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TMT on Mauna Kea: Where Science, Culture & Community Collide

by · Monday, Jan 25, 2016

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Construction of Thirty Meter Telescope (TMT) on Hawaii's tallest mountain is at the center of science vs. culture debate. The \$1.4 billion international collaboration is led by the California Institute of Technology and the University of California. Courtesy TMT International Observatory.

By Chiara Cabiglio and Narrissa Spies

17 min read

As PhD student Narrissa Spies glanced down at her phone to check her email, a wave of relief washed over her. In her inbox was an award notification from the Hawaii Community Foundation! Funding for her graduate program is very competitive, and this \$7,500 award came within days of discovering her previous funding would be cut. The joy and excitement was short lived when she realized the scholarship funds were from the [TMT THINK Fund](#), a program that provides scholarships to Hawaiian students majoring in STEM fields. “My heart just dropped, because I knew what accepting the money meant,” said Spies. Spies is one of the many Native Hawaiians opposed to construction of the Thirty-Meter Telescope (TMT) on Mauna Kea, a place revered by the Hawaiian people.

Mauna Kea is a dormant volcano nearly 14,000 feet in height. If built, the TMT would be the 13th telescope built on the summit. At more than 18 stories, it would not only be the largest man-made structure on the Island of Hawaii, but also the largest telescope in the world.

For Spies, the TMT controversy has sparked an internal conversation about the intersection of science, culture, and community in her identity as a biologist and Native Hawaiian. For scientists of color across the country, it has ignited discussion about the role and value of diversity in science as a whole.

Permitting Woes

The construction process for the TMT began more than seven years ago. Community opposition was present from the beginning as with each of the previous telescopes that were constructed. It is estimated construction of the TMT will cost \$1.4 billion but will allow astronomers to see more than 13 billion light years away.

On December 2, 2015, the Hawaii Supreme Court [ruled](#) the Hawaii Department of Land and Natural Resources had not followed the proper permitting protocol and the construction permits they had issued were invalid. Construction can resume only if the TMT decides to restart the permitting process.

Those against the telescope are hopeful the state Supreme Court’s decision marks its final defeat, but, at the same time, realize it is too soon to announce a victory. As the TMT Corporation and the state return to the drawing board, a heated clash between science, culture, and community continues.

Potential for Discovery

Mauna Kea was chosen for construction of these scientific instruments because of its elevation, lack of turbulence, and low light pollution. Telescope construction began on Mauna Kea more than 40 years ago, and the telescopes there have been involved in numerous scientific discoveries: galaxies, black holes, and dozens of extra-solar planets. Collaboration between astronomers at Mauna Kea also makes it an attractive site for construction.

Prior to the current permitting problems, TMT construction was estimated to take eight years and operations were set to begin by 2024. Michael Bolte, astronomy professor at the University of California, Santa Cruz (UCSC) and TMT International Observatory Board member commented, “The TMT telescope will provide extremely sharp images that will allow astronomers to see much fainter and more distant objects than possible with existing telescopes and to study them in greater detail. This represents the possibility of pushing our vision farther into space and our understanding farther back in time to help answer fundamental questions about the universe.”

A Divided Community



Not all Native Hawaiians are opposed to the TMT construction on Mauna Kea. They point to their [Polynesian ancestors](#) who navigated their way to Hawaii more than 1,000 years ago, using the stars. According to these Hawaiians, to be honored with a device that enables them to see the stars better than anyone in the world is only fitting. "I'm one of the Hawaiians that really believes that this is something that we should really take over," said astrophysicist and Native Hawaiian, Paul Coleman.

Similarly, recent graduate Alexis Acohido, who is of Native Hawaiian descent, is [in favor of the TMT](#). Now a communications intern in the Hilo offices of Gemini Observatory, she said, when she first heard about the project, it "sounded really awesome. I thought it would be cool to have for Hawaii."

Telescope supporters maintain that culture and science can and should coexist, and the TMT is proof of this. "The people behind TMT have been committed since the beginning to a new paradigm of development on Mauna Kea founded on integrating culture, science, sustainability and education," says Michael Bolte. Although the TMT Corporation claims to have reached out to representatives of the Native Hawaiian community, anti-TMT demonstrators don't feel it was enough.

A Sacred Space

For Native Hawaiians, Mauna Kea [is sacred](#). It is where all life on Earth began. It represents the point where Wākea (sky father) and Papahānaumoku (Earth mother) touch and is a holy temple where many are still spiritually drawn. Hawaii itself has a tumultuous past when it comes to outsiders and land rights. To Western-weary Hawaiians, these are not distant events. Rather, as *The Atlantic* writer Adrienne LaFrance described, they are "a history that continues to run just beneath the surface of public discourse like a live wire." The recent cultural revival in Hawaii brought back many things, but it did not reclaim the people's sovereignty nor their right to determine how their land is used. Thus, for indigenous activists and scientists, the fight over Mauna Kea is about much more than a telescope or even a sacred mountaintop.

Science, Culture, and Community Collide

The heart, soul, and driving force of [SACNAS](#) is the merging of science, culture, and community and is what makes us unique. The blend of all three is exactly what makes many in our community stay in science: knowing you do not

need to leave your culture behind at the lab door or heading into the field, and you have a community of minority and indigenous scientists supporting you at every step of your journey.



SACNISTAS share their thoughts on TMT (left to right clockwise): Dr. Chanda Prescod-Weinstein; PhD candidate Keolu Fox; Dr. Healani Chang; Undergraduate student Aaron Lopez.

Naturally, those who are part of the SACNAS community, known as SACNISTAs, embody the unification of science, culture, and community. Therefore, when witnessing the battle on Mauna Kea, which is a quintessential example of the clash between these three components, SACNISTAs are compelled either to take sides, or, at the very least, weigh in. The Mauna Kea conflict tugs at their heart strings, challenges their values, and demands a response. For Native Hawaiians, the fight for Mauna Kea is more about freedom to determine their own future. For SACNISTAs, it is more about identity and a larger, systemic problem within science.

Does the fight over Mauna Kea represent the inability of science to fully accept indigenous and minority scientists culture and all? What message does this conflict and its surrounding dialogue send to minority scientists and indigenous communities around the world?

Decolonize STEM

[Dr. Chanda Prescod-Weinstein](#), who is of Black Caribbean descent, is a SACNAS member, 2012 [Summer Leadership Institute](#) alumna, and a theoretical astrophysicist at the Massachusetts Institute of Technology. She is also [against the construction of the TMT](#). "What I have learned as a cosmologist is that science has too often been on the wrong side of progress." When it comes to culture and science she says, "No telescope or science is more

important than people.” Dr. Prescod-Weinstein advocates for the Mauna Kea protectors and has been [outspoken on social media](#), using the hashtags #DecolonizeSTEM and #DecolonizeAstronomy.

She says maybe “progress doesn’t actually mean doing everything as quickly as possible with no regard for cultural consequences.” As one of the only African American women in her field, Dr. Prescod-Weinstein says she’s been dismayed by the sentiments of the TMT supporters. “It’s very alienating,” she told [BuzzFeed News](#). “Their reflections on Hawaii really affect how I see myself in this community. How can I tell Caribbean and other Black Americans that astronomy has a place for you?”

According to Dr. Prescod-Weinstein, “this is consciously looking away and willfully not making a connection that is so obvious: that when you show up on someone else’s ancestral land and appropriate it for your own purposes, there’s something wrong with that picture.” And, for some astronomers, the fact that this will be the most advanced and powerful optical telescope on Earth will never justify what it took to build it. “I want those pictures,” Dr. Prescod-Weinstein says, “but not by any means necessary.”

A Struggle with Identity

SACNISTA Keolu Fox is a Native Hawaiian PhD candidate and geneticist at the University of Washington. Fox believes the Mauna Kea conflict is [another manifestation](#) of Western colonization and oppression of the Hawaiian people. “My reasons for opposing the construction of the TMT are actually not spiritual. Opposing the construction of the TMT isn’t about opposing science: it’s about opposing the system that was designed to oppress Indigenous Hawaiians.”

Fox admits it has not been easy to reconcile his Native Hawaiian and scientific principles. Following conversations with his *ohana* (family), a fundamental question burned in his mind: “What am I first, a *Kanaka Maoli* [Native Hawaiian], a *Hapa Haole* [mixed race Hawaiian], a scientist, or a human being? I experienced a profound tension between my scientific and *Kanaka Maoli* identities.” His internal identity struggle led him to the answers he needed. “As a *Kanaka Maoli* scientist, you inhabit two different identities. One earned through scholastic achievement and the other through *kuleana* or responsibility and respect from one’s community. *Kuleana* represents a deeper commitment to your community than earning a degree.”

After much deliberation, Fox decided to honor his *kuleana* and oppose the TMT, a decision he acknowledges could potentially jeopardize his career. He urges all indigenous scientists to put their *kuleana* and *ohana* first. “I believe that as *Kanaka Maoli* scientists, we should use our voices as a dispatch for the crucial intersection of Indigenous knowledge and science, to represent the interests of our community in opposition of the telescope, a symbol of the continued oppression of Indigenous rights in Hawaii.”

Mauna Kea is Our Sibling

Native Hawaiian scientist, [Dr. Healani Chang](#), Ilima SACNAS Chapter advisor, also does not want the telescope to be built, but for slightly different reasons. She stresses the interconnectedness of human beings with Mother Earth, and that what we do to nature, we do to ourselves. “Hawaii and Hawaiians consider themselves part of the land. Our sibling is *haloa*, the taro plant. The environment is not separate from us as human beings, but is our sibling, the plants and the animals, and we’re here as a family to protect one another and to support one another. If we take care of the land, *malama*, the land will take care of us and feed us.”

Dr. Chang believes it is the responsibility of us all to protect not just Mauna Kea, but the entirety of the natural world. She questions what will happen once the TMT Corporation is done using the telescope. Will they clean up after themselves? Even if they do, Dr. Chang reminds us of the undeniable human footprint that will remain on the

mountaintop. “When do you stop building and polluting the land? They have no idea what’s going to happen with all of the pollution and building material that’s going to be there.”

A Clash of Cultures

University of California Santa Cruz (UCSC) SACNAS Chapter member Aaron Lopez is a first generation Mexican American scientist majoring in applied physics with a focus in astronomy. For the last two years, he has been doing astrophysics research at UCSC.

When asked how the TMT project affects him as an underrepresented minority and a scientist in the field of astronomy, he said, “It would be dishonest of me to say I am affected as deeply as the Native Hawaiians or the astronomers at the forefront of the TMT controversy. However, as most of my peers have been quick to defend the importance of astronomy over the native culture, I’m reminded of how single minded and goal oriented academia trains us to be.”

In the national news, the TMT controversy is often painted as a clash between science and culture. Lopez says he dislikes this. “To me, it’s really just a clash between cultures of different values. I think the worst thing that has come from this event is the further dissolution of an already tenuous relationship between the general public and science when science isn’t to blame, just its outspoken operators. It’s very frustrating to see these communities have such terrible relations.”

What the TMT controversy says to other minority native scientists is “that they will be expected to choose between their cultures and their passions,” Lopez says. Nevertheless, Lopez is hopeful for cultural inclusion in the field of astronomy, remarking, “I think it’s a fight for all of this: identity, social justice, the continued marginalization and oppression of indigenous and underrepresented minority communities, a larger systemic problem within science. But really, I would like this to become a fight for coexistence between academics and the local communities affected by further large-scale scientific endeavors such as this because these issues will only be exacerbated by future global and economic climates.”

Both a Scientist and a Native American

Charee Peters is a PhD candidate at the University of Wisconsin-Madison’s Department of Astronomy. She was a session presenter at the 2015 SACNAS National Conference, where she discussed the Chiles Survey and using radio observations to peer into the universe. Peters has been [outspoken against the telescope](#) from day one, and, as a result, has been met with praise for her bravery, threats, and warnings that her candidness will cost her her career. “[It] has had a major impact on me. I’m an astronomer, so I especially recognize the need for advancement of our equipment in order to further our understanding of the universe. However, I’m also Indigenous (Yankton Sioux), so I can empathize with the Native Hawaiian people on the need to protect culture and what’s sacred.”



SACNISTAs discuss the unintended consequences of pitting science against culture (left to right clockwise):

*PhD candidate **Charee Peters**; **Dr. Adam Burgasser**; **Dr. Jesus Pando**.*

For Peters, the conflict confirms her identity, not confounds it. “Every day that I see something [in the news] about the TMT, I am reminded that I’m *both* a scientist and a Native American. Some days this imparts on me a positive feeling of belonging as an Indigenous astronomer, but, unfortunately, some days it doesn’t.”

Similar to Dr. Prescod-Weinstein, Peters has been discouraged by the sentiments of many in her field. “The hurtful response of some people towards indigenous communities is likely what has affected me the most. When people use hateful language towards our cultures and beliefs, calling them “magical,” or “backwards” even, I feel like this demonstrates that there’s no place for people like me in the field of astronomy,” Peters confesses. “I especially feel hurt because I wouldn’t be an astronomer if it weren’t for the heavy presence of astronomy in my own culture.”

Both Lopez and Peters worry the battle over Mauna Kea will discourage potential scientists of color from pursuing STEM careers because it may require them to choose between their science and their culture. “I worry that the TMT controversy will lead other minority scientists to believe that, if they have strong cultural backgrounds, they can’t be scientists, which is not true at all.”

Concerns on Both Sides

Dr. Burgasser is an associate professor in the University of California San Diego, Department of Physics, and is current chair of the American Astronomical Society (AAS) Committee on the Status of Minorities in Astronomy (CSMA). Dr. Burgasser acknowledges the enormous potential for discovery and scientific advancement, stating construction of the TMT can “greatly expand our understanding of many realms of the universe - from the very first

stars to exoplanets that could potentially host life.” As primarily a nearby star and planet scientist, Burgasser says, “This latter possibility is the one most critical to me. I truly believe that the aperture and resolution of TMT will enable us to determine for the first time the presence and/or probability of life in the universe beyond Earth, which is such a fundamental question to our species.”

On the other hand, as a long-time SACNAS conference attendee, Dr. Burgasser emphasizes, “As a SACNISTA, I temper this excitement with the concern as to whether the research done with TMT will be open to all astronomers, particularly astronomers of color. I feel it critical that astronomers of color have the same access, ability, training, etc., to make use of this major resource as white astronomers. The awareness that science occurs in cultures and communities, i.e., it is not independent of them, is something that is important to engage with.”

Another one of Dr. Burgasser’s concerns has to do with opportunity. “Should the TMT not go forward, or move away, this may greatly harm those who are interested in science and engineering in the local community,” he says. Based on knowledge he’s gained from students he’s mentored, he notes that talented Hawaiians must travel to the mainland for education, and they rarely come back due to the lack of STEM jobs in their homeland. He says a shutdown of the TMT will stifle tech development on the islands and create a mass exodus of local Hawaiians. “I think this is something those who are opposed to TMT must consider.”

Science and culture, Dr. Burgasser believes, can coexist on Mauna Kea. “But there must be a willingness for both sides to have respectful discussion,” he says. “I’m optimistic there’s a way forward in which both sides can gain from a partnership rather than a standoff.” Whether you have an opinion on the TMT or not, he says the important thing is for SACNISTAs to engage in conversation about this issue.

The Importance of Diversity of Opinion

Dr. Pando is the associate professor and chair of the Department of Physics at DePaul University. He was the session chair for the Big-Data Revolution in Astrophysics seminar at the 2015 SACNAS National Conference and has served as co-advisor for DePaul’s SACNAS chapter. As a Mexican American cosmologist, he says, “I feel a great deal of sympathy with those who want to keep the TMT from being built because I am from a group that has not had equal access to the scientific enterprise and because I have personally witnessed cultural insensitivity.” For Dr. Pando, the fight over Mauna Kea has not made him question his identity. “I am both a scientist and an activist,” he says.

Like Dr. Burgasser, Dr. Pando believes that science and culture can coexist on Mauna Kea. “I believe it is possible for science to be done in a way that respects the local community and culture. Science, and any other human activity, must respect that local culture and must abandon projects that severely affect the local community. That determination must be made by that local community and not by outsiders.”

When asked what the TMT means for other minority and native scientists and how it might impact them, he alludes to one of the reasons SACNAS was founded. “[SACNAS] was founded to give communities, whose voice might not be loud enough for ‘powers’ to hear, a chance to be heard. The local culture is part of the SACNAS family. If their voices are being ignored, it is important that SACNAS weigh in on the issue.”

Many Opinions, One Plea

If there is one thing on which many from the SACNAS community and the astronomy and science communities at large can agree, it is the dire need for respectful and professional dialogue and communications when discussing the TMT project. In a [joint statement](#) issued by a number of SACNISTAs and others within the science community, they stress how “It is crucial that as leaders and role models in our field we understand the repercussions of our words and

actions, and it is incumbent on us to demonstrate respect for the broader society on whose support we depend. It is important also that junior researchers not be professionally penalized for their views on this issue.”

Not Just Astronomy

While many astronomers are in favor of the TMT because of its benefits to the field of astronomy, many other scientists oppose construction of the TMT on Mauna Kea. Astronomy is not the only science taking place on the mountain. In fact, the entire Island of Hawaii is a hotspot for the fields of ecology and evolution. For environmentalists, Mauna Kea is a [biodiverse ecosystem](#) that is home to many rare and altitude-sensitive species. One of these species is the endemic wēkiu bug (*Nysius wekiuicola*), found nowhere else on earth. Ecological damage from development, conservationists say, threatens the habitat of the region’s native plants and animals, but TMT advocates say the telescope would touch only 0.08 hectares of the wēkiu bug’s habitat.

Proponents of the project, however, claim the TMT has been carefully designed to avoid such impacts. According to the [Mauna Kea and TMT websites](#), the telescope is based on a new model of sustainable astronomy that will leave zero waste and “will be the most environmentally sensitive telescope ever built on Mauna Kea.”

Then there’s the debate of building on protected land. The Mauna Kea Science Reserve (MKSR), where the telescope would be built, is designated as [conservation land](#) leased by the University of Hawaii (UH). To some, conservation land equates to leaving an area untouched indefinitely in order to preserve its pristine state. According to Hawaii state law, however, astronomy is an identified use for protected zones. Many opponents still believe this project falls under industrial development and consequently would violate the rules for such districts.

Potential Environmental Impacts

Michael Bolte affirms that the TMT has held more than 20 public hearings and numerous meetings with representatives from the Native Hawaiian community. “At each step of the planning process we have consulted extensively with cultural practitioners and experts in the fragile environment of Mauna Kea and adjusted our plans to ensure the protection and preservation of Mauna Kea culture and landscape.” He stresses the selected site has none of the cherished *heiau*, or shrines and was chosen in agreement with Hawaiian cultural practitioners. Nevertheless, even the [environmental impact statement](#) performed prior to the approval of TMT construction recognized how 30 years of astronomy atop Mauna Kea has indeed harmed culture and nature, the desecration of which would likely continue to occur if the TMT is built.

According to Dr. Gabrielle Feldman, environmental policy expert and owner/principal of [Environmental Policy Solutions, LLC](#), the CMP and EIS do not sufficiently evaluate or mitigate resources and potential impacts. “There was no attempt to quantify the potential impacts either from the project itself or within the cumulative impacts assessment,” says Dr. Feldman. “None of the survey data was newer than 2007, which means that the potential impacts could be far greater than originally anticipated.” Furthermore, Dr. Feldman points out that because a large contingent of impacted stakeholders feel they were not properly included in the planning process, “it is impossible to say that the agency did an adequate job of stakeholder relations.”

Investing in Hawaii

As part of the agreement to build on Mauna Kea, the TMT project has established a community benefits package in order to [give back to Hawaii](#). Since they were constructed, telescopes on Mauna Kea have paid only \$1 of annual sub-lease rent to the University of Hawaii. In contrast, the TMT project, when constructed, will pay \$1 million per year in lease rent, with a portion going to the Office of Hawaiian Affairs to benefit Native Hawaiians. Additionally, the TMT project has set up the [THINK Fund](#) scholarship program. Still, many feel these mitigation efforts are not enough. As Dr. Feldman says, “the mitigation measures outlined in the EIS are more like reparations.”

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Ohana Over Science

In the end, SACNISTA and Ilima SACNAS Chapter President Narrissa Spies decided not to accept the money from the TMT THINK Fund despite how much she truly needed it. She commented, "While I think promoting STEM education through scholarships is a great idea, I felt a little like I was trying to be bought" Spies said in an opinion piece for [Civil Beat](#) that she "felt this was a payoff, a way to buy the cultural resources that are sacred to so many. You cannot purchase a culture because it is something that is invaluable." When asked about her views on astronomy and science, she said, "I have aloha for science and I have aloha for astronomy, but astronomy does not represent all of science, and aloha cannot be bought."

About the Authors

[Chiara Cabiglio](#) is the SACNAS Communications & Marketing Coordinator. She's passionate about researching and writing on the intersection of indigenous cultures and environmental conservation/sustainability.

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