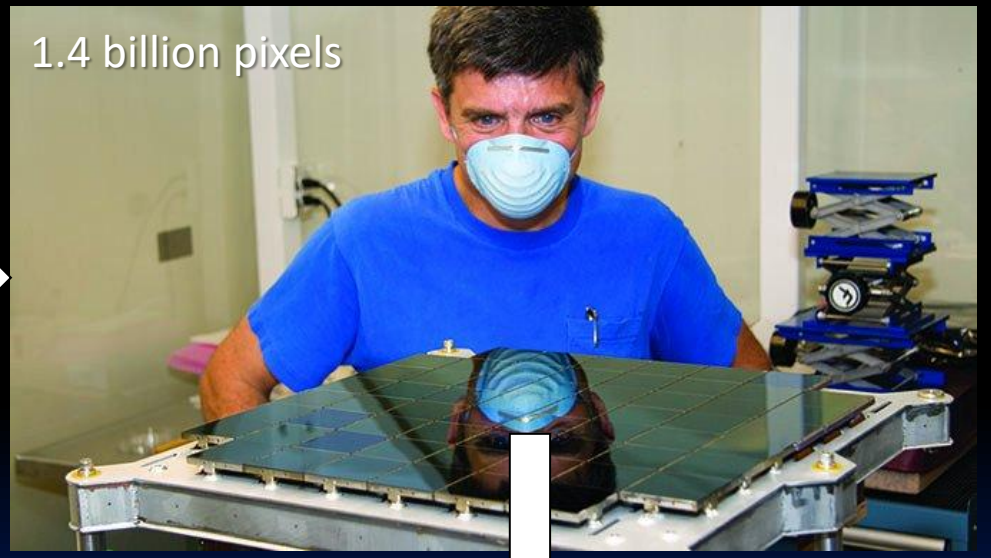


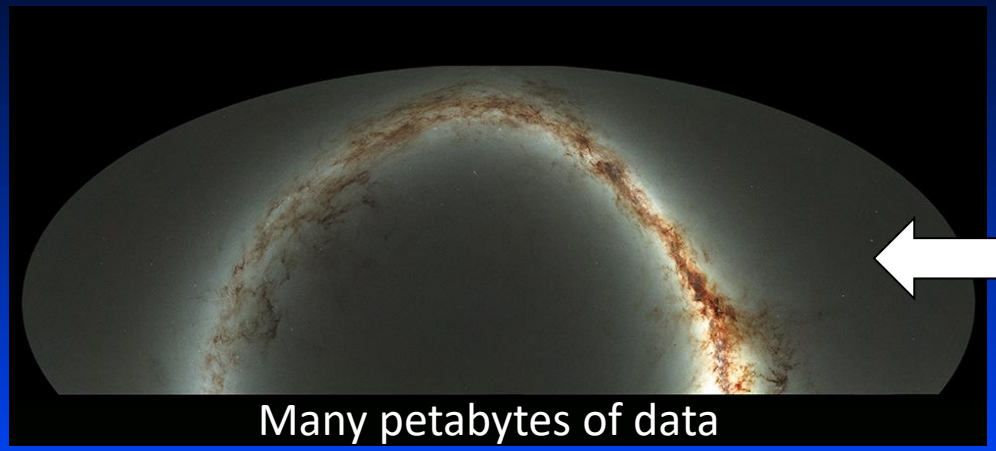
James Webb Space Telescope

IfA – Leader in Developing Large Format Digital Focal Planes



100 million pixels





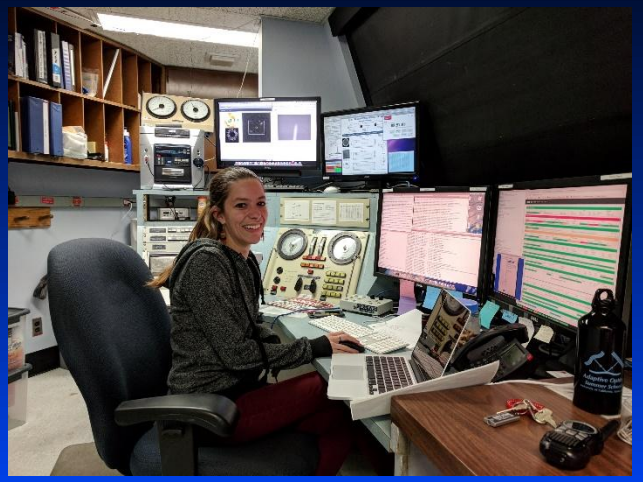
Many petabytes of data

Robo AO

Robo-AO

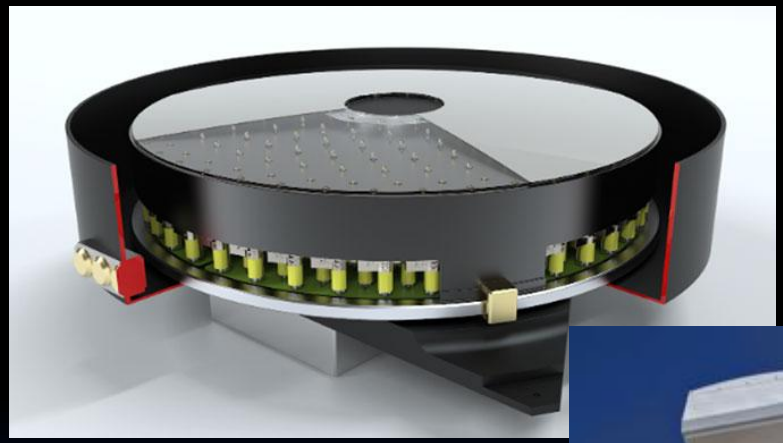
Fully automated telescope + laser guide star + adaptive optics

Students testing remote control S/W for 88”



Adaptive Secondary Mirror

- ASM technology being developed at IfA-Hilo for demonstration on NASA IRTF and UH 2.2 m
- Lower cost approach to previous ASMs
  - Actuators
  - Face sheet
  - Calibration/control
- Intended to serve as tech-demonstrator for eventual use on various facilities



IRTF Adaptive Secondary Mirror

The first near-IR diffraction limited image on IRTF!

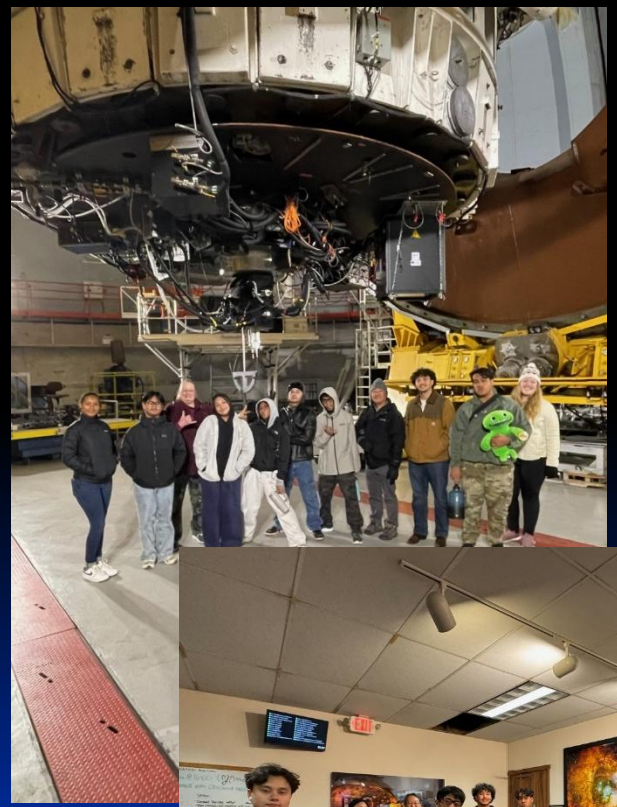
Photos: Mike Connelley


IfA Community Connections

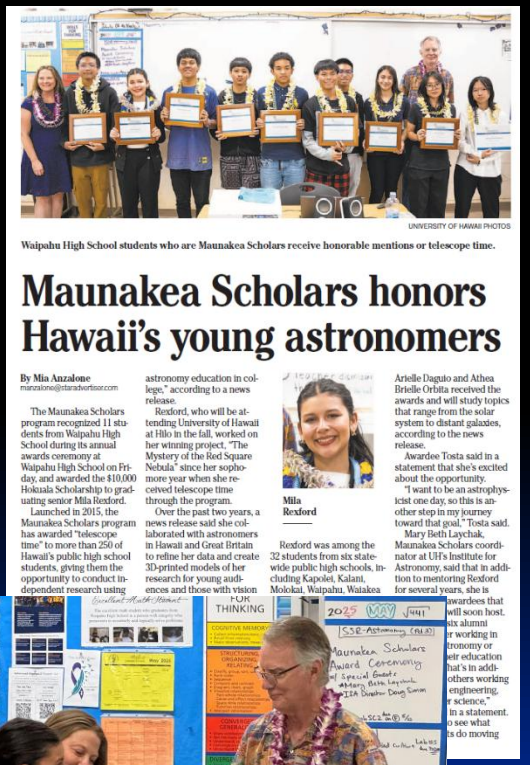
Lots of Outreach Programs!

Maunakea Scholars at Molokai High

Kapolei Maunakea Scholars Visit CFHT



Maunakea Scholars Awards at Waipahu High



UNIVERSITY OF HAWAII PHOTOS

Waipahu High School students who are Maunakea Scholars receive honorable mentions or telescope time.

Maunakea Scholars honors Hawaii's young astronomers

By Mia Anzalone
manzalone@staradvertiser.com

The Maunakea Scholars program recognized 11 students from Waipahu High School during its annual awards ceremony at Waipahu High School on Friday, and awarded the $10,000 Hōkūala Scholarship to graduating senior Mila Rexford.

Launched in 2015, the Maunakea Scholars program has awarded "telescope time" to more than 250 of Hawaii's public high school students, giving them the opportunity to conduct independent research using astronomy education in college," according to a news release.

Rexford, who will be attending University of Hawaii at Hilo in the fall, worked on her winning project, "The Mystery of the Red Square Nebula" since her sophomore year when she received telescope time through the program.

Over the past two years, a news release said she collaborated with astronomers in Hawaii and Great Britain to refine her data and create 3D-printed models of her research for young audiences and those with vision

Mila Rexford

Rexford was among the 32 students from six statewide public high schools, including Kapolei, Kalani, Molokai, Waipahu, Waiakea

Arielle Dagulo and Athea Brielle Orbita received the awards and will study topics that range from the solar system to distant galaxies, according to the news release.

Awardee Tosta said in a statement that she's excited about the opportunity.

"I want to be an astrophysicist one day, so this is another step in my journey toward that goal," Tosta said.

Mary Beth Laychak, Maunakea Scholars coordinator at UH's Institute for Astronomy, said that in addition to mentoring Rexford for several years, she is

awardees that will soon host. six alumni r working in tronomy or eir education hat's in addi- others working engineering, r science," In a statement. o see what s do moving

Mila is starting at UH Hilo this fall majoring in astronomy

Hawai‘i State Astronomy Program

Origins & Future Growth

Photo: Bo Reipurth

The Hawai‘i State Astronomy Program

- In exchange for providing Maunakea and Haleakalā access to various governments, the State of Hawai‘i was provided access to observatories sponsored by those governments, enabling the State’s astronomy program
  - Same model used elsewhere, e.g., Chile and Spain
- *That State program is hosted by UH* – the institution tasked with creating a program that broadly benefits the State and is part of a strategy envisioned decades ago by Gov. Burns to leverage Hawai‘i’s natural resources to increase our global presence and value while benefitting the people of Hawai‘i

Linking Act 255 to Past and Future

Approved by the Governor
on JUL 07 2022
HOUSE OF REPRESENTATIVES
THIRTY-FIRST LEGISLATURE, 2022
STATE OF HAWAII

ORIGINAL

ACT 255
H.B. NO. 2024 H.D. 1 S.D. 2 C.D. 1

A BILL FOR AN ACT

RELATING TO MAUNA KEA.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

PART I

SECTION 1. The purpose of this Act is to establish the Mauna Kea stewardship and oversight authority and a transition and governance structure for the management of Mauna Kea lands.

SECTION 2. The Hawaii Revised Statutes is amended by adding a new chapter to be appropriately designated and to read as follows:

"CHAPTER

MAUNA KEA STEWARDSHIP AND OVERSIGHT AUTHORITY

§ -1 Findings and purpose. The legislature finds that Mauna Kea serves as an important cultural and genealogical site to the people of Hawaii, particularly to Native Hawaiians. The summit region of Mauna Kea is a spiritual and special place of significance that is home to cultural landscapes, fragile habitats, and historical and archaeological artifacts. Due to its topographical prominence, Mauna Kea is also a highly valued site for astronomical study, which produces many significant discoveries that contribute to humanity's study and

(2) Conduct an assessment on whether the University of Hawaii school of astronomy should be relocated, in whole or in part, to the University of Hawaii at Hilo; and

§ -8 Astronomy development; declaration of policy; reserved viewing or observing time and other requirements. (a) It is declared that the support of astronomy consistent with section -1 is a policy of the State.

Beginnings

Governor Burns speaking at Hale Pohaku in 1964 at a dedication to the new Maunakea Summit Road and observatory test site

The committee also should help develop "action programs to make the bright new world of science a beneficial reality to Hawaii's people," the Governor said.

A-8 HONOLULU ADVERTISER Friday, August 7, 1964

Burns Urges Science Group To Push Job Opportunities

Governor Burns yesterday told members of his new Advisory Committee on Science and Technology that the committee should "play a crucial role in identifying those research and science areas which hold the highest promise of employment opportunities for our sons and daughters."

The committee also should help develop "action programs to make the bright new world of science a beneficial reality to Hawaii's people," the Governor said.

* * *

BURNS SPOKE at a Washington Place luncheon for the 14 committee members whom he appointed Tuesday.

As research and development increase, "the premium paid for intelligence will be higher than ever," Burns said.

"The industries of the future will be attracted less by natural resource availability, cheap labor and transportation networks than by available pools of skilled technicians and scientists."

* * *

THE GOVERNOR noted that Hawaii has "some obvious natural advantages in this area of scientific research, in the areas of oceanography and space exploration."

He said, "We must capitalize on these, utilizing all of our available resources at the University, in the industrial community and at the levels of State and local government."

Burns also emphasized Hawaii is not "constrained by these physical advantages. We can acquire competence in any field of scientific inquiry. The limitations are only those we impose on ourselves."

He said members of the committee have the necessary educational and professional background to assess shifts in scientific emphasis, on the part of both government and industry, and relate these shifts to Hawaii's economic prospects and problems.

* * *

HE SAID the committee should consider the impact on Hawaii's research and development prospects of cut-backs in Federal research and development spending, and should try to find "how Hawaii can 'lock itself in' to research programs before they reach a spending 'plateau.'

"It should consider how the State can prepare itself to capitalize on the commercial prospects unveiled by oceanographic research, what Hawaii needs to provide oceanographic instrumentation and facilities and servicing for them."

The committee also might consider evaluating the problems of Hawaii's sugar industry "in terms of the possibilities offered by sucrochemistry and the threat of sugar substitutes," he said.

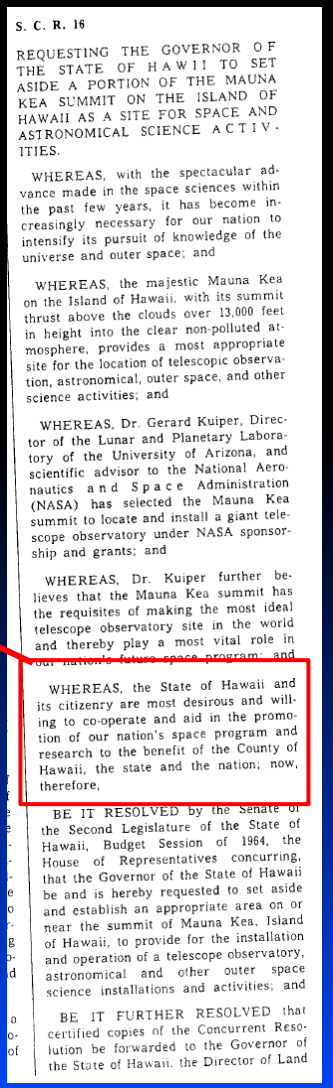
Maj. Gen. (Ret.) Edmond H. Leavey was appointed chairman of the Governor's Advisory Committee on Science and Technology yesterday. The group held its first meeting at Washington Place and passed out an agenda. Their first assignment is to formulate plans for a Governor's Conference on Science and Technology.

Beginnings

Governor Burns speaking at Hale Pohaku in 1964 at a dedication to the new Maunakea Summit Road and observatory test site

Hawaii Senate Concurrent Reso 16 (1964)

WHEREAS, the State of Hawaii and its citizenry are most desirous and willing to co-operate and aid in the promotion of our nation's space program and research to the benefit of the County of Hawaii, the state and the nation; now, therefore,



S. C. R. 16

REQUESTING THE GOVERNOR OF THE STATE OF HAWII TO SET ASIDE A PORTION OF THE MAUNA KEA SUMMIT ON THE ISLAND OF HAWAII AS A SITE FOR SPACE AND ASTRONOMICAL SCIENCE ACTIVITIES.

WHEREAS, with the spectacular advance made in the space sciences within the past few years, it has become increasingly necessary for our nation to intensify its pursuit of knowledge of the universe and outer space; and

WHEREAS, the majestic Mauna Kea on the Island of Hawaii, with its summit thrust above the clouds over 13,000 feet in height into the clear non-polluted atmosphere, provides a most appropriate site for the location of telescopic observation, astronomical, outer space, and other science activities; and

WHEREAS, Dr. Gerard Kuiper, Director of the Lunar and Planetary Laboratory of the University of Arizona, and scientific advisor to the National Aeronautics and Space Administration (NASA) has selected the Mauna Kea summit to locate and install a giant telescope observatory under NASA sponsorship and grants; and

WHEREAS, Dr. Kuiper further believes that the Mauna Kea summit has the requisites of making the most ideal telescope observatory site in the world and thereby play a most vital role in our nation's future space program; and

WHEREAS, the State of Hawaii and its citizenry are most desirous and willing to co-operate and aid in the promotion of our nation's space program and research to the benefit of the County of Hawaii, the state and the nation; now, therefore,

BE IT RESOLVED by the Senate of the Second Legislature of the State of Hawaii, Budget Session of 1964, the House of Representatives concurring, that the Governor of the State of Hawaii be and is hereby requested to set aside and establish an appropriate area on or near the summit of Mauna Kea, Island of Hawaii, to provide for the installation and operation of a telescope observatory, astronomical and other outer space science installations and activities; and

BE IT FURTHER RESOLVED that certified copies of the Concurrent Resolution be forwarded to the Governor of the State of Hawaii, the Director of Land

SCR16 → Act 255

- "Astronomy…is a policy of the State…" is substantially a restatement of SCR16 approved decades ago, as part of a broader vision for Hawai‘i engaging and in some cases leading the world
- Central to this policy is the intended benefit of the State's astronomy program for everyone in Hawai‘i
- To date most of that benefit has gone to residents of Oahu, Maui, and Hawai‘i Island, though more pathways are opening…

Welcoming Students Across Our Archipelago

Maunakea Scholar Host Schools
(over 1300 students and counting)

IfA – A Multi-island Program

- Beyond the enormous logistical, programmatic, and legal challenges of consolidating the Hawaii State astronomy program into one site, it seems prudent to first ask would such a change be consistent with the vision behind the origins of the State's program?
  - A major facility move would require high-level approvals within UH, faculty endorsement for change of tenure locus, new facilities, funding, etc.
- Through various initiatives, the State's astronomy program has naturally expanded across several islands – should we promote multi-island growth or consolidation in the future?
  - Over its ~50 years as a UH program, IfA has opened base facilities on Oahu (Mānoa), Maui (Pukalani) and Hawai'i Island (Hilo) and integrated them into one program
- In the end perhaps it comes down to who should benefit and whose vision should we follow…


Mahalo
Photo: Don Mitchell