

Q1/2017

A Quarterly Publication

WRITTEN AND PRODUCED BY
PACIFIC RESOURCE PARTNERSHIP

INSIGHTS

ASTRONOMY IN HAWAII

INSIDE:

A CLOSE LOOK AT
A FAR OUT SECTOR

Hawaii in the STARS

Hawaii holds at least one title that is undisputed: home of the world's greatest astronomical observation site.

Photo: [c] National Astronomical Observatory of Japan

To be deemed the “world’s best” is usually a rare accomplishment. Many residents would opine that Hawaii holds that title in a number of areas - world’s best people, surf, food, weather - the list is never-ending. While some of those claims are debatable, Hawaii holds at least one title that is undisputed: home of the world’s greatest astronomical observation site.

Hawaii has ideal atmospheric conditions for astronomy, with some of the highest peaks in the world and relatively miniscule amounts of light pollution. Haleakala, on Maui, is home to seven observatories and the future site of the Daniel K. Inouye Telescope, which will be the world’s most powerful solar observatory when construction is complete in 2018.

Maunakea, on Hawaii Island, rises above almost all other astronomical observation sites. As a shield volcano, Maunakea’s high summit, sloping sides and isolation in the

middle of the Pacific Ocean allow winds traveling across the open ocean to reach the summit relatively undisturbed and pass over with minimal turbulence. This is significant because looking through turbulence in the air flow has a major distorting effect on astronomical observation. Maunakea’s unique qualities minimize distortion and allow clearer observation.

Maunakea and Haleakala’s unmatched combination of topography and geography have led academic institutions from around the world to unparalleled research and discoveries. Hawaii has been involved in nearly every astronomical breakthrough of

the past 50 years. Here are some of the highlights:

- The University of Hawaii’s R. Brent Tully was part of the team of astronomers that defined the super cluster that is home to the Milky Way and 100,000 other nearby galaxies. It was given the name *Laniakea*, or “immense heaven” in Hawaiian, to honor Polynesian navigators, who used knowledge of the heavens to navigate the Pacific Ocean.
- Award-winning astronomer Andrea Ghez, from UCLA, used the Maunakea telescopes to publish compelling proof of

the existence of a supermassive black hole in the center of our galaxy.

- Maunakea telescopes have also helped identify the presence of dark energy, the existence of a dark galaxy near our own galaxy, and potentially habitable planets in other solar systems.
- Mike Brown, an astronomer and professor at the California Institute of Technology, used Maunakea telescopes to help reclassify Pluto as a dwarf planet. His team also found another dwarf planet that they named *Haumea*, after the mother of Pele and goddess of fertility and childbirth.

GROWING KNOWLEDGE

One of the many benefits of the astronomy sector is that it makes Hawaii a research and education center. It moves scientific knowledge forward with unknown and potentially limitless possibilities for the well-being of humanity. There are several local astronomy and research organizations contributing to the advancement of astronomy.

UH MANOA

Founded at the University of Hawaii in 1967 to manage and develop the budding observatories in the state, the Institute for Astronomy (IfA) carries out its own research. It operates one of the largest astronomy graduate programs in the country and has recently embarked on two new undergraduate programs in astronomy and astrophysics in cooperation with the educational departments at UH Manoa and UH Hilo. With a staff of about 300, including 55 faculty and 40 graduate students, the IfA has a budget of \$30 million, including \$20 million in grants from the federal government.

In addition, UH Manoa’s Department of Physics and Astronomy operates a separate physics graduate program and has vigorous research groups with particular emphases on particle astrophysics, elementary particle physics, nanoscience and free electron lasers. The Department of Chemistry includes an interstellar chemistry group that undertakes theoretical and experimental research into reaction dynamics under interstellar and planetary conditions.

UH HILO

UH Hilo’s Department of Physics and Astronomy offers a unique undergraduate astronomy degree and leads the country in the number of majors and degrees granted each year among undergraduate institutions. All faculty members are involved in research and include undergraduate students in their projects. UH Hilo is also home to the Imiloa Astronomy Center of Hawaii, an education center for visitors and students featuring exhibits and planetarium shows that explore the connections between Hawaiian cultural traditions and astronomy.

HAWAII INSTITUTE FOR GEOPHYSICS & PLANETOLOGY

The Hawaii Institute of Geophysics & Planetology undertakes research on planetary geosciences, operates the Pacific Regional Planetary Data Center and manages the Hawaii Space Grant Consortium.

GROWING THE ECONOMY

The astronomy sector also contributes direct benefits to Hawaii by generating economic activity through local purchases, wages paid to employees and spending by visitors and students.

According to the University of Hawaii Economic Research Organization, astronomy accounted for the following economic contributions in Hawaii:

ANNUAL ECONOMIC IMPACT (including indirect and induced benefits)



\$175.47M STATEWIDE TOTAL

\$95.55M HAWAII COUNTY

\$71.53M HONOLULU COUNTY

\$5.58M MAUI COUNTY

\$2.73M KAUAI COUNTY

These totals include \$54.63 million in earnings, \$8.52 million in state taxes, and 1,394 jobs generated by astronomy activities statewide.*

*All figures are in 2016 dollars. Calculations based on data for 2012 (University of Hawaii Economic Research Organization, *The Economic Impact of Astronomy in Hawaii*, 2014).



Expert Q&A

DOUG
SIMONS

CANADA-FRANCE-HAWAII
TELESCOPE



Doug Simons is the executive director of Maunakea's Canada-France-Hawaii Telescope, a joint facility of the National Research Council of Canada, Le Centre National de la Recherche Scientifique of France and the University of Hawaii. Doug has been a Hawaii resident for 31 years, staying in the islands ever since he earned his PhD in Astronomy from the University of Hawaii. He spoke to us about astronomy's place in Hawaii.

Q: HOW IMPORTANT IS HAWAII TO THE FIELD OF ASTRONOMY?

DS: We are number one without a doubt in terms of ground-based astronomy. That's the case year after year. There is a metric called science impact, by which Maunakea has four of the top five telescopes in the world. The only one that is not Hawaii-based is the VLT in Chile. Hawaii not only dominates the northern hemisphere, but also arguably leads worldwide ground-based astronomy these days, in terms of science impact. That's huge.

The flip side to that is if we lose Hawaii astronomy, that will be fairly devastating to the field internationally because of the years of investment and building up the program here that would be lost and simply irreplaceable for many, many years.

Q: WHAT DOES THE ASTRONOMY COMMUNITY NEED TO CONTINUE TO FLOURISH IN HAWAII?

DS: To sustain astronomy you need to continually upgrade your instrumentation and occasionally replace existing telescopes with new telescopes. I'm confident that by doing that we are in an incredibly good state to sustain what we've got in terms of a worldwide preeminence in the field. I have repeatedly stated my support for the limitations defined in the master plan and the comprehensive management plan. But obviously, we are at a tipping point in terms of support. The loss of TMT will seriously shake investor confidence in the future for Hawaii astronomy.

I dearly wish that the general community felt a sense of personal ownership in the observatories. I think if people look up at Maunakea and see the telescopes and don't personally relate to them, the intellectual argument alone doesn't necessarily work. You need to make that personal connection and that takes time. It happens via direct connection to the people who work at the observatories and the facilities themselves. By having programs that open the doors of the observatories you've got a long commitment of engagement and a kind of back and forth of understanding that will help to either alleviate fears that people may have or come to a deeper understanding of the good that Hawaii astronomy does for so many people. There just has to be a way to find a collaborative environment for us to exist in, rather than a combative one.

Q: HOW DO WE BALANCE THE COMPETING NEEDS OF SCIENTIFIC PROGRESS AND CULTURAL PRESERVATION?

DS: I think part of it is trying to literally get into the thoughts and perspectives of those you might perceive as being on a different side. We can start to promote not just our own interest, for example in astronomy, but other interests that are equally important. Cultural and environmental interests on Maunakea absolutely have to be considered.

There are lots of ways that people can do this. There is a great program down in Keaukaha, where the community is restoring a huge canoe we hope to sail out from Hilo Bay next summer to greet the Hokulea when it returns to Hawaii. We've made calls for residents to help and had a large turnout from the astronomy community. It's a great focal point for the community that has nothing to do with astronomy. This has to do with Hawaiian culture, and through the process of rebuilding that canoe, people are building relationships and trust that are the foundation for ultimately seeing value in other perspectives about the future of Maunakea.



Integrated Communities

BUILDING ASTRONOMY COMMUNITIES

It's common for communities to identify with a local industry. Long after the decline of steel mills, Pittsburgh remains home to the Steelers. Municipalities across the Rocky Mountains identify as ski towns. The plantation era may have ended, but the diversity of cultures that the sugar cane industry brought together still defines a vast number of Hawaii communities today. When industry and locality fuse, both can thrive.

In Hawaii, astronomy stakeholders are hoping to engender pride and identification among their neighbors and more fully integrate astronomy into the surrounding areas by reaching out to the communities where they work and live.

Astronomy's benefits to Hawaii Island are numerous, starting with the lifeblood of any community, the economy. According to UHERO, \$61.18 million in local expenditures by the astronomy sector in 2012 occurred in Hawaii County, nearly 70 percent of the statewide total. That generated \$95.63 million in total economic output for the county, including \$29.25 million in earnings and \$4.18 million in state taxes. (All figures are in 2016 dollars). In Hawaii County, astronomy's impact in 2012 was about one third the size of the entire UH system's impact.

Hawaii's astronomers have also been striving to capture the hearts and minds of Hawaii County youth, because communities are more than economies. For example, this year marks the Gemini International Observatory's 12th annual "Journey through the Universe" week. Throughout the week, scores of astronomers, engineers and astronomy educators share their passion for science through hundreds of classroom visits, engaging students in STEM fields and helping to develop their knowledge and interest about the universe.



Imiloa Astronomy Center of Hawaii

In 2016, the Gemini Observatory and the Canada-France-Hawaii Telescope created the Maunakea Scholars program, which allocates observing time to local kids. The program leverages the most powerful collection of telescopes in the world for the direct educational advancement of Hawaii's high school students. The inaugural year includes classes of juniors and seniors at Waiakea High School on Hawaii Island and Kapolei High School on Oahu, with a goal to take the program statewide with mentorship opportunities for a full range of clean, high-tech careers facilitated by the observatories.

Other community engagement events include:

- **The Maunakea Fund**, set up at the Hawaii Community Foundation to support scientific, cultural and environmental programs that advance stewardship through opportunities grounded in Hawaiian cultural values.

- **The Kamaaina Observatory Experience**, a monthly community event put on by the Maunakea Observatories and Imiloa Astronomy Center welcoming Hawaii residents to the science reserve atop Maunakea to see world-class telescopes and learn about the cultural and environmental importance of the mountain.

- **Astroday**, an annual event from the Maunakea Astronomy Outreach Committee in its 15th year. The 2016 event, which fell on International Astronomy Day, was a celebration of astronomical sciences that featured over 40 exhibits, demonstrations and activity areas. Presenters include the observatories on Maunakea, educators, students, Hawaiian culture groups and commercial vendors.

- **The Solar System Walk** is a free event that turns Waimea into a model of the solar system. Hosted by the Canada-France-Hawaii Telescope, the W.M. Keck Observatory and the University of Hawaii's Institute for Astronomy, the walk gives the community an opportunity to talk with staff from the world's most scientifically productive telescopes and to explore the planets – just like professional astronomers.

These programs not only pique interest in future astronomers, but also illustrate the incredible discoveries and many social and economic benefits the astronomy sector brings to the community, giving them something to be proud of. By inviting their neighbors closer, these efforts help to weave the astronomy sector into the fabric of Hawaii County. ●



As the third generation of his family to lead the company that bears its name, Les Isemoto knows about the importance of integrity. For 90 years on Hawaii Island, Isemoto Contracting has been synonymous with family values, building an unmatched reputation for quality work, workplace safety and union loyalty. Les recounted for us his insights from his vast experience working on astronomy projects.

COMPANY:
Isemoto Contracting Company, Ltd.

GENERAL CONTRACTOR:
Self performs heavy civil construction, underground utilities, concrete, masonry, carpentry and pre-engineered metal buildings for public and private sector clients.

CONTACT:
Leslie Isemoto, President

PHONE:
{808} 935-7194

EMAIL:
info@isemotocontracting.com



Contractor Profile

LESLIE ISEMOTO

ISEMOTO CONTRACTING COMPANY, LTD.

“Sometimes, even if you measure it twice, you still get it wrong,” says Les, referring to the hazards of working at high altitudes. “Your ability to think clearly throughout the day is compromised. You tend to forget the dimension of something you just looked at.”

It was one difficulty Les would overcome, among many others, that arise when doing construction work on Maunakea’s telescopes. In addition to services for repairs and improvements over the past few years at the Subaru, Gemini and Keck Observatories, he has four decades of experience building for the astronomy sector, including:

1975 – Canada-France-Hawaii Telescope, Maunakea

Sub-contractor for concrete stem walls and concrete decking work.

1995 – Subaru Telescope, Maunakea

Interior finish work.

1998 – Gemini Observatory Hilo Base Facility, UH Research Park

General Contractor for the Hilo Base Facility.

2000 – Smithsonian Submillimeter Array Base Facility, UH Research Park

Sub-contractor for concrete work.

2004 – Subaru Telescope at Hilo Base Facility, UH Research Park

General contractor for a two-story, 3,000-square foot office addition.

2004 – Subaru Telescope, Maunakea

Installed new equipment platforms on the interior of the existing facility. concrete, rough and finish carpentry.

According to Les, the biggest difference between telescopes and other types of construction projects is the working environment, where altitude and thermal conditions can take a major toll.

“Workers’ performance and productivity at high altitudes are reduced,” says Les, who notes that productivity can be as little as half to three quarters what it would be at sea level. He suffered through the adversity himself as a carpenter apprentice on Maunakea’s Canada-France-Hawaii observatory. “It took me a week to get acclimated, but I never came close to the productivity output I could achieve at sea level. Some of our workers always had altitude sickness and could not work at the summit,” says Les.

Even equipment performance drops off. “Just driving a car up to the summit, you will notice significant power loss compared to driving at sea level,” he says.

The weather also has a big impact on a mountain summit. “Due to the thin atmosphere, the sun is a lot hotter and you will get sunburned much faster. Summit work is also prone to high wind conditions, so materials must be secured during and after work or they could end up several thousand feet below the summit. My first two days working on the summit were ‘Wind Out’ days, with 60-70 MPH winds.”

Extreme conditions mean summit facilities require much more insulation, even during construction, to ensure structural integrity and stability. “When we were pouring concrete on the Canada-France-Hawaii observatory, we needed steam curing with fiberglass thermal blankets to keep the concrete from cracking.”

The work is more difficult, but Les finds the results – and the rewards for Hawaii – to be worthwhile. “Observatories provide a clean environmental industry and economic impact to our island and the state,” he says. “The astronomy industry provides a keen insight into our universe that is shared globally.” ●

Our View

PRP STAFF



At PRP, part of our mission is to help guide the community toward a stronger, more sustainable Hawaii in a way that promotes a vibrant economy, creates jobs and enhances the quality of life for all residents. That’s why we support the astronomy sector in Hawaii and efforts to help it thrive.

Hawaii’s astronomy sector is one of the largest in the United States, according to UHERO, and the direct economic benefits (see page 3) are significant. However, the human capital investment and reputational benefits that come along with hosting astronomy – a world-class, low-impact, research-based field of academic inquiry whose only export is data – are tremendous and impossible to replicate. Astronomy supports STEM education and the development of scientific talent and signals to the world that Hawaii is a place where science and research can flourish. Hawaii’s leadership in the field creates esteemed, high-paying jobs that are hard to come by – especially on Hawaii Island. Our communities gain much from astronomy. We should continue to support it and work to overcome community divisions over its place in Hawaii.

Balance is essential to build anything right. The same is true for the Thirty-Meter Telescope (TMT) project that has generated so much controversy on Maunakea. The proposed \$1.4 billion TMT would be a world-class research facility, with an instrument capable of seeing farther back into the universe’s earliest history than any other telescope. Unfortunately, the construction process has been mired in delay. Hawaii risks losing TMT – and its \$1 million annual commitment to support education on Hawaii Island – if the issues aren’t resolved soon.

The best way to move forward is by building partnerships. Instead of remaining isolated in ivory towers, Hawaii’s astronomy academics and professionals have reached out to their communities, hosting events, visiting schools, supporting STEM education and taking part in initiatives that benefit everyone. By getting to know their neighbors, explaining what they do and sharing their successes with their community, everyone feels a part of the astronomy sector. We need to see more of this bridge-building and fence-mending between opposing sides in every facet of public life in the Aloha State, not just astronomy.

We also applaud the efforts of the many Native Hawaiian voices who support astronomy on Maunakea and have helped inform a responsible, balanced approach to construction and operation of TMT. We need to support their efforts to lead Hawaii’s exploration of the cosmos, just as their ancestors were the world’s leaders in using celestial navigation to explore and populate the Pacific.

Hopefully, we are making progress. A poll conducted in July 2016 by Ward Research found an increase in support among Hawaii Island residents for moving ahead with construction of the TMT project, compared to October 2015.

We need to build on the growing support by listening to each other’s concerns and moving forward together in the spirit of harmony that is essential for any successful scientific endeavor. Maunakea can be sacred ground for the field of astronomy and for Native Hawaiians, as long as we respect it as such.



Learn more about Industry Integrity

PRP is committing our time and resources to promote integrity in our industry and raise awareness about the widespread, costly impacts of non-compliant contractors. To learn more, please visit www.prp-hawaii.com/industryintegrity.



1100 ALAKEA STREET, 4TH FLOOR
HONOLULU, HAWAII 96813
808.528.5557
WWW.PRP-HAWAII.COM

PRESORTED
STANDARD
US POSTAGE PAID
HONOLULU, HI
PERMIT NO. 169

