Science, Culture Clash Over Sacred Mountain

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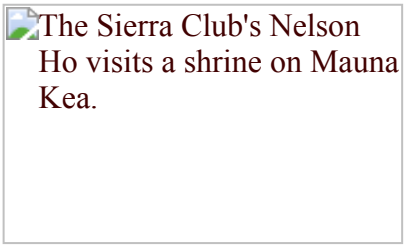
MAUNA KEA--When Ed Stevens drives the dusty track to this wind-swept summit atop Hawaii's Big Island, he tries hard not to see the gleaming white and silver telescope domes set starkly amid this dormant volcano's red rock.

He tries not to see where precious cinder cones--homes to goddesses--were flattened and paved for the hulking Western machines. He tries not to see a blindingly white radio antenna dish within a stone's throw of an ancient rock shrine that resembles Stonehenge.

"I go up there and I don't see them. Because if I see them I get angry," said Stevens, 70, who regularly drives two hours from his house in Kona to worship at Mauna Kea. In the naturalistic religion of Hawaiians, Mauna Kea--the White Mountain--is the highest temple in Polynesia, where, amid the snow, Hawaiians placed shrines and practiced burial rituals so secret that it is taboo to speak of them to outsiders.

But he can't ignore the newcomers completely. "You hear this humming," he said. "It's so intrusive when you are trying to commune with these entities. These benefactors."



The Sierra Club's Nelson Ho visits a shrine on Mauna Kea. (photo)

Technicians clean mirrors on Keck II telescope (photo)

Photos by KEN LOVE / For The Times

The mountain is equally sacred to astronomers: With its astonishingly clean, clear and dark skies, it is the best place on the planet to view the universe. This desolate peak holds the world's densest concentration of telescopes: 13, including the world's two largest.

When the first telescopes rose from the mountain--one a year in 1968, 1969 and 1970--there was not a peep of dissent from Hawaiians. Thirty years and nearly $1 billion worth of telescopes later, though, Hawaii is a very different place.

A once fledgling Hawaiian movement has grown into a vocal political power in the islands. There are calls for secession from the United States, a return of native Hawaiian lands and, on Mauna Kea, a moratorium on telescopes and even their removal.

Hostage to the dispute is a high-profile National Aeronautics and Space Administration/Caltech project that is crucial to developing the world's next generation of telescopes, a project that could be the first to image distant planets that might harbor life. The $50-million project is already a year behind schedule. If some Hawaiians have their way, it will not be built at all.

The emotionally charged debate over modern and ancient uses of this rocky pinnacle is much more, though, than a fight over a telescope or a mountaintop. To many Hawaiians, nothing less than the future of their homeland is at stake. And it is a perfect example of the often fumbling progress of science in a multicultural world.

Once prized for the clean industry and jobs they brought to this economically challenged island, astronomers are now lumped in with the missionaries, whalers, plantation owners and golf-course developers who have taken turns carving up this island.

One of the angriest is Kealoha Pisciotta, who, at 30, is as old as the age of modern astronomy in Hawaii.

Pisciotta was one of the first Hawaiians to work at a telescope. She spent long, frigid nights at the summit as a telescope technician, steering the European/Canadian James Clerk Maxwell sub-millimeter telescope toward distant clouds of dust and gas so that astronomers could study the newborn stars cloaked within.

On the way to her high-tech job, Pisciotta would take part in an age-old Hawaiian tradition. She would stop to worship on the flanks of the mountain, bringing small offerings to her family stone, or aumakua.

But that stone has been desecrated. Once, it was taken to the town dump. Once, it was carted off by a fellow telescope employee. And once it was overturned, strewing Pisciotta's aunt's ashes on the ground. Now the stone is missing for good, and Pisciotta, angry that astronomers did not do more to protect her stone, has resigned her position at the telescope.

Today, Pisciotta is angry that astronomers pay Hawaii just $1 per year to use land seized by Americans a century ago. She claims that, in their race to build bigger and better telescopes, the scientists have trampled not only on rare insects, native birds and the mountain's fragile geological landscape, but also on centuries of religious and cultural tradition.

"It truly is not Hawaiians versus astronomy," said Pisciotta, who is still proud of her work on the telescope but can barely contain her exasperation at astronomers. "But they never once have said, 'We screwed up and we're sorry.' They never once said, 'Thank you for letting us use your sacred temple.' "

Hawaiians imbue many natural phenomena--volcanoes, rocks, the ocean--with religious significance. Mauna Kea, at 13,769 feet, is so sacred because it is the closest thing in Hawaii, indeed in all of Polynesia, to the heavens. The towering volcano is considered the piko, or navel, of Hawaii, from which all else arose.

The mountain holds more than 90 shrines and burial sites. None is at the very top, which is considered too sacred even for shrines and certainly for Western machines. A 1996 fire that killed three workers building the Subaru telescope on the mountain was seen by some as a curse, an ominous warning from the gods.

There is much gray area in this collision of unlikely forces. The scientists' goals are lofty ones: to view the stars and answer some of the most riveting questions of our time, questions about the origin of the universe and the beginnings of time.

"These are not greedy guys trying to build a hotel," said Tom Peek, an amateur astronomer, teacher and writer who resigned his job as a stargazing guide on the mountain because he was distraught at how Hawaiian issues have been treated by astronomers. "But their moral compasses become confused because they are blinded by the excitement of discovery."

What astronomers want from Mauna Kea they can get nowhere else in the Northern Hemisphere--pristine, transparent skies unsullied by pollution, dust, water vapor and city light. The otherworldly summit sits high above cloud layers and much of the Earth's distorting atmosphere. The smooth shape of the volcanic cone and the stable temperatures of the Pacific

Ocean mean that air flows smoothly over the telescopes. And it is far easier to reach than two other areas with good viewing: the Chilean Andes and the South Pole.

The mountain's crown jewel is the Keck telescope complex: twin behemoths with 10-meter mirrors that are the world's largest gatherers of light. The summit is managed by the University of Hawaii's Institute for Astronomy. Keck is jointly run by NASA, Caltech and the University of California.

These monster "light buckets" trump the orbiting Hubble space telescope for data-gathering capability. They have imaged some of the faintest, most distant objects in the universe and unleashed a string of scientific hits. Using Keck, a Caltech team proved that galaxies formed shortly after the Big Bang, much earlier than expected.

Andrea Ghez, a leading UCLA astronomer, used the machine to pinpoint a massive black hole at the center of our own galaxy. One UC Berkeley team defied odds and used Keck to detect barely perceptible planets around other suns. Another Berkeley team measured supernovae racing away from our galaxy and showed, to the astonishment of many, that the universe is still expanding.

It is a coveted machine and an expensive one. Viewing time costs $1 per second, or $30,000 per night. And Keck is just beginning to flex its optics. Keck's proud director, Fred Chaffee, describes the machine as "Mozart at age 7." The instrument is likely to help answer a host of what scientists call "origins questions"--just how did our solar system form? And our galaxy? And the universe? And, perhaps most pressing of all: Are we alone?

Proud of what they do, and convinced of its importance, many mainland astronomers chafe at the way they have been represented by islanders.

"It annoys me to see astronomers portrayed as tyrants who come in to exploit Mauna Kea. That's very unfair," said Richard Ellis, a cosmologist at Caltech who uses the Keck to study the origin and evolution of galaxies. He recently turned down the directorship of the Institute for Astronomy because he believed that political issues, including the Mauna Kea dispute, were compromising the ability to do first-rate science there.

"We're searching for truth and knowledge, the kinds of things that have motivated countries for centuries. We don't need to apologize. We need to explain what we do."

Yet the accusations cannot be completely denied.

"It comes as a shock, but there's an element of truth there, isn't there?" said Robert A. McLaren, a Canadian who oversees astronomy on Mauna Kea for the University of Hawaii's Institute of Astronomy. "Just because you have a noble purpose and you don't mean [to cause] any harm doesn't mean you don't.

"The desire is there to do a much better job," he said. "What's not negotiable is the desire to have a world-class observatory."

Litter Complaints

The imbroglio at the summit started with something very small: a few pieces of construction trash blowing down from the telescopes. In 1994, Sierra Club members noticed the debris and called Nelson Ho, a club leader, to complain.

"I'm an amateur astronomer myself," said Ho, a seasoned environmental leader who approached astronomers as colleagues. But the Mauna Kea astronomers, he said, brushed off his

complaints. The trash was not cleaned up until 1995, after Ho enticed a local newspaper to write a front-page article.

By then, Ho was looking into the telescopes in detail and criticizing astronomers for taking shortcuts, ignoring environmental laws and sneaking projects in with little or no public review.

In 1996, an entomologist discovered that construction at two telescopes had destroyed critical habitats for the Weiku bug, a quarter-inch creature found only atop Mauna Kea, feasting on wind-borne insects and protected from freezing by a strange biological antifreeze.

Others were angry that the telescope builders had placed their machines too close to pu'u, or cinder cones with religious significance, even flattening some of them.

And there was an outcry over how astronomers tallied telescopes. Astronomers said that arrays of telescopes, even those with two dozen components, should count as one telescope because such an array is a single scientific instrument. Hawaiians argued that, from a land-use perspective, each machine should be counted separately and to do otherwise is to play a shell game.

"We can count," Pisciotta said.

In 1998, the state published a scathing audit on summit management that backed many of the Hawaiians' claims, but that is still hotly contested by the university's McLaren. It accused the University of Hawaii of neglecting historical, cultural and natural resources on the mountain and focusing primarily on building telescopes and boosting its own research program.

In response, the university hired consultants to create a new master plan to govern the mountain. They asked for public input at open hearings. It was like uncorking a bottle of anger, frustration and tears.

"It is inconceivable to me, people on this committee could even consider asking for anything more, except forgiveness," a stern Pisciotta said in May 1999 as she joined a long line of those who came to speak.

It took more than a year of discussion and committee meetings to draft the master plan. The effort involved one of Hawaii's most powerful figures, Sen. Daniel K. Inouye; the university's board of regents; and a panel of Hawaiian elders led by Stevens.

On June 16, the regents approved the plan. It allows astronomers three new telescopes, not five. A new management board that includes Hawaiian representation will oversee stewardship of the mountain. Oversight will be based not on the neighboring island of Oahu, but in the nearby city of Hilo, soothing notorious inter-island politics that have further mired the debate.

But many Hawaiians remain deeply unsatisfied. A good deal of the wording is vague. And much remains to be negotiated, including each new construction proposal, including the Caltech/JPL project now in limbo.

Anger flared anew late last year when UC Santa Barbara publicized plans to build a 30-meter telescope, the California Extremely Large Telescope, and place it, perhaps, atop Mauna Kea.

That was proof, Hawaiians said, that astronomers would arrogantly move forward despite local concerns. Astronomers on Mauna Kea, and many at Caltech familiar with the controversy, cringed at UC Santa Barbara's announcement, calling it premature and badly timed.

Astronomers are still reeling from the hostility that has been directed at them, anger that still echoes in letters to local newspapers. For three decades, astronomers had been golden children on the island, featured in one governor's campaign literature as the future of a modern Hawaii and touted for bringing about $142 million into state coffers each year.

"This is not to minimize or try to downplay the feelings we've heard recently," McLaren said in a recent interview. "All I'm saying is, it was so different from what we'd experienced in the past."

Bonding Agent

In 1970, when Kealoha Pisciotta was born and the mountain bore just three small telescopes, Hawaiians weren't allowed to speak their own language in schools. And their voices, even when it came to protecting their precious Mauna Kea, were muted.

"Native Hawaiian self-esteem was so low, they didn't know how to argue. They didn't know how to object," said Nainoa Thompson, 47, a modern Polynesian navigator who has re-created the long-distance ocean voyaging techniques of his ancestors, navigating by the stars among Hawaii, Tahiti and Easter Island.

Through these journeys, Thompson has become a potent symbol of the resurging pride in Hawaiian culture. But he still cringes when he recalls that his grandmother was beaten for speaking her native Hawaiian language in school.

Pualani Kanahele, the daughter of a revered cultural leader on the Big Island, cringes too, and weeps openly when discussing the mountain. She won't even look up at Mauna Kea now, because she did nothing to stop the telescopes, which she, like many here, call pimples. "I have to stand up to my grandkids," the anguished Kanahele said at one hearing, "and say, 'I never did anything.' "

Telescopes may seem an unlikely bonding agent for a budding indigenous political movement. But the fight against development on the mountain is bringing together Hawaiians of all types, not only cultural practitioners, activists and environmentalists, but also grandmothers, students, engineers and even retirees who pledge to throw their bodies in front of construction equipment.

"If you're going to push on this," warned Mililani Trask, an outspoken lawyer and community activist who recently served as president of Ka Lahui Hawai'i, a Hawaiian nation proposed by pro-sovereignty groups, "we're going to push you back."

The Hawaiian independence movement has gained much momentum since 1993, when Congress and President Bill Clinton formally apologized for the illegal overthrow of the Hawaiian monarchy 100 years before. A year later, the Navy returned a small island, Kahoolawe, that it had long used as a bombing range. And Hawaiians are still fighting to regain control of 1.8 million acres of ceded lands that once belonged to Hawaii's queen.

The Mauna Kea Astronomy Precinct sits squarely on those ceded lands.

The battle over telescopes has become a chance to reclaim, symbolically and practically, ground that their people lost long ago.

"Mauna Kea is the center of our spirituality," said Thompson, who also sits on the University of Hawaii's board of regents. "For it to be the place we debate this issue is not by chance."

Chaffee, the director of the Keck, agrees. "This isn't about astronomy," he said. "We're just the most visible thing. We're a lightning rod for years and years of distrust."

Links to Astronomy

The challenges of conducting science in a multicultural world vex scientists who are used to getting their way.

In Arizona in the late 1980s and early '90s, astronomers circumvented environmental and cultural preservation laws by winning a congressional exemption to build telescopes on Mt. Graham, a mountain considered sacred by many Apaches.

Last year, in a very different outcome for science, then-Interior Secretary Bruce Babbitt ordered the bones of the 9,300-year-old Kennewick Man returned to five American Indian tribes--to the emotional wails of scientists who called the decision a death blow to anthropology.

In Hawaii, as in all melting pots, there are unexpected synergies. Hawaiians have a strong link with astronomy: The first Hawaiians, the skilled Polynesian voyagers, navigated by the stars. Today, Hawaiian elders speak easily of galactic nebulae and supernovae. Astronomers, likewise, can relate oral Hawaiian legends set on the mountain. Telescope director Chaffee takes lessons in the Hawaiian language.

Still, an almost unfathomably deep culture clash remains. The very traits that make for a successful scientist today--a dispassionate, detached view of the world and an extremely narrow focus on a single question--are characteristics that many Hawaiians mistrust.

"You can't have a one-track mind; all you want to do is look up in the sky at those things and not care about anything else," said Larry Kimura, an assistant professor in the budding Hawaiian language program at the University of Hawaii at Hilo who helped head the committee that drafted the master plan. "You don't just start plopping things all over the place--your million-dollar machines--without thinking of giving anything back."

Many Hawaiians say the astronomers have been especially callous in naming the machines. A large telescope now on the drawing board has been dubbed "GOD," for giant optical device. Auxiliary telescopes planned for the Keck telescope are called "outriggers"--a nod to boats used by Hawaii's legendary sea voyagers that native Hawaiians see as condescending.

Kimura's cultural connection to the mountain is a personal one: His family is one of many that participate in the ritual of depositing the umbilical cords of their children in the sacred waters of Mauna Kea's Lake Waiau--a way to connect the newly born to their spiritual home.

"We are not just people of yesterday," said Kimura from an office where fragrant ginger flowers sit atop a turquoise computer. "We are also people of today."

Hawaiians are not the only ones frustrated by cultural differences. McLaren is among astronomers who feel blindsided by Hawaiian complaints that did not surface when the telescopes were being planned. (Objections raised initially in the 1970s and '80s centered on environmental issues and access to the mountain for hunters and hikers.)

"With our Western ways, we speak up. That's not necessarily the Hawaiian way," McLaren said.

But he does admit that the astronomers who planned the mountain should plead guilty to cultural ignorance.

"They didn't put those [telescopes] up there because science is more important than Hawaiian culture," he said. "They put those things up there because they didn't think of Hawaiian culture at all."

Tricky Technology

For astronomers, passage of the master plan was a victory, but a humble one. Said Keck Director Chaffee, "It's what we've been working on for three years--to get to the starting line."

Though he is hovering behind the starting line, it is obvious Chaffee wants to sprint.

When the controversy over the mountain broke, Chaffee was in the middle of a major effort to beef up the powerful Keck. The project is the $50-million Keck Interferometer. It aims to ring the two massive Keck telescopes with four to six smaller "outrigger" telescopes and then to pool the light from all of those instruments. Astronomers are almost giddy at the prospect; it would mean the combined telescopes could image distant objects about 10 times more sharply than they can today and could start making maps of nearby stars and their planets.

The Caltech/JPL interferometer project is a linchpin of the NASA Origins project, an energetic push to find other planets that might harbor life.

The technology is tricky. Precisely merging a number of speeding light beams has been a major challenge for JPL engineers. Last week, they linked the light from the two large telescopes for the first time.

Proof that linking a number of telescopes together can work on the ground is the first step in developing a new generation of space interferometers that could detect Earth-sized planets and eventually build a "Terrestrial Planet Finder" that could image those planets in a search for life.

A permit to build the new telescopes--which must be granted by Hawaii's Department of Land and Natural Resources--will be the first test of the fragile agreement on the mountain.

As NASA gets closer to asking for its permit, opposition gets louder.

The Sierra Club, which has praised NASA for conducting recent environmental reviews on Mauna Kea, nevertheless wants a full environmental impact statement, a process that could take months. Last month, the Office of Hawaiian Affairs dismissed NASA's plans to mitigate damage to the summit as "vague and ambiguous at best."

"While NASA searches for other life forms in space," deputy administrator Colin Kippen Jr. wrote to NASA officials, "it is ironic that its search may extinguish an entire species of the Weiku bug here on Earth."

Ahahui Ku Mauna, the panel of elders led by Ed Stevens that has been negotiating with astronomers, announced last month that it would not support the Keck project until it receives assurances that astronomers would give something back to Hawaiians. Council members are seeking long-term funding of programs that could help the native Hawaiian community.

For now, no one can predict which way the decision will go.

With so much at stake, Chaffee, and even the top NASA administrator in charge of the project, Rick Howard, are both willing to go slowly.

"We're trying hard to listen to concerns," said Howard, a senior executive at NASA's Washington headquarters who formerly managed the Caltech Submillimeter Observatory on Mauna Kea. "No one had been listening to them for 100 years."

Astronomers also have started sharing their science--making school presentations and hiring Hawaiian students, in hopes that they will spur a new generation of Hawaiian-born astronomers. An $11-million astronomy facility in Hilo, dedicated Feb. 23, will help foster a new degree program in astronomy offered at the university's Hilo campus.

The Mauna Kea Visitor Center now offers cultural programs for the hordes who ascend in the evening to gaze at the stars through small telescopes put out for the public.

But the astronomers' main focus--and their fear--remains pinned on the mountaintop. The Keck outriggers have become hugely symbolic.

To Chaffee, they are a chance to move ahead, painstakingly, and get the process right by "meeting both the spirit and the letter of the law." The tiny telescopes have already generated more paperwork than their massive brothers, Kecks I and II.

Astronomers don't want to squander their claim, or their right to be on a mountain they find so precious. "I've got to look, not just at Keck, but at the future of astronomy in this part of the world," Chaffee said.

To Hawaiians, the outriggers could open the door to a slew of new interferometry projects, and to telescopes multiplying like rabbits across their sacred landscape.

"We were asleep too long," Stevens said. "We won't go to sleep again."

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