



W. M. KECK OBSERVATORY
Maunakea, Island of Hawai'i

November 2021

Aloha,

When the Keck telescopes saw First Light some three decades ago, they were among the scientific and engineering marvels of the world. No one had built a large complicated segmented mirror telescope before Keck. Many suspected the idea would not work. The endeavor took the courage of Keck's founding institutions coupled with the brilliance of the telescopes' designers to give the world these magnificent machines of science.

Since the early 1990s, the Keck telescopes have remained the leading enablers for ground-based astronomy thanks to constant innovation in instrumentation. The same courage of will and brilliance of design continues at Keck Observatory, as through the years we have added to our powers of discovery with the addition of new instruments.

During the past five years, the pace at which we add new, innovative instrumentation has increased substantially. We've added the Keck Cosmic Web Imager (KCWI), an instrument now highly in demand by our community of astronomers who study the history of galaxies and their surroundings. We've upgraded workhorse instruments such as NIRSPEC and LRIS. We created the Keck Visiting Scholars Program to give young astronomers the opportunity to get hands-on work with cutting-edge astronomical instrumentation early in their careers. In 2022, we'll add two major instruments sure to change the face of research at Keck: the Keck Planet Finder (KPF) and the Keck Cosmic Reionization Mapper (KCRM). We're also upgrading NIRSPEC with a Laser Frequency Comb (LFC) that will advance exoplanet research. And in the near future, Keck will welcome our newest generation of adaptive optics, a project known as Keck All-sky Precision Adaptive optics or KAPA.

All of these instruments and upgrades were made possible in large part through your past support of the observatory. Please know that we are most sincerely grateful.

Now I want to give you a brief preview of the next transformative step forward in instrumentation, the Keck Discovery Engine (KDE). KDE will be the first integrated suite of instrumentation and software at Keck Observatory. We will build a Wide Field Imager (WFI), providing Keck with wide field survey capability for the first time. WFI will have a field of view far larger than any existing Keck instrument. In fact, it will be the most powerful camera in the world for astronomy. It will allow Keck to be responsive to "things that go flash in the night," those transient events that are now consuming the interests of the world astronomical community. The Keck telescopes are currently among the preferred facilities in the world for following up on recently discovered transient events - with WFI, we will also lead in their initial discovery.

WFI will be coupled with a new deployable secondary mirror, allowing for quick translation from survey to spectroscopy. The latter will be handled by WFI's new partner instrument, the Fiber-Optic Broadband Optical Spectrograph (FOBOS), a spectrograph unlike any other in the world allowing massively multiplexed spectroscopy. FOBOS will be capable of taking up to 2,000 individual spectra at a single pointing, informed by custom programmed software using Artificial Intelligence and Machine Learning. Within minutes after WFI observes and images a section of the sky, this software will instruct the FOBOS spectrograph which 2,000 targets to observe and analyze simultaneously. When all these elements of the Discovery Engine are working in concert, KDE will produce more than a year's worth of science in a single evening.

The prospect for this unrivaled scientific productivity is our future at the Keck Observatory. Even with the advent of the planned extremely large telescopes, Keck will remain a leading and in demand astronomical research facility, thanks to the continued addition of the instrumentation I've summarized for you here, as well as the addition of other upgrades and improvements to our adaptive optics and telescope infrastructure.

I hope I've tantalized you with the excitement of our planned Keck Discovery Engine. Please plan to join me for a Donor Salon on December 10th during which I'll provide more information about KDE.

It is my sincere hope that you will continue with us on our exciting journey of discovery. Please do so by making a gift this holiday season to Keck Observatory. You may use our donation form, which you may access by clicking [HERE](#).

Best Wishes for a Wonderful Holiday Season, and Keep Looking to the Stars,

Dr. John O'Meara, Chief Scientist
W. M. Keck Observatory



Credit: Andrew Richard Hara