

MOUNTAIN BATTLE

Plans to build one of the world's biggest telescopes on Mauna Kea in Hawaii are mired in conflict. Four people involved in the fight explain their diverse views.

BY ALEXANDRA WITZE

A low, mournful note rings across the broad summit of Mauna Kea, the highest peak in Hawaii. Joshua Lanakila Mangauil lowers his conch-shell horn and begins to walk over the craggy volcanic rock. Behind him come a dozen other Native Hawaiian men and women, many carrying the red, white and blue state flag. Together, they sing traditional chants as they hike up a volcanic ridge, headed for the top of the mountain.

On this July day, Mangauil is leading a reverent but short visit to the 4,200-metre-high summit. Native Hawaiian tradition calls for visitors to pay their respects to the sacred *mauna*, or mountain, and then leave. The group planned to stay a few hours, then get back into its pickup trucks and drive to a camp farther down. There they would resume the task that has consumed Mangauil and others for the greater part of a year: protecting the *mauna* from an effort to build a massive telescope.

An international consortium plans to construct the Thirty Meter Telescope (TMT) on top of Mauna Kea on Hawaii's Big Island. A cutting-edge astronomical facility, it would have a light-gathering mirror 3 times bigger than any of the 13 other telescopes already on the mountain, which include some of the largest and most scientifically productive observatories in the world.

TMT construction began in April and stopped almost immediately when demonstrators led by Mangauil blocked the vehicles from reaching the summit. They say that the TMT would violate both a fragile ecosystem and indigenous rights that have not been properly valued by astronomers. "Before you look into space, you need to respect this place," Mangauil says.

The battle that erupted this year echoes previous clashes. Native Hawaiians, environmentalists, scientists and other interest groups have wrangled for decades over the environmental and cultural impacts of the summit telescopes (see 'Peak passions'). But the fight over the TMT has grown larger and more divisive than past debates. Thanks to a renaissance of Native Hawaiian pride and the flashpoint potential of social media, the protests have tapped into broader anger against the US government and its past behaviour towards the islands and their native peoples.

Mangauil is adamant that the telescope should not be built — but others have equally passionate, divergent perspectives. Here, *Nature* talks to four people living in Hawaii and involved in the controversy, whose differing viewpoints reveal the complexity of finding common ground and securing the future of astronomy there.

KENT NISHIMURA

Joshua Lanakila Mangauil

THE OPPONENT

When Mangauil is not paying tribute on Mauna Kea's summit, he can often be found about 1,400 metres below, at a stopping point that includes a visitor's centre and a makeshift camp set up by demonstrators in March. As one of the leaders of the protest group there, Mangauil frequently talks to supporters, tourists, journalists — anyone who stops by.

In late July, the camp consisted of a small thatched hut, of traditional design, in which a Native Hawaiian man wearing a loincloth and shoulder cape was waiting to describe cultural customs to any visitors. Half a dozen other protesters stood around talking to each other quietly. Next to the hut, in a large tarpaulin enclosure amid camping beds and food supplies, Mangauil was working on his mobile phone, wearing a T-shirt and hoodie. He broke away to talk to a group of children who had travelled from the neighbouring island of Maui to see him. Many wore the bright-red *kū kia'i mauna*, or 'guardians of the mountain', T-shirts that have become popular among TMT protestors.

Mangauil bent over to greet several of the students, touching his nose to theirs in the traditional manner that symbolizes an exchange of breath. "Our creation is connected to this mountain," he explained, as some of the kids recorded him on their smartphones. In Hawaiian history, the sky father and the earth mother came together to create the Big Island, and

Mauna Kea is the centre. "This mountain is the oldest sibling that watches over all of us," Mangauil said. "It collects the clouds, it channels the water, it gives us life."

Mangauil has felt this connection since his childhood in a rainy town beneath Mauna Kea's northern slopes. "The river behind my house comes from this place," he says. "This has always been my mountain."

Like many in the younger generation of Native Hawaiians — Mangauil is 28 — he attended a Hawaiian-language immersion school. Such institutions have helped to reinvigorate Hawaiian culture after a long period during which it was suppressed. In Mangauil's grandparents' generation, children at school were beaten if they spoke their native language, and heard more about George Washington than about their own Kamehameha the Great, who united the Hawaiian islands two centuries ago. But beginning in the 1970s, activists began to push back. Now, Hawaiian students can choose from a variety of immersion programmes in public and charter schools across the islands.

Mangauil says that he was too young to be involved when the TMT began the seven-year process of obtaining state permits to build on Mauna Kea, but one of his teachers was a long-time activist fighting development on the mountain. Through her, he grew familiar with the issues surrounding Mauna Kea. After graduating, he returned to his school to work as a teacher.

As his interest in cultural matters grew, Mangauil set up a business to consult on Native

Hawaiian issues and began spending more time on Mauna Kea. In October 2014, when TMT officials organized a groundbreaking ceremony with visiting dignitaries, Mangauil surprised them — and himself — by jumping in front of the cameras and denouncing the project. "That was not planned," he says. "I was upset."

Six months later, Mangauil was again in the front of a protest group blocking the path of TMT construction trucks. He and 30 other demonstrators were arrested, booked and released. (A wealthy descendant of Hawaii's monarchy has put up much of the bail money.)

Now Mangauil spends most of his time in the role of mountain guardian: leading protests, testifying at hearings and travelling to other islands to meet with activists. He helps to ignite demonstrations through his popular Facebook pages. He is also dipping his toe into politics, by running for a seat in a newly formed group that aims to build a governing base for a future Hawaiian nation. (Hawaii's monarchy was overthrown in 1893 by pro-US interests; it became a US state in 1959.)

Mangauil's more-immediate goal is simple: to stop the TMT from being built on Mauna Kea. "We are fighting for the rights of the mountain," he says. "I have nothing against astronomy — just don't put it up there."

Looking ahead, Mangauil sees a day when astronomers will leave Mauna Kea. The existing telescopes are legally allowed to operate there until their lease to the site expires in 2033. At that point, Mangauil argues, they should all be dismantled. "Then the mountain can rest."

PEAK PASSIONS

With some of the best astronomical viewing conditions in the world, Mauna Kea in Hawaii has long played host to top telescopes. But scientists have frequently clashed with Native Hawaiians and environmentalists over facilities on the mountain.

1960

A tsunami devastates the city of Hilo. Looking for ways to rebuild the economy, local businessmen begin recruiting astronomers to develop observatories there.

1968

The state of Hawaii gives the University of Hawaii a 65-year lease to operate the summit area of Mauna Kea as a science reserve.

1968

The US Air Force builds the first research telescope on Mauna Kea, a 0.6-metre facility.



Alexis Acohido

THE SUPPORTER

As Mangauil sounds his conch on Mauna Kea's summit, Alexis Acohido stands nearby trying to explain her feelings about the protest movement. "I'm conflicted," she says finally. "I'm really conflicted."

Acohido, aged 22 and part Native Hawaiian, is of Mangauil's generation but not his mind-set. Growing up on the island of Oahu near the heart of Honolulu, Acohido was always drawn towards science. "In high school, I wanted to

be a biologist, but when I got to college I had all these math credits and thought, why don't I get my degree in math?" she says.

Acohido first heard of the TMT several years ago, while sitting in an orientation lecture for a summer astronomy internship. A project scientist spoke about how the TMT would see stars and galaxies with unprecedented clarity, better even than today's views from the Hubble Space Telescope. "What they had planned sounded

really awesome," she says. "I thought it would be cool to have for Hawaii."

So when TMT protests began to spread this spring, she decided to become more active. In a debate during a philosophy class, she spoke out in favour of the TMT, and a fellow student asked her to write an opinion piece for the university's newspaper. After that appeared, the public-relations firm that has been handling TMT affairs asked her to expand on her ideas for Honolulu's major newspaper, and so she published a commentary there in April.

Acohido argued that the TMT should be built and that it would bring opportunities to students in Hawaii, a state that has typically ranked below US averages in school performance. (Among other contributions, the TMT has set up an educational fund that awards US\$1 million annually to Big Island students in technical fields.) Her article did not go down well. Many people told her "How could you? You need to get back to your roots", she says. Some people who commented online claimed she had no cultural authority to speak about Native Hawaiian issues and had been brainwashed by TMT leaders. "I've been called a bad Hawaiian so much it's not funny," she says.

Acohido says that she even faced opposition from some members of her family. But others have offered encouragement, including her Native-Hawaiian grandmother. "She's been super-supportive," Acohido says. "She'll always save any news piece that comes out, for me to read when I get home."

In many ways, Acohido represents the next generation of Hawaiian scientists that the TMT and other observatories hope to foster. She graduated with her mathematics degree earlier this year and now works as a communications intern in the Hilo offices of Gemini Observatory, which runs an 8-metre telescope on Mauna Kea. The day she saw Mangauil was her first time at the summit. She handed over her smartphone so she could get a photo of herself with the gleaming Gemini dome behind her.

Watching the demonstrators, Acohido talked about the conflict she feels. "It's important to uphold your cultures and traditions, but I also think it's important to pick your battles," she says. "A lot of their anger is misplaced." In her view, they should focus their wrath on the University of Hawaii (UH), which has managed the mountain observatories since the 1960s. "If they are going to be mad at anyone," she says, "they should be mad at UH."

KENT NISHIMURA



1990s

The biggest telescopes on Mauna Kea start operations: the 8-metre Gemini North and Subaru, and the twin 10-metre Kecks. Environmentalists, Native Hawaiians and others argue that the mountain has been desecrated.

2006

Following strong opposition and legal setbacks, NASA decides not to build supplementary 'out-rigger' telescopes at Keck.

2009

Officials for the Thirty Meter Telescope (TMT) announce their plan to build a next-generation observatory on Mauna Kea.

2015

Native Hawaiian protestors halt TMT construction. The state's governor announces that the university must decommission as many telescopes as possible.

THE BATTLE-SCARRED ASTRONOMER

The UH's Institute for Astronomy sits above the urban bustle of Honolulu in a neighbourhood of quiet winding streets. Inside, on a muggy August morning, astronomer Bob McLaren sighs at the current chaos engulfing Hawaiian astronomy. "The core disagreement is simple, but there's no easy solution," he says.

McLaren knows these battles all too well. As the university representative tasked with developing astronomy facilities, he has taken part in some of the most contentious fights over the future of Mauna Kea.

He came to Hawaii from Canada's University of Toronto in 1982, drawn to Mauna Kea as the best site to do infrared astronomy. Observing variable stars with the 4-metre Canada-France-Hawaii Telescope, he helped to recalibrate the distances to many nearby galaxies. But as larger telescopes started to come online, McLaren saw a role in helping to manage how astronomy was conducted on the mountain. He moved into his UH administration job and onto the front lines of public battles.

Some of his most painful professional memories are from the 1990s, when university and state officials were working to adopt a master plan for the mountain's future. In a blistering 1998 report, auditors slammed the university for failing to balance telescope development with Mauna Kea's archaeological, cultural and environmental resources. Among its criticisms, the assessment noted that Native Hawaiian cultural practitioners — generally older men and women who travel to the mountain's summit to carry out personal devotions — charged that rubbish and development had desecrated it.

Relations between astronomers and Native Hawaiians deteriorated so much that the late Senator Daniel Inouye, a legendary figure in Hawaiian politics, had to intervene. He forced nine people from each side, including McLaren as the institute's associate director, to sit down and talk out their differences. "It was kind of awkward at first, but it actually worked," McLaren says. "We could discuss why we thought certain things and why they thought certain things, and what we were going to do about it. But it took time." Those 1999 talks helped to get a comprehensive plan for the mountain approved. And some of the Native Hawaiians on the panel formed a cultural advisory council that provides input into the management of Mauna Kea. It was a rare example of people with different interests managing to have a productive dialogue about the mountain's future, McLaren says.



Bob McLaren

Despite all the conversations, however, people were uncomfortable with the concept of future development, so the final master plan failed to lay out a clear sense of whether and how big telescopes could be built on the mountain. "We weren't able to achieve that," says McLaren. "That was a bit disappointing." In 2006, in the wake of the master-plan controversy, associated lawsuits and strong opposition, NASA pulled funding for a project that would have added up to six 'outrigger' telescopes to the twin 10-metre Keck telescopes, currently the largest atop Mauna Kea.

Even though the master plan did not go as far as McLaren had wanted, he says that it has helped to shape the current project. When the TMT team decided in 2009 to build on Mauna Kea, it worked within the guidelines of the plan to minimize the telescope's impact on the mountain. Physically, the dome is slated to sit about 150 metres below the summit ridge, making it less prominent. Project officials consulted with a number of Native Hawaiian groups, including the Mauna Kea cultural advisory council, and made plans to limit traffic to the summit and have local voices deeply involved in all stages of construction. The TMT is also the first Mauna Kea telescope with more than a token rent; it will pay \$1 million

a year for its space, with most of that flowing directly to mountain stewardship.

That made it all the more surprising — at least to astronomers — when Mangauil and others jumped in front of the cameras at the groundbreaking ceremony last October. "I can't explain what suddenly got all of these new people involved," says McLaren. In the past, "there were elements of this sovereignty movement and disenfranchisement in there, but they were secondary", he says. "Now it's a lot more complicated. Many of the people we're hearing speak would like to have a society that feels more Hawaiian to them, in the spirit of things they've been taught in school."

McLaren is frustrated by what he sees as changing cultural values among all the groups with a stake in the mountain. "I'd like people to tell me, if they got in a time machine and went back to 1964, what they would have done differently," he says. "Don't just criticize what's on the mountain now — tell us what we did wrong, in the context of what actually happened."

Most days, McLaren is optimistic that the TMT will be built in Hawaii. Other days, he cannot quite see a way through the conflict. "People like me get a little cynical," he says. "We've seen this movie before."



KENT NISHIMURA

THE BRIDGE BUILDER

Doug Simons

The discord might be familiar, but Doug Simons refuses to give up hope.

Simons has worked in Hawaii for three decades, including stints directing Gemini and now the Canada-France-Hawaii Telescope. He specialized in developing instruments to study the Universe in infrared wavelengths, and is now thinking of ways in which the diverse observatories on Mauna Kea can work together more closely.

Simons's ties to the mountain go far beyond his work. As someone who hunts birds on Mauna Kea, he wants to see its environment preserved and he has even made plans to have his ashes scattered nearby. "It tears me up to see my community being torn apart," he says. "At the end of the day, it's not me the astronomer, it's me the Big Island resident that has made me commit to finding a solution for my neighbours."

So Simons has been meeting with anyone who wants to talk to him: Native Hawaiians whose families are divided, businessmen who wonder whether Hawaii will invest in high-tech industries, secondary-school students who desire local well-paying technical jobs and those who want the telescopes removed. He does it the old-fashioned way, one face-to-face sit-down at a time. "I'm kind of old-timey," he says. "I'm not a Facebook guy."

Sometimes these conversations happen by chance: Simons recently ran into Mangauil at an airport and the two shared a beer. The discussions are always deeply personal. "You

have to come out of your comfort zone as a scientist and get into the emotional arena to make the connection," he says. When speaking with Native Hawaiians about Mauna Kea, he opens up about his quiet Catholic faith, his daily prayers. "It's my spiritual component trying to map out to theirs," he says.

He hopes and believes that these conversations will make a difference. "There is no way to make everybody happy on the mountain," he says. "Historically, these things have been worked through some sort of give-and-take process — I don't see why that can't happen here."

Some compromises have already been found. The UH is working through long-held plans to decommission some of the older telescopes on Mauna Kea and return the land to its natural state. Two are slated to be removed soon, and a third demolition is expected to be announced by the end of this year.

Meanwhile, legal challenges to the TMT continue to wend their way through Hawaii's courts. But the state's governor has said that the project has the authority to proceed, and unless the highest court rules otherwise, the TMT can begin construction again.

For now, the TMT and the demonstrators remain in an uneasy stand-off. Most recently, in mid-September, Mangauil and his colleagues agreed to leave their encampment partway up Mauna Kea, which they had occupied continuously since March. As *Nature* went to press, the TMT had not announced

when it might try to resume construction.

In the meantime, Simons continues to try building bridges whenever possible. In early August, he was one of more than 3,000 astronomers in Honolulu for a meeting of the International Astronomical Union. Most were not from Hawaii, and Simons arranged for Mangauil to give a private presentation to around 30 interested astronomers — "what I would call a one-hour classroom tutorial in his perspective", Simons says.

But Mangauil did more than that. A week before his presentation, he gathered some three dozen demonstrators outside the convention centre where the meeting was taking place. He and a UH historian held a press conference there, describing their grievances against the state, the university and the TMT in particular. After the talks were over and journalists had asked their questions, someone broke out a ukulele and led the crowd in traditional song.

About 20 metres away, some astronomers peered out curiously from inside the glass-walled conference centre. Most continued to travel up and down the main escalator on their way to poster sessions and talks about the Galactic Centre and the origin of the Universe.

One of the very few scientists who left the building to mingle with the demonstrators was Simons. He walked among them, head bowed in conversation. ■

Alexandra Witze writes for *Nature* from Boulder, Colorado.