

The Dark Side of Telescopes

by Florian Mathieu

Drawing on a socio-historical study of the construction of astronomical observatories on the island of Hawai'i, Pascal Marichalar shows that scientific policies can no longer be considered separately from their ecological and social impacts.

Reviewed: Pascal Marichalar, *La Montagne aux étoiles*, La Découverte, 2024, 304 pp., €22.

Famous for its idyllic beaches and surfing spots, the Hawaiian archipelago is also well known to astronomers thanks to its many observatories, some of which are among the largest in the world. At the summit of Mauna Kea, the highest point in the archipelago at 4,200 meters above sea level, no fewer than 13 professional observation instruments have been installed since the late 1960s. At such altitude, the air is thinner and the sky clearer. The lack of light pollution and the favorable climate make it an ideal site for astronomical activities. However, when historian and sociologist of science Pascal Marichalar traveled to Hawai'i¹ in July 2019 to visit his uncle, it was the local population's protests against the construction of a new telescope that was making news headlines. Are the native Hawaiian people "anti-science," as some astronomers working there appear to believe? This was the starting point for the book, which delves into the much deeper roots of these protests.

To write this story, which reads like a suspense novel, and highlight its many challenges, Pascal Marichalar carried out a lengthy investigation over five years. He

¹ The author has chosen to use this spelling with the inverted apostrophe, which corresponds more closely to the pronunciation and is recommended in current Hawaiian language conventions.

drew on a vast array of documents—some of which were relatively “sensitive” in light of what had previously been reported in scientific circles—from the archives of the observatories and universities involved. The author skilfully uses this archival material to support an ethnographic approach², drawing on encounters and interviews conducted on site or remotely. He spoke with a wide range of actors with sometimes very different social positions and roles, from astrophysics professors to construction blue-collar workers, as well as environmental activists and promoters of Hawaiian culture.

A short history of contemporary astronomy

The book opens with a piece of recent astronomy history (from the second half of the twentieth century). We learn that as early as the 1960s, the famous astronomer Gerard Kuiper marveled at the quality of the sky at the summit of Mauna Kea, alongside the “master of mirrors” Alikea Herring, a key figure in selecting the best sites and installing the first observation instruments.

Pascal Marichalar also uses the figure of Herring to sketch out a piece of the history of “site testing” and its techniques. This practice consists in searching for the best location to install an observatory, taking into account the specific climatic and atmospheric parameters of each site. Methods for measuring these qualities were formalized and standardized in the 1980s, but Herring also developed other criteria for “site testing,” based primarily on his powers of observation, his experience, and his detailed knowledge of instruments.

Marichalar also notes that several major discoveries in astrophysics and cosmology have been made at the Mauna Kea Observatory, such as the famous “dark energy,” which, according to models, accounts for nearly 70% of the total mass and energy of the universe. The existence of this energy explains, in particular, the observed acceleration of the expansion of the universe, which runs counter to Einstein's theory of general relativity in its initial conception.

² Pascal Marichalar also used this approach in his previous book, *Qui a tué les verriers de Givors ?* (La Découverte, 2017), which addresses the issue of recognizing occupational diseases.

However, the history of astronomy is not only that of astronomers, their techniques, and their discoveries. As the author points out, and this is where the real interest of the approach developed in this book lies: *“Telescopes may observe the sky, but they are always built on land, including fragile land, sacred land, and stolen land...”* (p. 27).

Early construction and early resistance

Soon after astronomers recognized the quality of the sky at Mauna Kea, the first observatory construction projects were launched. Since the federal government of Hawai‘i legally owned the mountain, an agreement was reached in the late 1960s with the University of Hawai‘i's Institute for Astronomy: in exchange for a symbolic rent of one dollar per year, the institute was offered a 65-year lease to install observation instruments at the summit of Mauna Kea. The institute then quickly sublet (again for a symbolic dollar) certain parts of the summit to other institutions (mainly other universities in the United States or other Western countries) keen to set up their own observatories there, in exchange for a guaranteed minimum amount of observation time for the local Institute for Astronomy. In practice, the government's provision of land resulted in the institute (and its president, John Jefferies) having almost complete control over the developments carried out, with the very first works even being carried out without a permit. It was not until the first large-scale project in the 1970s—the Canada–France–Hawai‘i Telescope—that an impact study and public inquiry were carried out, against a backdrop of renewed environmental activism and changes in environmental legislation. Several associations joined the cause, spearheaded by activists Mae and Bill Mull. While the impact study produced by the Institute for Astronomy concluded that the summit was of no interest from an archaeological or biodiversity perspective, these activists produced rigorous counter-studies pointing to the presence of rare birds and insects, as well as shrines and burial sites built by the Kānaka Maoli, the indigenous people of Hawai‘i.

However, the master plan for managing Mauna Kea, adopted in 1977, took no account of these warnings or the activists' basic demands, which included limiting the number of domes built on the summit to six.

While local business circles rubbed their hands with glee, welcoming the arrival of this academic community to the island as a significant economic boon (particularly through real estate speculation), environmental activists were gradually joined in their

fight by defenders of Hawaiian culture. This movement calling for recognition of the Kānaka Maoli people and indigenous culture experienced a significant revival in the 1970s. Initially skillfully associated with the promotion of astronomy (“the mountain is sacred and so is the telescope on it”), the Kānaka Maoli gradually distanced themselves as the construction of new instruments on the summit of Mauna Kea surged during the 1980s and 1990s. These sites were in no way respected by the actors involved in various scientific programs: from diverse forms of pollution to the destruction of shrines, the number of incidents increased, provoking the anger of defenders of Hawaiian culture.

Breaking point

In the early 2000s, the first giant telescope projects were launched, with diameters ranging from 25 to 40 meters, compared to 8 meters for the largest existing telescopes up to that point.

Despite previous protests (which had failed to prevent new telescopes from being built) and an official report warning of the political and social risks of building such a large instrument at the top of Mauna Kea, in 2009 two Californian universities chose the summit as the site for the Thirty Meter Telescope (TMT). Plans for a 30-meter-diameter telescope housed in an 18-meter-high dome were originally scheduled to be completed by 2020, but the project remains at a standstill. The last part of the book looks back at the events of the past 15 years, which have prevented work on the TMT from getting underway. From the earliest protests in 2014-2015 to the establishment of a permanent opposition camp in 2019, Pascal Marichalar places this unprecedented mobilization in the context of the Hawaiian archipelago's long colonial history. From James Cook's expedition at the end of the 18th century, its unilateral annexation in 1898, to its admission as a federal state of the United States of America in 1959, the history of the territory has been marked by violence, discrimination against the Kānaka Maoli, and, of course, the appropriation of their lands.

For many opponents, the appropriation of the summit of Mauna Kea by astronomers and the disrespect shown to a mountain considered sacred are just the latest stage in the denial of the indigenous Hawaiian people and their rights. More generally, the hundreds of millions of dollars spent on building telescopes over the past few decades have yielded only extremely limited economic benefits for the local

population, despite promises of prosperity. The repression suffered by the movement—particularly when opponents have been arrested for trying to block access to construction vehicles—appears to have been a major turning point that has largely contributed to making the TMT a central issue in Hawaiian politics.

As the author points out, there is indeed “something tragic” (p. 28) in this tale, which depicts scientists who are sincerely convinced that they are working solely for the good of humanity while ignoring (or worse, denying) the suffering of the Kānaka Maoli people; however, it is to be hoped that the publication of this investigation will help to re-draw the lines. If there were any doubts, this book amply demonstrates that the humanities and social sciences are a valuable tool for analyzing and understanding the complexity of the world, including scientific activities that are, a priori, ‘harmless.’ In light of this book, but especially in light of the protests against the construction of the TMT that inspired it, it now seems clear that any site testing projects for future telescopes will have to take into account not only various atmospheric parameters, but also the many terrestrial political and social issues that impact each observation site.

Beyond this case study, the book also makes an important contribution to several fields of research: the history and sociology of science, since it deals with astronomy, but also social movements, the study of post-colonial societies, and ecology. The strength of Pascal Marichalar's approach lies precisely in the many connections he establishes between these fields, on a subject that must be addressed in this way in order to be fully understood. The question of the land on which observatories—or other scientific infrastructure—are built invites us to reflect more broadly on what it means to introduce scientific activity in a given territory, and to seek to highlight the unspoken assumptions (in this case, colonial) that often underpin it.

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