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‘This Mountain is It’:

How Hawai‘i’s Mauna Kea was ‘Discovered’ for Astronomy (1959–79)

PASCAL MARICHALAR

ABSTRACT

This article focuses on issues of land tenure to retrace the history of how Hawai‘i’s Mauna Kea volcano was ‘discovered’ by and for astronomers. In the aftermath of Hawai‘i’s 1959 accession to US statehood, an inhospitable tract of land was suddenly heralded as being ‘probably the best site in the world’ for the observation of the Moon, planets and stars. Political and academic institutions moved decisively to secure exclusive rights over the land and started to market it to off-island scientists. In the mid-1970s, a first major project, the Canada-France-Hawaii Telescope, caused intense pushback from environmental activists and recreational users of the mountain. With the rebirth of the Hawaiian sovereignty movement, the tension surrounding astronomical facilities on Mauna Kea only increased, foreshadowing the conflicts to come.

Key words: Hawai‘i, astronomy, land, University of Hawai‘i, environmentalism, economic development, sovereignty

Hawai‘i Island, also commonly referred to as the Big Island, is the largest of the islands of the Hawaiian archipelago. It is also its most recent, being still located above the volcanic ‘hotspot’ that causes each Hawaiian island to emerge in succession as the Pacific tectonic plaque slowly shifts towards the northwest. Five volcanoes currently define Hawai‘i Island’s topography: the central Mauna Kea (also known as Mauna a Wākea) and Mauna Loa, each towering at over 4,000 metres (13,000 feet), the smaller Hualālai (2,521 metres, or 8,271 feet) facing west, the extinct Kohala at the northernmost tip, and the very active Kīlauea at the southwestern base of Mauna Loa.¹

[insert Figure 1 around here]

In recent years, Mauna Kea’s massive silhouette has become familiar to many in the Pacific and around the world. In the summer of 2015, women and men who identified as *kia‘i* (protectors) of the mountain made media headlines as the police forcefully removed them from the Mauna Kea access road. The *kia‘i* disagreed with the project of a new giant astronomical telescope that would join the dozen observatories already making the site the undisputed capital of astronomy for the Northern hemisphere. In the summer of 2019, a new caravan attempting to start the construction of the telescope was blocked by thousands of *kia‘i*, many of whom were ready to camp for months on the mountain. The project is currently at a standstill.²

The opposition to the proposed ‘Thirty Metre Telescope’ (hereinafter TMT, the name refers to the diameter of the primary mirror) was described by some as an anti-science mobilization. In an email that went viral, a famous American astrophysicist

warned her colleagues against the ‘horde of native Hawaiians who are lying about the impact of the project on the mountain and who are threatening the safety of TMT personnel’.³ Yet to those who were willing to listen, the *kia‘i* explained that this was not a struggle against science. As an important figure of the movement, Pualani Case, explained in 2012 to anthropologist Iokepa Casumbal-Salazar: ‘we’re not anti-science, we’re anti-another building. It could be a hospital up there: that’s not the point’.⁴ The *kia‘i* were determined to put a halt to what they considered to be the desecration of Mauna Kea.

Though Mauna Kea’s summit is inhospitable to human life because of the climate and the rarefied atmosphere, many signs show its historical importance to Native Hawaiians. Century-old adze quarries and cave shelters have been found in the higher parts of the mountain.⁵ Reverend Joseph Goodrich, the first European to climb the mountain in 1823, noted that his Native Hawaiians guides did not want to ascend past a certain line, and was surprised to discover an *ahu* (stone altar) at the summit.⁶ As Emalani Case notes, Native Hawaiians ‘knew they needed to live in the wao kanaka, below the gods’.⁷ In 1882, ‘Emalani Kaleleonālani Naea Rooke, known as Queen Emma, climbed the mountain and bathed in the pristine waters of the lake near its summit as part of her campaign to become Hawai‘i’s next elected leader.⁸ In oral history interviews conducted well before the beginning of the opposition to the TMT, kūpuna (elders) from the ranching town of Waimea recalled their intergenerational practice of burying the *piko* (umbilical cord) of each newborn child at the summit of the mountain.⁹

As *kia'i* and scholars made clear, the events that unfolded on Mauna Kea in the 2010s were not only about cultural heritage: sovereignty was also at stake. In recent times, Mauna Kea has become the symbol of the dispossession that defined modern Hawaiian history. At the end of the 19th century, a group of descendants of American missionaries, organized around influential sugarcane plantation owners, forced King Kalākaua to sign a 'Bayonet Constitution' stripping him of most of his powers (1887), then overthrew his successor, Queen Lili'uokalani (1893), aided by the menacing cannons of an American gunboat. In 1898, the United States (US) decided unilaterally to annex the archipelago, and in 1959, the US Territory of Hawaii became the 50th State of the Union.

The 1970s saw the rebirth of a Hawaiian nationalist consciousness, first on the islands of 'Oahu and Kaho'olawe. The centenary of the overthrow of the Hawaiian monarchy (1993) was a defining moment of this movement, around figures such as Kānaka Maoli (Native Hawaiian) scholar Haunani Kay-Trask, who proclaimed in a speech before the royal 'Iolani Palace in Honolulu: 'We are not American'. That universities and researchers from the United States mainland, as well as from other former colonial states, should feel entitled to decide what could be built on Mauna Kea, certainly fuelled the popular discontent with telescope projects.

Another central feature of the Mauna Kea events is the issue of land: its ownership and its management, what one can subsume under the notion of 'land tenure'. According to historian of science Megan Raby, land tenure 'encompasses the

social institutions, legal or customary, that regulate how people – including scientists – access, own, and use lands and their resources’.¹⁰ In 1848, King Kamehameha III redefined land ownership in what is remembered as the Māhele, which separated crown lands, government lands, and the lands destined to the maka‘āinana (common Hawaiians). As a result of the 1898 annexation, the Crown and government lands were transferred to the United States – managed first by the Territory of Hawaii, and then, after Hawai‘i became the 50th State of the Union in 1959, by the state government.

With the Hawaiian Homes Commission Act of 1921, part of these so-called ‘ceded’ lands were to be managed to the sole benefit of Native Hawaiians. The latter were defined arbitrarily and restrictively as people who met a 50 per cent blood quantum.¹¹ The rebirth of the Hawaiian sovereignty movement in the 1970s drew, in large part, on the sense that the Hawaiian home lands were being mismanaged, at the same time as the unbridled development and unequal sharing of profits made it more and more difficult for large sections of the population to live elsewhere. As of the 1990s, Mauna Kea progressively became a central cause of the Hawaiian sovereignty movement as Native Hawaiians were displaced from the shore inward, ‘pushed to the summit’ by the touristic and capitalist commodification of the lower expanses of land.¹²

This article retraces the history of how Mauna Kea was ‘discovered’ by and for astronomers in the 1960s and 1970s, and the early resistance that this takeover ignited. It inscribes these events in the broader history of economic and touristic development in the chain of islands, which was greatly accelerated by two events that occurred in 1959:

Hawai'i's statehood and the first regular jet service from the US mainland.

Almost overnight, the inhospitable mountaintop was heralded as being 'probably the best site in the world' for the observation of the Moon, planets and stars. Political and academic institutions moved decisively to secure exclusive rights over the land and started marketing it to off-island scientists. In the mid-1970s, a first major project – the Canada–France–Hawaii Telescope (CFHT) – caused intense pushback from environmental activists and recreational users of the mountain (in particular, skiers and hunters). In the second half of the decade, the burgeoning Hawaiian sovereignty movement increased the tension surrounding astronomical facilities on Mauna Kea, foreshadowing the conflicts to come.

The lexicon of 'discovery' was used by the first businessman and the first astronomer to consider Mauna Kea as a viable observation site. I use the word in a critical way. There is some heuristic value to comparing the action of these self-identified pioneers with what successive generations of explorers and settler colonists were doing when they first set eyes on emerged landmasses in the Pacific. The process known as discovery involved charting expanses of potentially livable and usable new territory, filling in the blanks of previous maps. It also involved claiming this territory, placing it through ritual and legal process under a specific human jurisdiction – and sometimes, like Cook in Raiatea and Motuara, 'taking formal possession' of an island even while knowing that its current inhabitants already had a jurisdiction of their own.¹³ This article explores the colonial and capitalist undertones that inform certain scientific

practices.

The discovery of Mauna Kea for astronomy put the mountain on the map as the final Hawaiian frontier of territory that could be developed – against the formidable odds of extreme wind and cold, lack of oxygen, and volcanism. It was followed by the political and legal work necessary to legitimate, *ex post*, the claims of a few men and institutions on the mountain’s destiny. This, in turn, caused pushback from the existing users of the mountain, who knew it as something more than *terra nullius*, ‘barren rock and sand’ or ‘wastelands’ in want of development.¹⁴ By focusing the political debate on land tenure, the burgeoning Hawaiian sovereignty movement raised the unsettling possibility that there existed anterior and legitimate claims to the land beneath the telescopes.

The debate over Mauna Kea astronomy was the subject of two 2014 PhD dissertations by Iokepa Casumbal-Salazar and Leandra Swanner that make important contributions to the historical perspective, even though they both focus on a critical discussion of political narratives employed in the recent struggles.¹⁵ In this article, I draw in particular on Swanner’s study of the early environmental resistance in the 1970s. Parts of this history have also been told in narratives by and about astronomers, such as the detailed accounts of the history of astronomy on Mauna Kea by Walter Steiger and John Jefferies, which are published on the Institute for Astronomy’s website, as well as books by Barry Parker and Michael J. West.¹⁶ Last but not least, the immense collection of archival documents and oral history interviews around Mauna Kea realised by Kepā Maly and Onaona Maly in the mid-2000s is an invaluable

source.¹⁷

This article adds to this scholarship through an original study of various sources: English-language newspapers such as the Hawai‘i Island newspaper the *Hilo Tribune-Herald* (renamed the *Hawaii Tribune-Herald* in 1964), and its offshoot *West Hawaii Today*; as well as the state’s two main newspapers, the *Honolulu Advertiser* and the *Honolulu Star-Bulletin*; the rich personal archives of Mitsuo Akiyama (1920–2004), who was an important member of the Hawaii Island Chamber of Commerce;¹⁸ the archives of the Canada–France–Hawaii Telescope, based in their headquarters in Waimea, in particular their collection of newspaper clippings and photographs; and the archives of the *‘Elepaio*, the bulletin of the Hawaii Audubon Society.

HAWAI‘I STATEHOOD AND THE PUSH TO ATTRACT MAINLAND INVESTORS

The story of how astronomy came to Mauna Kea must be put into the context of the sudden economic promise offered by Hawai‘i’s 1959 accession to statehood. This broadened the territory of economic development, leading some businessmen and politicians to believe that even a snow-capped volcano could be successfully marketed to the US mainland and the rest of the world as an attractive site.

The road to Hawaiian statehood is usually described as a mainly political and geopolitical issue. The citizens’ aspiration to proper representation encountered the opposition of mainland lawmakers who feared the effect the new state would have on

the balance of political power in Washington.¹⁹ In the context of the civil rights movements in the American South, some celebrated Hawai‘i as an ideal melting pot with supposedly little racial inequality and violence, while others warned of the supposedly impossible assimilation of the population of Asian descent.²⁰ Hawai‘i was also pictured as a potential bridge between the mainland and Asia. To many of its supporters, statehood was also meant as a symbol, directed to countries in the Communist sphere of influence, that America was truly committed to extending the reach of democracy.²¹

But the push for statehood also had profound economic implications, which have been less explored. Haunani Kay-Trask writes that ‘after Statehood, burgeoning tourism led to an overnight boom in hotels, high cost subdivision and condominium developments, and luxury resort complexes which necessitated ever-growing demands for land’.²² This was possible because, according to Davianna Pōmaika‘i McGregor, ‘statehood decisively incorporated Hawai‘i within the U.S. political system, assuring a stability that bolstered confidence in the economy and made it attractive to U.S. investors’.²³

On Hawai‘i Island, the anticipation of statehood, for example, led two mainland businessmen to buy 12,000 acres of land in the volcanic Puna area in 1958 and subdivide it into 4000 lots, which sold easily.²⁴ The *Hilo Tribune-Herald* expressed the opinion of the local business elite when it stated that it went ‘firmly along with the optimists, confident that the eager buying of land, much of it sight unseen, means that

the Big Island is finally coming into its own [...] Here on the Big Island we don't care much what brings them in as long as they buy'.²⁵

In 1959, a month after the Hawaii Admission Act, the Hawaii Island Chamber of Commerce sounded the call for a united front to attract mainland investors:

At no time in the past has it been more essential than it is right now for the Big Island to unite on an aggressive program of promotion. [...] Outside investment capital is looking over possibilities in the new State, and the Neighbor Island that is best able to sell itself to this capital will be the island with job opportunity for its young people and tax revenue to mend its financial woes.²⁶

James D. Evans, the president of the Chamber of Commerce, predicted that 'Hawaii will experience an unprecedented "boom" now that statehood has been achieved'.²⁷ He suggested that 'further interest in the utilization of our agricultural lands, including areas now considered unfit for agricultural purposes, can be expected'. Evans imagined creating industrial parks in the island's main town, Hilo, and around the northwestern Kawaihae harbour. The ultimate bonanza would undoubtedly be tourism, as a result of a direct jet service from the United States mainland to Honolulu, which started in 1959. For Hawai'i Island, Evans saw a particular interest in inter-island tourism: 'The increasing Honolulu population, with its expanding personal income, will be looking for vacation areas and will naturally turn to the Big Island if proper facilities are available'.

No tract of land was deemed too inadequate for economic development. The president of the Chamber of Commerce trusted that the barren lava fields of Kona as

well as the eruption-exposed Puna offered ‘excellent opportunities’ for development as retirement centres. The wealthy landowner and State Senator, Richard J. Lyman – also a trustee of the Bishop Estate, the largest private landowner in Hawai‘i – had more ambitious plans for his lands in Puna. At the beginning of 1960, he invited Magma Power, a Californian company, to start experimental drilling in view of establishing a geothermal energy plant that would harness the power of the active Kīlauea volcano. Lyman dreamed that ‘cheap power [would] open an unlimited field in industrial development in the State’,²⁸ in particular for electrochemical production of aluminium, magnesium and nitrous fertilizers.²⁹

The starry-eyed business elite was rapidly reminded of the island’s vulnerability to natural risks. On 22 May 1960, Hilo Bay was hit by a tsunami caused by a major earthquake in Chile: at least 61 people died, more than 300 were seriously injured, and the industrial area of the second largest city in the Hawaiian archipelago was literally flattened, parking metres twisted to the horizontal. The disaster made calls for economic development all the more pressing. Urban planners urged to transplant the ‘wrecked business district’ on higher ground. In September 1960, the *Hilo Tribune-Herald* published a letter from a reader who backed the project of direct Hawaiian Airlines jet service between Hilo and the mainland: ‘Hilo and the island of Hawaii need an urgent boost of economy and we know of no other immediate possibility than the direct service to Hilo which will develop Hilo and the Big Island into a tourist resort destination area’.³⁰

The author of the letter was Mitsuo Akiyama, a member of the Economic Development Committee of the Japanese Chamber of Commerce and Industry of Hawaii. Born in Hilo in 1920, Akiyama held a BA in accounting and finance from the University of Hawai‘i.³¹ After working in civil service and serving in Europe during the Second World War, he had become a real estate agent as well as an insurance salesman. Akiyama’s telephone number appeared regularly in the *Hilo Tribune-Herald* under advertisements that claimed: ‘Hilo is growing, we are growing and so is our list of choice properties – business, residential, acreage’.³²

A few years earlier, the Democratic Party had taken over the Hawaiian state government with the strong support of descendants of Japanese sugar plantation workers. Akiyama was a registered Democrat, and was well connected to the economic elite of the island. In August 1961, he became the new executive secretary of the Hawaii Island Chamber of Commerce. Akiyama continued to reflect on how to attract outside investment, and his attention turned to the island’s two highest mountains, Mauna Kea and Mauna Loa. The former, a dormant volcano whose last eruption dates back many thousand years, lacked any access road past the 9,300 foot (2,800 m) elevation. As for Mauna Loa, it was known as a volcano with frequent and dangerous bouts of activity since the 19th century.

In the summer of 1963, Akiyama wrote a dozen letters to large universities in the United States, as well as the University of Tokyo. In one of them, he wrote that,

the Hawai‘i Island Chamber of Commerce is seriously considering the possibility of undertaking a study as to the feasibility of using the two

mountains on our island, namely Mauna Kea and Mauna Loa, considered the tallest island mountains in the world,³³ for facilities undertaking solar research as well as for [a] space vehicle launching program.³⁴

To the attention of the president of the University of Hawai‘i, Akiyama noted that the volcanoes might also be used for ‘applied research on lava for commercial purposes’.³⁵

The idea of developing the mountains for economic profit was not unprecedented. Since the 1930s at least, many – from politician Lorrin A. Thurston³⁶ to the head of Hawai‘i’s prisons³⁷ – had dreamt of building a ski resort atop Mauna Loa, but the project had been dropped in the 1950s because of the dangerous lava terrain.³⁸ As for Mauna Kea, since the 1930s skiing at its summit during snowy winters had become an activity popular with tourists and the elite of European descent, but the ski slopes were still remote for want of a proper road, which meant one had to stay overnight in the mid-altitude Hale Pōhaku cabins.³⁹

There was a long history to the idea of using the island’s mountains as sites (and objects) of scientific research.⁴⁰ As early as 1794, Archibald Menzies, a Scottish surgeon and naturalist under George Vancouver’s command, had been authorised by King Kamehameha I to climb the lower volcano Hualālai as well as Mauna Loa, where he measured the temperature, atmospheric pressure (in order to estimate elevation) and collected botanical specimens. In 1834, another Scotsman, the botanist David Douglas, described the vegetation and geology on Mauna Loa and Mauna Kea in great detail while measuring the temperature and the relative humidity. In the winter of 1840–41, the United States Exploring Expedition under the command of Charles Wilkes

established a meteorological observatory that included a pendulum to measure gravity at the summit of Mauna Loa. Though they stayed only a few weeks, members of the ‘Ex. Ex.’ noted the harshness of the elements: extreme cold and wind, ultraviolet irradiance, altitude sickness, the sharp dried lava that destroyed leather shoes.

In 1916, part of Mauna Loa’s slopes and summit were included in the new Hawaii National Park, which secured premium access for scientists to what volcanologist Thomas Jaggar called ‘the most perfect natural laboratory in the world’.⁴¹ At the end of the 1940s, meteorologist Robert Simpson obtained support from the Navy, the Hilo Lions Club and Kūlani prison to build a road to Mauna Loa. The first meteorological observatory was inaugurated at the summit in 1951, and a second one rebuilt in 1956 lower on the northern slope. Because of its location in the middle of the Pacific, far from any human source of pollution, the new Mauna Loa Slope Observatory could claim that its monitoring of ozone and carbon dioxide levels provided a neutral benchmark of the Earth’s atmosphere’s composition, rather than a simple measurement of local conditions.

Akiyama knew all this because of his friendship with Howard Ellis, the new director (as of 1961) of the Mauna Loa Observatory. Furthermore, within view across the ‘Alenuihāhā Channel, Mount Haleakalā on Maui offered the inspiring example of a ‘Science City’ jointly built since the 1950s by the University of Hawai‘i and the US Military that was doted with a brand new solar observatory.⁴²

‘PROBABLY THE BEST SITE IN THE WORLD’

The consensus had long been that the conditions on Hawai‘i’s tall volcanoes were probably too extreme for astronomy, as a US mainland astronomer explained to the *Honolulu Star-Bulletin* in 1932:

Asked if he believed that the summits of Mauna Kea, Mauna Loa or Haleakala might be good locations for an observatory, Dr. Carr replied that he had often heard astronomers remark that an ideal place for an observatory would be a coral island in the middle of the Pacific. [...] ‘When you are gazing at stars millions of miles away, a few thousand feet up or down a mountain do not amount to much. It is not desirable to have an observatory too high on a mountain, above the snow line for instance, because of the variations of temperature and the effect of such variations on the mirror or lens’.⁴³

This view changed because astronomy changed. It is no surprise that, among all astronomers, Gerard Kuiper should be the one to reply favourably to Akiyama’s 1963 offer. Based at the University of Arizona, the Dutch–American planetologist was interested in collecting the low-energy, infrared light that planets emit. Most infrared light is absorbed by the water droplets present in the lower layers of the atmosphere, therefore infrared observation is best performed at a high altitude. For some years, Kuiper had been exploring peaks in California, New Mexico and Chile to determine which would be best suited for such an observatory.

Hawai‘i was not unknown to him. Kuiper was used to working with Alika Herring, an astronomer famous for the quality of the mirrors he crafted, who held Native Hawaiian ancestry. At the beginning of the 1960s, Kuiper and Herring had

worked together for the US Department of Defence to test the observational quality atop Haleakalā. More generally, the Hawaiian archipelago was of particular interest to Kuiper because of its relatively low latitude (around 20° north), which made much of the heavens accessible to observation.

During the fall of 1963, Akiyama followed up with his offer to Kuiper. He warned him to keep things discreet:

I don't want to mention any names, but it seems that some people here who are in the best position to help you may not be too receptive about your work and interest in making Mauna Kea and Mauna Loa available to your work. [...] we shall keep matters in confidence, and we maybe [sic] in a very favorable position to help you in your quest to develop and use our mountains on this beautiful island which we consider a pleasant place to live and to earn a living.⁴⁴

It may be that Akiyama had the skiers and hunters in mind when he urged caution. Or perhaps he was simply wary of competition from Maui to attract astronomers.

In January 1964, Kuiper came for a five-day trip to Hawai'i Island. He discovered that Akiyama's offer had solid backing from the state government, and this obviously mattered a lot to him. One meeting with Governor John A. Burns was enough to secure the construction of a graded and oiled 'Jeep track', which would almost reach the summit of Mauna Kea. In April 1964, a Hilo company built a 'very crude road',⁴⁵ but a road nevertheless, opening opportunities for future development.

Kuiper easily won a National Aeronautics and Space Administration (NASA) grant to observe the Moon (in preparation for the Apollo missions). This gave him a

pretext to test Mauna Kea's quality. Herring brought over from Haleakalā the mirror which he considered his best: 'Of excellent quality, the use of these optics not only made it possible to assign any image deficiencies entirely to the state of seeing,⁴⁶ but permitted an exact comparison with the results previously obtained at Haleakala'.⁴⁷ It was decided that the mirror would be housed in a dome erected atop a cinder cone named Pu'u Poli'ahu, at Mauna Kea's summit.

On 20 July 1964, the new telescope was dedicated in the presence of the governor.⁴⁸ Though tests had just started, Kuiper did not contain his enthusiasm:

I do not recall an occasion in my professional career that had the excitement and the promise of this moment. Here we stand on the highest mountain in the Pacific in the clearest and purest air that astronomers have found for making observations in support of the greatest of all human ventures: travel to the moon – hopefully by 1970 – and later possibly to Mars. [...] Hawaii is probably the best laboratory from which to study the Earth: its forces, its growth, its history, and the chemistry and history of its atmosphere. This mountaintop is probably the best site in the world – I repeat – in the world, from which to study the Moon, the Planets, the Stars. [...] Mr. Governor, as a scientist who has worked in Europe, Java, the Mainland, Chile, and on Haleakala, I want to tell you that, to use the words of Mr. Alike Herring, our first observer, 'This mountain is it'. It is a jewel! This is the place where the most advanced and powerful observations from this Earth can be made.⁴⁹

Herring's final report on Mauna Kea tests, published in March 1966, clearly demonstrated its superiority: 'The general stability of both the seeing and meteorological conditions is insured [sic] by the unusual elevation of the mountain,

which places the observatory well above the normal cloud level, the source of so much trouble at Haleakala'.⁵⁰ Herring also found the summit to be wide enough to support many observatories, should the need be felt: 'the mountain top will not only support a large complex of scientific installations, but it will be possible to place these so that no telescope will directly interfere with another', he wrote, referring to the atmospheric turbulence caused by the massive buildings themselves.⁵¹

THE UNIVERSITY OF HAWAI'I TAKES CONTROL

A month after Kuiper's enthusiastic speech, the Australian physicist John Jefferies landed in Honolulu with his wife and three children.⁵² A specialist of solar physics, he was relocating from Boulder, Colorado to the University of Hawai'i (UH) to supervise the opening of the new solar observatory on Maui's Haleakalā. Jefferies later recalled that Kuiper's grandiose dreams for Mauna Kea 'had nothing to do with my coming here, nothing at all. I didn't even know about it'.⁵³ Another mountain was his calling.

Yet from the moment Jefferies set foot on O'ahu, it was impossible for him to ignore the hype around Mauna Kea. A few weeks after his arrival, Kuiper arranged an informal meeting with him. The Arizona-based astronomer had his views set on a second NASA grant, this time to build a full-size telescope, and the funders had made it clear they were more likely to fund the project if UH was on board.⁵⁴ At first, Jefferies had no objection to underwriting Kuiper's application. However, after learning that Harvard University was also thinking of bidding for the same grant to build its own

telescope on Mauna Kea, he changed his mind. As Jefferies explained in a later interview,

so the University of Hawaii was in a position of hearing from these two outside groups that they had designs on a mountain which, I suppose, could reasonably have been regarded as under Hawaii's jurisdiction, and yet no one was talking to the University of Hawaii.⁵⁵

To Jefferies, the state and the UH were two sides of the same coin. Encouraged by his new colleagues, he decided he would draft an independent proposal in the name of UH. It was a gamble: strictly speaking, the university had no astronomy department to speak of, as astronomical research was conducted from the university's Institute of Geophysics; neither did it have in-house skill for building optical telescopes, and Jefferies himself acknowledged he was a theorist rather than an observer. Moreover, the easier choice for him would have been to focus entirely on Haleakalā, a site with a fine access road, new facilities and a mild climate, rather than on Mauna Kea with its 1930s mid-level stone cabins, shifting track, rarefied atmosphere and regular snowstorms. Nobody even knew if human beings would be able to survive, let alone work for extended periods of time, in such an environment.

However, Jefferies had a distinct advantage in the competition for the NASA grant: the close relationship between the University of Hawai'i and the state government. The final proposal, which UH submitted to NASA in February 1965, guaranteed that the state would contribute the 2 million dollars necessary for a

blacktopped summit access road, a power line, modern mid-altitude accommodation and a few scientific staff positions.⁵⁶ Strategically, the proposal suggested two possible sites for a 2.14 metre (84-inch) telescope, Mauna Kea and Haleakalā, while postponing the final decision (Jefferies later acknowledged that it would have been politically tricky for him to choose a site at this stage, because of the rivalry between Maui and Hawai‘i Island businessmen; better let NASA choose).⁵⁷

On 1 July 1965, Jefferies learned that the UH application had been accepted. He immediately proceeded with more surveys on Mauna Kea. Alikea Herring agreed to participate in some of them because of his knowledge of the site. The results seemed almost too good to be true: ‘our seeing measurements were so very good and needed close checking’, Jefferies recalled. ‘I was quite sure that the results, coming as they did from people without any background in site evaluation, would be regarded with great skepticism in the astronomical community’.⁵⁸ The testing rounds also suggested that it was possible to work at such an altitude, although as a precaution all upgoing workers were asked to acclimatize for 24 hours at the mid-level Hale Pōhaku. In March 1966, UH and NASA agreed that the telescope would be built on Mauna Kea.

The ground-breaking ceremony coincided with the autumnal equinox of 1967.⁵⁹ A journalist noticed that Mitsuo Akiyama was not at the ceremony, and asked him why: ‘I just guess I wasn’t invited’, the Hilo businessman said, which was certainly true considering Jefferies’ constant wish to present Mauna Kea astronomy as his own creation. Akiyama suggested that Kuiper, who was not present either, was the one who

deserved all the credit for the ‘discovery’ of Mauna Kea: ‘he made the scientific discovery. He announced it to the world’.⁶⁰

In the meantime, Jefferies had decisively consolidated his hold on the mountain. On 1 July 1967, a few weeks before the telescope’s inauguration, he had become the first director of a new autonomous research unit within the University of Hawai‘i named the Institute for Astronomy [IfA].⁶¹ Four months later, the IfA secured legal control over the Mauna Kea summit lands, even though they officially belonged to the state. The State of Hawai‘i’s Board of Land and Natural Resources approved a lease for all lands above the 12,000-foot elevation on Mauna Kea to the IfA for a symbolic \$1 per year.

Lease number S-4191 had a duration of 65 years: it started on 1 January 1968 and ran until 2033.⁶² It created a ‘Mauna Kea Science Reserve’ which was described as ‘a scientific complex, including without limitation thereof an observatory’ – in other words, the state saw no objection to the construction of more observatories in the future. This gave Jefferies a free hand to decide on land use on Mauna Kea’s summit, because any project would require a sub-lease granted by UH. The lease also stated that the zone would serve as ‘a scientific reserve being more specifically a buffer zone to prevent the intrusion of activities inimical to said scientific complex’.

In June 1970, the 2.2 metre (88 inch) UH telescope was dedicated in a ceremony attended by the governor. One can imagine Jefferies’ sense of professional accomplishment: less than six years after landing with his family in Honolulu, he was at the head of an autonomous research unit backed by the state political establishment,

with brand new headquarters in Mānoa valley, a growing staff, its own world-class telescope, and he had also secured what he considered were exclusive rights over an exceptional observation site that he felt entitled to market to colleagues as he pleased.

THE FIRST MAJOR PROJECT: THE CANADA–FRANCE–HAWAII TELESCOPE

The IfA's efforts to attract astronomers were initially directed towards US mainland institutions. The first two projects that Jefferies accepted were for optical telescopes operated respectively by the US Air Force and Arizona's Lowell Observatory.⁶³ With mirrors measuring each a mere 60 centimetres (24 inches), they were very far from the kind of massive project that would fully demonstrate Mauna Kea's exceptional scientific potential to the world. However, in the early 1970s, none of the prestigious US universities wanted to build a giant telescope on the mountain.

This may seem paradoxical, considering that this was a period during which US observational astronomers were in desperate need of viewing time. Historian of astronomy Patrick McCray writes that in the 1970s 'large telescopes were increasingly oversubscribed; simply observing faint objects for longer times was not feasible logistically. This was true especially at the national centers, where requests for observing time typically out-numbered nights available by more than three to one'.⁶⁴

One path would have been to build replicas of the Hale Telescope, constructed in 1949 at Mount Palomar (California), and the largest telescope in the world. The size of the Hale's 200 inch (5.1 metre) primary mirror was considered the technological limit for a parabolic mirror made of a single piece of glass (bigger ones would be deformed

or break under their own weight). However, many US research institutions suggested that they would rather take the time necessary to develop new designs for a greater light-collecting area than simply build from a blueprint that dated back to the 1930s.⁶⁵

Colleagues from other countries who lacked access to a Hale-class telescope had no such qualms. As of 1967, British astronomers had their own project known as the Northern Hemisphere Observatory, which consisted of a 150-inch telescope. Mauna Kea was considered, but eventually dismissed (in favour of the Canary Islands), on the grounds that the high altitude would be too difficult on the human body and, especially, that the site was too far from the United Kingdom.⁶⁶

In 1969, Jefferies met his colleague Graham Odgers at an astronomy conference in Honolulu. The two men had known each other since their student years at Cambridge. Since 1964, Odgers had been charged with building a national 4 metre telescope for Canada. The telescope, named the Queen Elizabeth II, was to become the second largest in the world, but the project had been abruptly cancelled in 1968 because of disagreements among Canadian astronomers. Odgers recalled asking Jefferies at the Honolulu conference: ‘This Queen E II is done for unless we can find a site and bring it back somehow. Could Canada have the site on Mauna Kea?’⁶⁷ Jefferies saw no reason why not.

In 1970, Jefferies was on a three-month sabbatical in Paris where he met again with Odgers as well as Roger Cayrel, the associate director of the French INAG (Institut national d’astronomie et de géophysique). It turned out that the French also had a project for an observatory. Cayrel had been prospecting for some years to find a site for

France's own 3.6 metre telescope, for which the mirror was already being cast in Ohio. After tests in France and the south of Spain, the French were now considering the site of Ensenada, Baja California, where the Mexicans were creating a national observatory, but they balked at the conditions: Mexico wanted full ownership of the telescope after 15 years.⁶⁸ The Canary Islands was another option, but after travelling there on Cayrel's invitation, Jefferies told him that he considered Mauna Kea to be better.

The idea of joining French and Canadian forces around a common project was validated. In 1973, delegations from the French National Center for Scientific Research (CNRS) and the Canadian National Research Council (NRC) went to Honolulu to negotiate with UH. Roger Cayrel recalls a proposal that they could not refuse: 'the offer of Jefferies was much better [than the Mexican one], he said that the site would be given for nothing'.⁶⁹ In 1974, the three partners signed the charter which created the Canada-France-Hawaii Telescope (CFHT) Corporation. Its bylaws stated that a parcel of summit lands would be sub-leased by UH to the CFHT Corporation for the token payment of \$1 per year. Canada and France would each pitch in for 42.5 per cent of running expenses, while UH would only contribute 15 per cent; observing time would be allocated in the same proportions.⁷⁰

ENVIRONMENTAL RESISTANCE TO SCIENTISTS' APPROPRIATION OF MAUNA KEA

A decade earlier, when inaugurating the first test telescope atop Mauna Kea in July 1964, Gerard Kuiper had implicitly acknowledged that there existed some people who were not thrilled by the arrival of astronomers on the mountain:

I want to stress that recreation, conservation, and science are not rivals; on the contrary, that their interests are parallel. Most major U.S. observatories are on game preserves, in National Forests or in Parks. The scientists will welcome visitors (naturally in small numbers) and could arrange for ‘open house’, say, once a month.⁷¹

These critics included hunters. In the aftermath of the Second World War, a hunting programme had been opened on parts of Mauna Kea, and the men who tracked feral sheep, goats, pigs, quails and pheasants on the weekends were wary of being turned off the mountain by the astronomers. Skiers formed another aggrieved group, though as one journalist noted they were ‘hardly a cross-section of Big Island residents’.⁷² A Hilo Ski Club had been founded in 1937, and a Hawaii Ski Association in 1953. The skiers lobbied for ski-tows, portable toilets and warming huts, and a road paved all the way up to the summit.⁷³

In 1974, when public discussions started about the Environmental Impact Statement (EIS) for the proposed Canada–France–Hawaii Telescope, new dissenting voices criticizing the telescope’s harm to the environment were heard loud and clear for the first time. The environmental resistance was led by Mae E. Mull, a 53-year-old woman who had settled a few years earlier in Volcano, Hawai‘i Island with her husband, after living in Mānoa Valley on O‘ahu.⁷⁴ They were both active members of the Hawaii Audubon Society (of which he would become president and she secretary). The group originally focused on bird conservation – the Mulls were involved in the annual bird counts – but also increasingly dealt with larger environmental issues. In 1971, Mae Mull had written to the *Honolulu Star-Bulletin* to denounce the fact that,

because of Governor Burns' emphasis on economic development, 'Oahu becomes a plastic paralysis of freeways, power plants, condominiums and shopping centers as more agricultural and conservation land is converted to urban use'. She wondered: 'And the Neighbor Islands are to follow the same pattern?'⁷⁵ According to her friend Sheila Conant, Mull was also 'instrumental in the drafting and passage of Hawai'i's first Endangered Species Act' in 1972.⁷⁶

The draft EIS did not consider that there was much to protect on Mauna Kea: it stated that the higher ranges of the mountain were an area with 'little vegetation' above 9850 feet (3000 metres) apart from some nondescript 'forbs and grasses', and the only animals to live there were some feral sheep and Chukar partridges.⁷⁷ Mull and the Audubon Society thought that a lot more was at stake than this description of the summit suggested: 'to destroy the unique natural values of the mountain for the sake of astronomical observation of outer space is not "progress" by any measure', she wrote to the Office of Environmental Quality Control.⁷⁸ Mull pressed for a comprehensive 'master plan' to be drafted for Mauna Kea before any further development.⁷⁹ This plan would guarantee the conservation of plants and wildlife while codifying how human uses of the mountain might respectfully coexist.

In June 1974, the Hawaii Island Fish and Game Association announced it supported the Audubon Society's proposal for a master plan and a moratorium on construction. Earl Pacheco, the leader of the hunting association, wrote to the Office of Environmental Quality Control that 'unfortunately, [Mauna Kea] is being treated like a

“junk” mountain by a few scientists and at the expense of our local people who know no other land and have no other land to move to’.⁸⁰

Political support for astronomy was no longer obvious. Since 1973, George Ariyoshi was the acting governor, replacing John Burns who was severely ill. Though not fundamentally opposed to the telescopes, Ariyoshi agreed with Mull’s idea of drafting a master plan first, as Mauna Kea was ‘certainly one of Hawaii’s most precious natural resources’.⁸¹

Many government agencies also voiced their concerns about the draft EIS.⁸² The State Board of Land and Natural Resources feared that the CFHT might affect Lake Waiau, the ‘alpine’ lake located close to the summit: oil leaks from construction equipment, dust and cesspool wastes could seriously damage such a small expanse of water. The same agency also demanded that ‘the section on “Vegetation” in the EIS be expanded to more fully describe what was meant by “few forbs and grasses”’. The Department of Transportation reserved its review for a comprehensive impact statement, which would include all future observatory projects, instead of a piecemeal review. The Department of Planning and Economic Development warned of the ‘visual impact’ of placing domes on the summit, and imagined ‘possible conflict due to the demand for both recreational and scientific use of the summit’. Faced with the barrage of criticism, UH had no choice but to announce it would start talks with the state’s Department of Land and Natural Resources about a master plan.⁸³

In spite of the tension, the ground-breaking ceremony took place uneventfully on 2 July 1974.⁸⁴ Adorned with leaf garlands, Jefferies tried to reassure the opponents to

astronomy: ‘All this can be done without adverse effects to nature, our people, our environment. [...] We definitely do not want to damage the environment nor do we want to keep the people out’. The director of the Institute for Astronomy claimed that the CFHT would ‘give the islands a new image, an intellectual uplift’.

In 1976–7, the telescope’s construction was already well underway when new public hearings were held about the draft Mauna Kea master plan. Mull was there to voice her concern for the disappearing forest of māmane trees on the mid-altitude slopes.⁸⁵ This was the home of the yellow and grey palila bird⁸⁶ that used to be widespread in the archipelago but now was found only on the lower slopes of Mauna Kea. The Audubon Society also voiced concern for the rare Mauna Kea silversword plant (‘ahinahina), endemic to the higher slopes of the mountain.

A local citizens committee, of which Mull was a member (on Ariyoshi’s decision), recommended that the number of observatories on the mountain be restricted to the current number either existing, under construction, or approved for construction, which amounted to six.⁸⁷ ‘Stop at six and see what the effects are’, said Mae Mull, adding that ‘the astronomers have more than their fair share of Mauna Kea’ and that ‘the Institute of Astronomy should not be greedy’.⁸⁸ Jefferies strongly disagreed: he considered that there could easily be as many as 22 telescopes at the summit without any harm to the environment. ‘The controversy over plans for new astronomical observatories on Mauna Kea is due mainly to a lack of understanding by those interested in the mountain’,⁸⁹ he claimed in his characteristically brazen and undiplomatic manner.

At this point, the unlikely coalition between conservationists and hunters had all but dissolved. Though many hunters agreed that limiting the number of telescopes at the summit would be wise, there was now a ‘side debate’ with the Audubon Society about what was killing the māmane trees. Feral sheep and goats were blamed for eating the young trees, and there were calls for their mass elimination. This angered the hunters, who feared losing a significant source of game. Their leader, Earl Pacheco, remarked that the palila had also disappeared from other areas where goats were not present: ‘There must be something else’.⁹⁰

The final draft of the master plan was approved in February 1977.⁹¹ It established four new management areas in addition to the Science Reserve managed by UH: a ‘mamane-naio forest ecosystem’, a ‘special natural area and historic/archeological management area’ (including Lake Waiau and the adze quarry), a silversword area, and a military area (encompassing the lands within the Pōhakuloa training area). The master plan did not put any limit on the number of observatories at the summit. However, new projects were required to show ‘public benefit to the people of Hawaii, in terms of employment sources, educational pursuit, overall economic development, etc.’, as well as ‘evidence that Mauna Kea is the best site for such facility’. The construction of any new telescope would also require depositing the adequate security ‘to cover the cost of removal of the facility should that be necessary’.

MAUNA KEA ASTRONOMY AND THE HAWAIIAN SOVEREIGNTY MOVEMENT

In the 1970s, Mauna Kea was not yet a focus of organized and visible Native Hawaiian

activism concerned with issues of cultural practices and sovereignty. In oral history interviews conducted in the 2000s, Hawai‘i Island inhabitants who were involved in Mauna Kea debates in the 1970s share an impression that the debate was then restricted to hunters, skiers, conservationists and astronomers, to the exclusion of what was then sometimes referred to euphemistically as ‘cultural issues’.⁹²

This absence from public view can be explained by the chronology of causes that accompanied the emergence of Hawaiian nationalist consciousness during the decade. At the beginning of the 1970s, land claims first pitted urban local communities against profit-driven and tourism-focused real-estate developers in places such as Kalama Valley, Waiāhole-Waikāne and Sand Island on the island of ‘Oahu.⁹³ As Haunani Kay-Trask writes in her seminal article on the Hawaiian movement, ‘by the mid 1970s, these claims had broadened to cover military-controlled lands and trust lands specifically set aside for Hawaiians by the U.S. Congress but used by non-beneficiaries. Justification for these claims had also expanded. At the beginning of the decade, the rallying cry was ‘land for local people, not tourists’. By 1976, the language of protest had changed from English to Hawaiian, with emphasis on the native relationship to land. The cultural value of ‘*Aloha ‘Āina* (love of the land) was to characterise the demands of protesters into the 1980s’.⁹⁴

Authors concur to date this shift to the mid-1970s, around the issue of Kaho‘olawe, an uninhabited island that was being used as a bombing range by the US Navy since the Second World War.⁹⁵ Though the Navy claimed the island contained ‘no

areas of particular aesthetic value’, businessmen and politicians on nearby Maui expressed in 1969 their concern that the bombing was having an adverse ‘impact on development here’. As Mansel G. Blackford notes, ‘in the mid-1970s, native Hawaiians became the leading opponents of military use of Kaho‘olawe, turning what had been a local conflict into a major statewide issue that attracted national attention’.⁹⁶

In 1976 and 1977, a group that came to be known as the Protect Kaho‘olawe ‘Ohana (PKO) organised five landings on the island to stop the bombings. The movement contributed to the recognition that ‘a deep spiritual relationship to the land lay at the roots of Hawaiian culture’, as a witness explained during the trial of some PKO activists.⁹⁷

The construction of Mauna Kea’s first major telescope, the Canada–France–Hawaii, was concomitant with the dramatic events occurring on Kaho‘olawe. The fact that, at the time, no voice audibly criticized the astronomical developments strictly on the grounds of Hawaiian culture or Hawaiian sovereignty – though many did so, on the grounds of environmental conservation or touristic development – does not mean that such opposition did not exist. As Jonathan Kamakawiwo‘ole Osorio recalls about Kaho‘olawe: ‘my grandmother, a pure Native Hawaiian who considered herself a patriotic and God-fearing American, told me that the Navy’s bombardment of the island was pohō (wasteful) when I was still in elementary school back in the early 1960s’, that is, long before the birth of the Protect Kaho‘olawe ‘Ohana.⁹⁸ In the matter of Mauna Kea, the hypothesis of this private, muffled substratum of Hawaiian opposition appears

all the more plausible when one considers the pains to which promoters of astronomy went – as of the mid-1970s – to depict the construction of telescopes as in keeping with Hawaiian culture, and to fend off potential accusations of colonial opportunism.

In his 1966 assessment of Mauna Kea's quality as an observation site, Alike Herring commended the mountain's 'location in a part of the United States, certainly a matter to consider in these days of uncertain political climates throughout the world'.⁹⁹ This statement overlooked the archipelago's tumultuous history: Hawai'i was a part of the United States only as a result of a coup and an illegitimate annexation, and as of the mid-1970s revived knowledge of this historical fact started to cause considerable political uncertainty in the state.

The Hawaiian movement focused increasingly on issues of land tenure. This was unfortunate for proponents of astronomy on Mauna Kea, as the historical and legal status of the lands on which the access road, the mid-altitude facilities and the summit observatories were being built was, in fact, more contentious than had been hitherto acknowledged. It became more and more widely known that part of Mauna Kea's acreage was included in the so-called Crown and Government lands (according to the categories of the 1848 Māhele), later known as the Ceded lands and finally rebranded as State lands after 1959 – lands that were supposed to be managed for the sole benefit of Native Hawaiians.

As a result, as of the mid-1970s the 'Hawaiianness' of what was happening on Mauna Kea seemed to be at stake as much as issues of environmental protection and recreational use. In 1977, a pro-astronomy newspaper article commenting on the master

plan hearings noted that, in 1881, King Kalākaua had been favourably impressed by the visit of the Lick Observatory in California. The Hawaiian king had written to the observatory's president that, 'something of the kind is needed here very much but we have so few people who take interest in scientific matters'.¹⁰⁰ With this quote, the journalist suggested that even the Hawaiian monarchy would have been in favour of telescopes on Mauna Kea. However, the article omitted to mention that Kalākaua's sponsorship of astronomy was very far from an invitation to foreign scientists; rather, it was conducted in the context of a scientific society, the Hale Nauā, which was restricted to Native Hawaiians because it vowed 'to further the humble and careful way of life as nurtured by our ancestors from the beginning of time'.¹⁰¹

One episode involving the Canada–France–Hawai'i telescope suggested that astronomers were aware of the potential tension between their claims on Mauna Kea and the arguments of the Hawaiian sovereignty movement.¹⁰² In March 1979, a crane carefully unloaded a huge steel case from a boat at Kawaihae harbor on the Hawai'i Island. It contained the telescope's mirror. The astronomers' project was to place the case on a trailer and parade it the next day through the town of Waimea, where the CFHT headquarters were located, before bringing it to its final destination. As site engineer Peter Sydserff recalled in an oral history documentary: 'that evening we realised that the flags that were painted on the side [of the mirror case] didn't have the Hawaiian flag, only the Canadian and French one'.¹⁰³ The blunder was deemed severe enough that a painter was immediately, and discreetly 'summoned' to add the missing flag to each side of the case.¹⁰⁴

In fact, he or she did more than this. The study of the many pictures taken of the mirror case arriving on the island shows that the painter was also told to modify the lettering on the case that evening. In Victoria (British Columbia), the Canadians had painted ‘Mirror for Canada France Telescope in Hawaii’ on one side, and ‘Miroir pour télescope Canada France à Hawaii’ on the other. Even under a Hawaiian flag, these words could be interpreted as a sign that the French and Canadian considered Hawai‘i not as a fully fledged partner but only as the site in which their joint telescope was located.

On the English side, the painter was told to switch the words ‘Hawaii’ and ‘Telescope’, so that the lettering now read ‘Mirror for Canada France Hawaii Telescope’ (the preposition ‘in’ removed). On the French side, he or she replaced the adjective ‘Franco-Canadien’ with the words ‘France Canada’, and the ‘À’ preposition, indicating a geographical location, was painted over in yellow to match the steel case’s background. The modified French side finally read ‘Miroir pour Télescope Canada France Hawaii’. Media accounts of the mirror’s parade through Waimea suggest that none of the onlookers were aware of the misstep, nor did they notice the last-minute correction.¹⁰⁵

The inauguration ceremony for the Canada–France–Hawai‘i Telescope was held on the morning of 28 September 1979. It was an exercise in performative Hawaiianness, or, what tourism scholar Dean MacCannell calls, ‘staged authenticity’.¹⁰⁶ 160 guests were massed under the dome, including Governor Ariyoshi, UH President Fujio Matsuda, Canadian Minister Roch La Salle and French Minister Pierre Aigrain.¹⁰⁷ Big

Island Mayor Herbert Matayoshi, who was in favour of a limit on the number of telescopes, did not attend. Lei comprised of vanda orchids intertwined with maile leaves had been tied to the giant tube, and a parterre of hundreds of red anthuriums had been assembled at its foot. Four flags were flying (France, Canada, United States, Hawai'i) and four anthems were played.

The telescope was blessed by Reverend Leon Sterling of Kona. There was a performance of a Hawaiian-language chant composed by CFHT employees Elsbeth McKeen and Edi Radl. The chant suggested that the sacred attributes of the mountain could be transferred to the telescope. Its translation, distributed to the guests, read: 'Majestic is Mauna Kea in the calm, a sacred dedicated place, a majestic mirror, silent, as in ancient times'. It also insisted on the complementarity between the summit and the stars: 'The Pleiades are a lei for Poli'ahu', one of the Hawaiian deities of snow. Conches were blown over the intercom system as the lei were untied. The ceremony ended with a grandiose demonstration of the telescope tube's dance around its axis and a rotation of the dome.

The attendees were then expected in Waimea for lunch, where they were joined by one hundred additional guests. The reception was hosted by Richard Smart, the owner of the Parker Ranch, the most important private landowner around Mauna Kea and a fervent proponent of astronomy. Prime rib from the ranch was served with French champagne and red wine. Gerhard Herzberg, a Canadian who had recently received the Nobel Prize for his research in spectroscopy, gave a speech during which he reflected on the 'remarkable site' on which the telescope had been built. UH President Fujio

Matsuda praised the memory of former Governor Burns, who had passed away four years earlier. All in all, the day's style was 'strictly Hawaiian', according to the *Honolulu Advertiser* – the same newspaper which, eight decades earlier, had been instrumental in the overthrow of the Hawaiian monarchy and the annexation of the islands by the United States.¹⁰⁸

CONCLUSION: UNRESOLVED ISSUES

In 1980, Mauna Kea's first large international observatory was up and running, ready to deliver first-class data to scientists around the world. Other projects were already in the works: the 1980s and 1990s would see the approval of the twin Keck telescopes, the Japanese Subaru telescope and the Gemini North telescope. The constraints placed on the astronomers by the 1977 Mauna Kea master plan proved to be minimal. In particular, the 'best site' prerequisite could always be met.

Yet like the magma that stealthily builds up under the crust of solidified lava, discontent was stirring beneath the apparent consensus that astronomy was Mauna Kea's gift to the world. Many issues that had emerged since Akiyama and Kuiper first met remained unresolved. Environmental resistance was steadily building up, in the name of the fragile palila bird but also of the wēkiu bug, a unique insect that was co-discovered in 1979 by William P. Mull, Mae Mull's husband, and only lived on Mauna Kea's summit.¹⁰⁹ The Hawaiian sovereignty movement was turning its focus from Kaho'olawe to Hawai'i Island, as concern grew about geothermal drilling in Puna and

military exercises in Pōhakuloa, in the saddle between Mauna Kea and Mauna Loa. The Mauna Kea access road was yet unpaved between the mid-altitude Hale Pōhaku and the entrance to the summit area, making for rough driving, and it was not sure whom this pleased most: opponents to astronomical development or astronomers themselves.

At the turn of the 1980s, many supporters of astronomy seemed to have forgotten that the telescopes' presence on the mountain was precarious. Successive master plans and Environmental Impact Statements would regularly reopen the debates about the legitimacy of such facilities on lands that were both conservation lands and Hawaiian home lands. Each observatory was asked to set aside money for eventual deconstruction, and UH's lease ran only until 2033 – with provisions that prohibited granting an extension of such a lease. Before long, the volcano of discontent would erupt.

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FOOTNOTES

¹ Hawaiian language diacritical marks (‘okina and kahakō) are used when needed, except when quoting texts that did not originally make use of them.

² For perspective on recent events, see Emalani Case, ‘I Ka Piko, To the Summit: Resistance from the Mountain to the Sea’, *Journal of Pacific History* 54, no. 2 (2019): 166–81; Candace Fujikane, ‘Mapping Abundance on Mauna a Wākea as a Practice of Ea’, *Hūlili: Multidisciplinary Research on Hawaiian Well-Being* 11, no. 1 (2019): 23–

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³ Iokepa Casumbal-Salazar, ‘A Fictive Kinship: Making “Modernity,” “Ancient Hawaiians,” and the Telescopes on Mauna Kea’, *Native American and Indigenous Studies* 4, no. 2 (2017): 18.

⁴ Joseph Salazar, ‘Multicultural Settler Colonialism and Indigenous Struggle in Hawai‘i: The Politics of Astronomy on Mauna a Wākea’ (PhD diss., University of Hawai‘i, 2014), xxix.

⁵ Kepā Maly and Onaona Maly, “*Mauna Kea – Ka Piko Kaulana o Ka ‘Āina*” (*Mauna Kea – The Famous Summit of the Land*): *A Collection of Native Traditions, Historical Accounts, and Oral History Interviews for: Mauna Kea, the Lands of Ka ‘ohe, Humu‘ula and the ‘Āina Mauna on the Island of Hawai‘i* (Hilo: Kumu Pono Associates, 2005), 244–46.

⁶ *Ibid.*, 99–100.

⁷ Case, ‘I Ka Piko’, 176.

⁸ Maly and Maly, “*Mauna Kea – Ka Piko Kaulana o Ka ‘Āina*”, 156–61.

⁹ Kepā Maly and Onaona Maly, *Appendix A: Mauna Kea – “Ka Piko Kaulana o Ka ‘Āina”*: *A Collection of Oral History Interviews Documenting Historical Accounts and Recollections of Mauna Kea and the Mountain Lands of Hāmākua, Hilo and South Kohala, on the Island of Hawai‘i* (Hilo: Kumu Pono Associates, 2006), 216–19, 299.

¹⁰ Megan Raby. “‘Slash-and-Burn Ecology’: Field Science as Land Use’, *History of Science* 57, no. 4 (2019): 452.

¹¹ See J. Kēhaulani Kauanui, *Hawaiian Blood: Colonialism and the Politics of Sovereignty and Indigeneity* (Durham, NC: Duke University Press, 2008).

¹² Case, ‘I Ka Piko’, 175–6.

¹³ Nicholas Thomas, *Discoveries: The Voyages of Captain Cook* (London: Penguin Books, 2003): 109–10.

¹⁴ Fujikane, ‘Mapping Abundance’, 33–6.

¹⁵ Salazar, ‘Multicultural Settler Colonialism’; Leandra Swanner, ‘Mountains of Controversy: Narrative and the Making of Contested Landscapes in Postwar American Astronomy’ (PhD diss., Harvard University, 2014). See also Leandra Swanner, ‘Instruments of Science or Conquest? Neocolonialism and Modern American Astronomy’, *Historical Studies in the Natural Sciences* 47, no. 3 (2017): 293–319.

¹⁶ Walter Steiger, ‘Origins of Astronomy in Hawai‘i’, Institute for Astronomy – University of Hawai‘i, n.d., <http://www.ifa.hawaii.edu/history/steiger> (accessed 24 Mar. 2021); John T. Jefferies, ‘Astronomy in Hawai‘i 1964–1970’, Institute for Astronomy – University of Hawai‘i, n.d., <http://www.ifa.hawaii.edu/history/jefferies> (accessed 24 Mar. 2021); Barry Parker, *Stairway to the Stars: The Story of the World’s Largest Observatory* (New York: Plenum Press, 1994); Michael J. West, *A Sky Wonderful with Stars: 50 Years of Modern Astronomy on Maunakea* (Honolulu: University of Hawai‘i Press, 2015).

¹⁷ Maly and Maly, “*Mauna Kea – Ka Piko Kaulana o Ka ‘Āina*” (2005) and *Appendix A: Mauna Kea* (2006).

¹⁸ The Mitsuo Akiyama Archival Collection can be accessed on the website of the Office for Maunakea Management: <http://www.malamamaunakea.org/library> (accessed 23 Mar. 2021).

¹⁹ See Ann K. Ziker, ‘Segregationists Confront American Empire: The Conservative White South and the Question of Hawaiian Statehood, 1947–1959’, *Pacific Historical Review* 76, no. 3 (2007): 439–66.

²⁰ See John S. Whitehead, ‘The Anti-Statehood Movement and the Legacy of Alice Kamokila Campbell’, *The Hawaiian Journal of History* 27 (1993): 43–63.

²¹ See Gretchen Heefner, “‘A Symbol of the New Frontier’: Hawaiian Statehood, Anti-Colonialism, and Winning the Cold War’, *Pacific Historical Review* 74, no. 4 (2005): 545–74.

²² Haunani Kay-Trask, ‘The Birth of the Modern Hawaiian Movement: Kalama Valley, O‘ahu’, *The Hawaiian Journal of History* 21 (1987): 2.

²³ Davianna Pōmaika‘i McGregor, ‘Statehood: Catalyst of the Twentieth-Century Kanaka ‘Ōiwi Cultural Renaissance and Sovereignty Movement’, *Journal of Asian American Studies* 13:3 (2010): 311.

²⁴ George Cooper and Gavan Daws, *Land and Power in Hawaii* (Honolulu: Benchmark Books, 1985): 259–77.

²⁵ ‘All To the Good’, *Hilo Tribune-Herald*, 15 Jun. 1958, quoted in Cooper and Daws, *Land and Power*, 260.

²⁶ ‘Call for United Front’, *Hilo Tribune-Herald*, 19 Apr. 1959.

²⁷ James D. Evans, ‘Industry: Outlook Bright for Hawaii County, Chamber Chief Sees New Interest in Isle’, *Hilo Tribune-Herald*, 24 Apr. 1959.

²⁸ ‘Puna Steam Power Proposed’, *Hilo Tribune-Herald*, 22 Feb. 1960.

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³⁰ Mitsuo Akiyama, letter to the editor, *Hilo Tribune-Herald*, 1 Sep. 1960.

³¹ ‘Mitsuo Akiyama is Appointed Chamber Executive Secretary’, *Hilo Tribune-Herald*, 4 Aug. 1961; ‘Mitsuo Akiyama is New VA Counselor’, *Hawaii Tribune-Herald*, 16 Jul. 1969.

³² Advertisement published in the *Hilo Tribune-Herald*, 4 Nov. 1960.

³³ Akiyama is referring to their elevation when measured from their underwater base.

³⁴ Mitsuo Akiyama to Saburo Okazaki, 20 Jun. 1963, Mitsuo Akiyama Archival Collection, <http://www.malamamaunakea.org/library/download/index/2513> (accessed 24 Mar. 2021).

³⁵ Mitsuo Akiyama to Thomas Hamilton, 19 Jun. 1963, Mitsuo Akiyama Archival Collection, <http://www.malamamaunakea.org/library/download/index/2553> (accessed 24 Mar. 2021).

³⁶ ‘The Mauna Loa Highway’, *Honolulu Star-Bulletin*, 1 Aug. 1921.

³⁷ Thomas B. Vance was the head of the Department of Public Institutions of the Territory of Hawai‘i. Forrest M. Mims III, *Hawai‘i’s Mauna Loa Observatory: Fifty Years of Monitoring the Atmosphere* (Honolulu: University of Hawai‘i Press, 2012), 54–5.

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⁴¹ Ashanti Shih, ‘The Most Perfect Natural Laboratory in the World: Making and Knowing Hawaii National Park’, *History of Science* 57, no. 4 (2019): 494.

⁴² See Steiger, ‘Origins of Astronomy’.

⁴³ John B. Peck, ‘Astronomer Believes Life Exists on Planet Mars’, *Honolulu Star-Bulletin*, 21 Mar. 1932. The article is an interview with Dr. Francis E. Carr, an astronomer at Oberlin College who was on vacation in Waikiki.

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⁴⁵ John Jefferies, interview by Spencer Weart, 29 Jul. 1977, transcript, Niels Bohr Library & Archives, American Institute of Physics, College Park, MD USA, www.aip.org/history-programs/niels-bohr-library/oral-histories/4693 (accessed 24 Mar. 2021).

⁴⁶ In astronomy, the quality of ‘seeing’ refers to the degree of atmospheric turbulence that affects the light collected by a telescope.

⁴⁷ Alikea K. Herring, ‘The Mauna Kea Site Survey’, 7 Mar. 1966, 1, Mitsuo Akiyama Archival Collection, <http://www.malamamaunakea.org/library/download/index/2634> (accessed 24 Mar. 2021).

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⁵⁰ Herring, ‘Mauna Kea Site Survey’, 4.

⁵¹ *Ibid.*

⁵² Jefferies, ‘Astronomy in Hawai‘i’.

⁵³ Jefferies, interview by Weart.

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⁶⁰ Walt Southward, ‘Project’s Booster Misses Ceremony’, *Honolulu Advertiser*, 22 Sep. 1975.

⁶¹ Jefferies, ‘Astronomy in Hawai‘i’.

⁶² Swanner, ‘Mountains of Controversy’, 449.

⁶³ Jefferies, ‘Astronomy in Hawai‘i’.

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⁶⁶ Javier Méndez, ‘A General Overview of the Beginnings of the Roque de Los Muchachos Observatory’, Isaac Newton Group of Telescopes, n.d., <https://www.ing.iac.es/PR/tour/beginnings.html> (accessed 24 Mar. 2021).

⁶⁷ Interview of Graham Odgers in *Gathering the Forgotten Voices: An Oral History of the Canada-France-Hawaii Telescope’s Early Years*, produced and directed by Liz Bryson (CFHT, Kamuela, Hawai‘i, 2006).

⁶⁸ Interview of Roger Cayrel in *Gathering the Forgotten Voices*.

⁶⁹ Ibid.

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⁹² Maly and Maly, *Appendix A: Mauna Kea*.

⁹³ Noelani Goodyear-Ka'ōpua, 'Introduction', in *A Nation Rising*, ed. Goodyear-Ka'ōpua, Hussey, and Wright, 1-33.

⁹⁴ Kay-Trask, 'The Birth of Modern Hawaiian Movement', 126–7.

⁹⁵ See Davianna Pōmaika'i McGregor, *Nāa Kua 'āaina: Living Hawaiian Culture* (Honolulu: University of Hawai'i Press, 2007): 249–85.

⁹⁶ Mansel G. Blackford, 'Environmental Justice, Native Rights, Tourism, and Opposition to Military Control: The Case of Kaho'olawe', *The Journal of American History* 91, no. 2 (2004): 555.

⁹⁷ Jonathan Kamakawiwo'ole Osorio, 'Hawaiian Souls: The Movement to Stop the U.S. Military Bombing of Kaho'olawe', in *A Nation Rising*, ed. Goodyear-Ka'ōpua, Hussey, and Wright, 155.

⁹⁸ *Ibid.*, 139.

⁹⁹ Herring, 'Mauna Kea Site Survey', 5.

¹⁰⁰ Helen Altom, ‘Big Isle Observatory Hailed’, *Honolulu Star-Bulletin*, 12 Nov. 1976.

¹⁰¹ Noenoe K. Silva, *Aloha Betrayed: Native Hawaiian Resistance to American Colonialism* (Durham: Duke University Press, 2004), 104.

¹⁰² This section is based in part on a series of photographs conserved at the CFHT Archives in Waimea.

¹⁰³ Interview of Peter Sydserrff in *Gathering the Forgotten Voices*.

¹⁰⁴ Flags were a touchy issue: another photograph kept in the CFHT Archives is a close-up of a shipping label pinned to a large wooden crate of equipment. The label says ‘Canada France Hawaii Telescope Corporation’, with a national flag depicted above the words Canada and France. There also was a flag over the word Hawaii, but someone has cut it out. One can imagine it was the flag of the United States.

¹⁰⁵ Frankie Stapleton, ‘Mirror Moving up Mauna Kea’, *Hawaii Tribune-Herald*, 15 Mar. 1979.

¹⁰⁶ Dean MacCannell, *The Tourist: A New Theory of the Leisure Class* (Berkeley: University of California Press, 1999), 91–107.

¹⁰⁷ Hugh Clark, ‘Observatory Dedicated on Mauna Kea’, *Honolulu Advertiser*, 29 Sep. 1979; Leigh Critchlow, ‘A New Eye Scans Skies atop Mauna Kea’, *Hawaii Tribune-Herald*, 30 Sep. 1979.

¹⁰⁸ It was then called the *Pacific Commercial Advertiser*, and Lorrin A. Thurston was its director.

¹⁰⁹ ‘How many other small, unique and valuable (for study) wonders of nature there are in the summit area we don’t yet know – but we’ve found enough to know that the “barren wasteland” of upper Mauna Kea is in fact a fragile aeolian ecosystem’, Mae Mull and William Mull, ‘Perspective: The Marvelous Mountain’, *Hawaii Tribune-Herald*, 27 Jan. 1980.

Figure 1 caption: Detail of the U.S. Geological Survey map of the Hawaiian Islands, 1972, University of Hawai‘i at Mānoa Library, <http://hdl.handle.net/10524/59582>.

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