INDIGENOUS LANDS & WHERE WE DO SCIENCE

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Special thanks to Prof. Andrew Baker for vital feedback!

KITT PEAK (ARIZONA) - LOCATION FOR NEW NATIONAL OBSERVATORY

By the 1950s, only had private observatories in US
- Lick Observatory (Univ of CA)
- Palomar Observatory (Carnegie Institution, Caltech)

Wanted the 1st *national* observatory,
with ideal optical observing conditions:
- Clear, dry skies (high elevation, ~6000-8000 ft less air turbulence)
- Far from city light pollution
- Close enough to an area with building materials

1955, site-search led by astronomer Helmut Abt.
Conducted search on own (via aircraft & jeep).

Narrowed down to Kitt Peak (elevation 6875 ft).

Image taken from Google Maps

Source: Jacelle Ramon-Sauberan (2018)

KITT PEAK (AZ) - DISCUSSIONS ON OBSERVATORY

Tohono O'odham Nation considers Kitt Peak sacred. They call it "*Iolkam Du'ag*", meaning "I'itoi's (creator's) garden".

1956, Tohono O'odham guides agreed to meet with astronomers & take to the summit on horseback.

Afterwards, met with elders in community & leaders of Tohono O'odham's Schuk Toak District to discuss leasing land.

At one of the meetings, astronomers invited leaders in the Tohono O'odham community to look through a 36" telescope at University of AZ

Image from NOAO 50th reunion

Source: Jacelle Ramon-Sauberan (2018)

KITT PEAK (AZ) - DISCUSSIONS ON OBSERVATORY

Agreement to lease the land was more complicated than some astronomers' narratives on this.

(from astronomer Frank Edmondson), getting permission was "a simple matter".

In other accounts (from historian L. A. Swanner, 2013):

- Divided opinions among members of Tohono O'odham community - many worried about telescope construction disrupting sacred lands
- Telescope proposal was rejected twice
- Full reasoning behind approval unclear: perhaps the 36" telescope demonstration helped, and telescope would generate revenue & job opportunities

KITT PEAK (AZ) - CONSTRUCTION & LATER RELATIONS

1958, National Science Foundation (NSF) was leased 200 acres for the observatory.

"Cultural Ambassador" Elizabeth Estrada worked at the observatory to maintain relations between astronomers & Tohono O'odham

- Sell Tohono O'odham crafts at the Visitor Center
- Preferentially hire Tohono O'odham staff

Source: L. A. Swanner (2013)

2003, VERITAS gamma ray telescope began construction

In response, 2005 Lawsuit by Tohono O'odham Nation against NSF:

- Tohono O'odham stated they were unfairly represented with 1956 lease.
- Also stated that NSF violated the National Historic Preservation Act with VERITAS.

VERITAS moved to Mount Hopkins, AZ (slightly SE of Kitt Peak)

QUESTION:

When astronomers want to build a telescope, how should they balance the astronomical qualities of a possible site (weather, opacity, turbulence, etc.) with environmental and cultural factors?

OIR: want low atmospheric turbulence
RMS:want low atmospheric opacity

MT. GRAHAM INTERNATIONAL OBSERVATORY (MGIO) in AZ

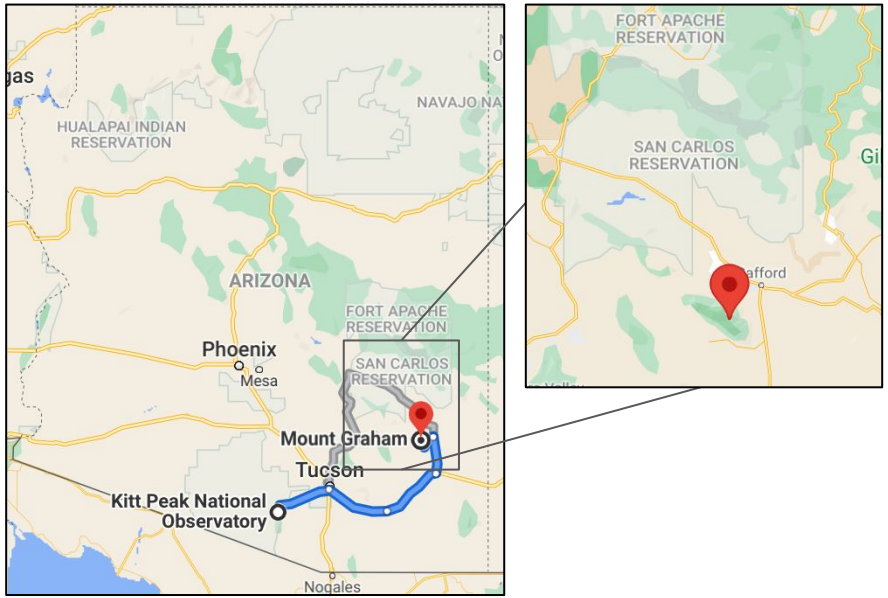
1873, the US government took away land ownership right of Mt. Graham from San Carlos Apache Nation

- Not federally required to get San Carlos Apache approval

1916, established Steward Observatory

1984, astronomers proposed for more telescopes on Mt. Graham.

The largest telescope would be called *Columbus*... perhaps tied to collaborators in Italy & Ohio State (Columbus, OH)
→ now the Large Binocular Telescope



Images from Google Maps

Source: L. A. Swanner, 2013

MGIO (AZ) - PUSHBACK ON OBSERVATORY

Pushback from environmentalist groups:

- Only known environment suitable for Mt. Graham red squirrel

Pushback from San Carlos Apache Nation:

- Consider Mt. Graham sacred home to guardian spirits
- Also provides holy water, sacred herbs, and as a burial site

1992 Columbus Day - protest at Steward Observatory (students, environmentalists, members from Native communities)

Summer 1993 - protestors chained themselves to a cattle guard on the main road to summit of Mt. Graham

Source: L. A. Swanner, 2013

MGIO (AZ) - RESPONSE TO PUSHBACK

Mt. Graham *International* Observatory - led by University of AZ, collaboration with other US universities, Italian and German governments, and Vatican City State.

Statement from Franklin Stanley, Sr. - San Carlos Apache spiritual leader:

> "If you desecrate Mt. Graham it is like cutting off an arm or a leg of the Apache slaughtered even as they were drumming our sacred songs and prayers. Building the telescopes on Mt. Graham is like ripping off the arms of the singers. But we thought those times were over."

Response from Father George Coyne - director of Vatican Observatory:

> "We are not convinced by any of the arguments thus far presented that Mt. Graham possesses a sacred character which precludes responsible and legitimate use of the land...In fact, we believe that responsible and legitimate use of the land enhances its sacred character"

Source: L. A. Swanner, 2013

MGIO (AZ) - ASC LAWSUIT

Evidence existed: in 1980's, two shrines were found on Mt. Graham

1991, Apache Survival Coalition filed lawsuit against Forest Service for violating National Historic Preservation Act

Within council, some believed lawsuit was waste of resources

Within Native community, differing opinions:
- telescope symbol of colonialism
- some supported observatory's construction

Ola Cassadore Davis, founder of Apache Survival Coalition. Image from Robin Silver

Source: L. A. Swanner, 2013

MGIO (AZ) - CONSTRUCTION

Construction began in 1989. Delayed with lawsuits from ASC and environmental groups. Also delayed by lack of funding.

ASC lawsuit dismissed in 1992.

Construction finished in 2003.

Originally proposed 13 telescopes, constructed 3:

- Columbus (now the Large Binocular Telescope)
- Two smaller telescopes including the Vatican Advanced Technology Telescope (VATT)

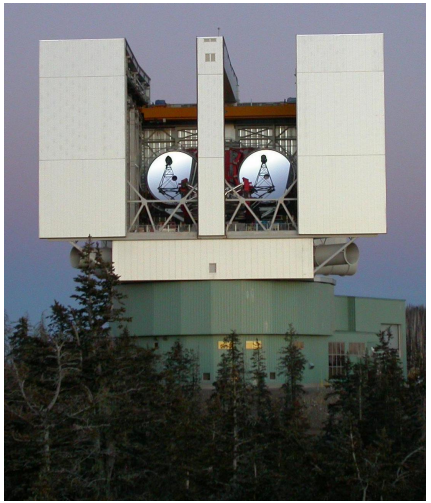


Image from Large Binocular Telescope Observatory

Source: Mia de los Reyes (2019)

QUESTIONS:

How should we evaluate whether the leadership of a telescope project has done a good job?

What proof, if any, should an indigenous group need to show of special ties to a particular site? Does it matter whether the indigenous group is recognized on a state or federal level?

THIRTY-METER TELESCOPE, TMT (MAUNAKEA)

- Would be largest US ground-based telescope ever built (EELT ~39.3 m diameter)
- 30 m diameter aperture
- Goal resolution of 12 times sharper than images from the Hubble Space Telescope
- Better understanding of the 'Dark Ages' of our universe
- Provide information on the physics of the early universe and possibly the nature of dark matter.

Image from TMT homepage

Source: Ellis Avallone (2019)

TMT (MAUNAKEA) - LOCATION

- Preferred location in the northern hemisphere since the European Extremely Large Telescope (EELT) and Giant Magellan Telescope (GMT, which is a partner with TMT in the proposed "US ELT" partnership) are being built in Chile in the southern hemisphere

Image from an article by The Atlantic

- Primary location on the northwest slope of Maunakea volcano (Hawaii)
- Altitude of 4050 m
- Location chosen due to high altitude and low light pollution, dry atmosphere and low turbulence

- Alternate location: Canary Islands (Spain). 1800 m lower in elevation + issues with Sahara dust, currently erupting volcano.

Source: Ellis Avallone (2019)

TMT (MAUNAKEA) - History

- 1960s - Summit of Maunakea leased by the University of Hawaii from the Board of Land and Natural Resource (BLNR)
- Land further subleased by University of Hawaii to observatories (for a small fee and a percentage of the observing time)
- University of Hawaii receives large scientific gains
- Office of Hawaiian Affairs and the Hawaiian people receive no compensation

Several telescopes have been built on Maunakea since 1979. Meetings during the building of these telescopes involved discussions about

- Limit on the number of telescopes built on Maunakea
- University of Hawaii's failure to consider the environmental effects
- Acknowledgement of need for official public hearings

Source: Ellis Avallone (2019)

TMT (MAUNAKEA) - Past observatories

Looking back at the environmental impact statement released by Office of Mauna Management during the building of **Canada France Hawaii Telescope (CFHT)**, in 1974:

- No archeological sites present on telescope site
- Present day cultural sites not addressed
- Significance of Maunakea in Hawaiian culture not addressed
- Indigenous Hawaiian Groups not consulted during preparation of statement

Image taken from AstroPixels

Despite concerns raised about the number of telescopes being built (and a planned set of outriggers to the Keck telescope being cancelled), plans for further development proceeded

Source: Ellis Avallone (2019)

TMT (Maunakea) - Cultural importance of Maunakea

In favor of the TMT

- Supposed to be 'the most environmentally sensitive telescope' ever built on Maunakea
- Support from some island residents, some of whom consider the telescopes on the mountains to be a modern embodiment of Hawaii's cultural ties to astronomy

TMT and the cultural significance of Maunakea

- Maunakea is a burial ground and an embodiment of sacred ancestors
- It is also home to a hundred archeological sites in addition to having ecological and geological value
- Three main historic sites close to the observatory
- Site is proposed 0.5 miles northwest of Kukahau'ula, which is believed to be a manifestation of the deity Ku

Source: Ellis Avallone (2019)

TMT (Maunakea) - Construction approval and delay

- Construction was approved by the Hawaiian State Supreme Court on July 15 2019
- On July 15, 2019, access to roads was blocked as a sign of protest
- 4 week shut down of 12 observatories, longest in 50 years
- Controversy triggered by TMT construction but also informed by generations of conflict between the Native Hawaiians and the U.S government

Statement by Rick Fienberg, press officer for AAS: "*The Hawaiian people have numerous legitimate grievances concerning the way they've been treated over the centuries. These grievances have simmered for many years, and when astronomers announced their intention to build a new giant telescope on Maunakea, things boiled over*"

- Due to protests and the pandemic, the construction has been delayed to 2021

Source: Ellis Avallone (2019)

TAKE-AWAY: we must be mindful of our research & its impact on others.

DISCUSSION QUESTIONS:

Can conflicts between indigenous groups & scientists be prevented?

How can fair, equitable decisions be made on who has rights to lands for the purpose of scientific research?

Who should be involved in discussions between astronomers and indigenous groups, and how can power imbalances be addressed?

For future observatories & observatories which already exist on indigenous lands, how can relations between the astronomers & indigenous groups be improved?

ASTRO2020 REPORT - (Sec. 3.4.1) by steering committee

GOALS FOR COMMUNITY ASTRONOMY

- Listen & empower:
  - "... empowers the local community with at least partial control, even if power-sharing is not legally required."
  - Ensure community leaders are present in governing meetings
- Aim to do good for all:
  - Higher than bare minimum of legal requirement
  - Add human value (educational cultural, economic)
  - Demonstrate worth through different lenses & be open to alternate solutions beyond optimizing science
- Invest in the future:
  - Collaborate w/ local leaders & all stakeholders for long-term mutual benefits
  - Aligning values & priorities

ASTRO2020 REPORT - (Sec. 3.4.1) by steering committee

Recommendation: astronomy community should work with experts in our own field & in other research fields (via national groups like American Astronomical Society) and work with representatives of local communities to formally define Community Astronomy model.

They look to the example of Arecibo Observatory:

- Within ~60 yr history, "highly regarded" by Puerto Rican locals
- Provides local economic benefit, & training/employment opportunities

(November 2020) NSF announced plans to decommission Arecibo Observatory. Local support to preserve Arecibo site for educational & cultural activities (even if not research)

ASTRO2020 REPORT - Appendix N.6.7

← Panel advisory not necessarily binding to steering committee.

Goal 7, Suggestion 1: The panel suggests that funding agencies hold ground-based observatories accountable to a high ethical standard, particularly around the construction of TMT on Maunakea. A true partnership as defined above would redirect effort to identify stakeholders and assess their needs, values, and activities, especially in relation to the Kanaka Maoli.[238]

Method, impact, and programmatics and cost to achieve this suggestion:

- **State of Hawai'i and TMT Institutions, Held Accountable by Funding Agencies**
  - *Method:* The panel strongly suggests that *any* new or continued construction on the summit of Maunakea be contingent upon having proactively established a pathway forward using a community-based approach that is based on consent and *mutual* agreement.[239] To ensure said pathway, the panel suggests, in addition to following guidelines developed in Goal 1, Suggestion 2, and Goal 6, Suggestion 1, the three methods outlined below. The panel further suggests that funding agencies not invest in future projects on Maunakea unless this and the following three methods are realized.
  - *Impact:* Allow time for respectful dialogue, which cannot occur under duress.[240]
  - *Programmatics:* No change in cost.[241]
- **TMT International Observatory LLC (TIO), University of Hawai'i (UH), and other Facility Lease Holders on Maunakea's Summit, Held Accountable by Funding Agencies**
  - *Method:* Allocate funding in facilities budget for proactive, ecologically sound maintenance of current facilities and complete cleanup of decommissioned observatory sites.[242] The panel suggests that funding agencies mandate annual reports on maintenance, cleanup, and other terms of land lease/occupation, as a requirement of any federal investment in TMT and in compliance with Goal 6, Suggestion 3.
  - *Impact:* Demonstrate that Indigenous voices have been heard on this matter and are respected, and thus intentional reparations are enacted.
  - *Programmatics:* Federal agencies can ensure compliance. Cost is $1 million/year for maintenance, $23.5 million/observatory for decommissioning and cleanup.[243] These costs will need to be verified and updated using independent estimates and in collaboration with the local community.
- **TIO,** Held Accountable by **Funding Agencies**
  - *Method:* Fund initiative(s) for stakeholders who have an interest in Maunakea, including Kanaka Maoli cultural knowledge holders, to open a respectful and continuous dialogue around informed consent, where Kanaka Maoli are included in the TMT/TIO leadership. Informed consent[244] means an iterative process of proposal and review that addresses ethics and impacts on Indigenous persons and communities. Funding agencies can hold TIO accountable by making any federal funding for TMT contingent upon the ethical practices for partnership.
  - *Impact:* Provide a roadmap for the respectful development of future facilities that upholds the integrity of Indigenous people and the Profession.
  - *Programmatics:* Cost: $10 million initial efforts, 10 percent annual operating and maintenance costs—in addition to "Community Benefits Package" and "Education and Public Outreach."
- **Funding Agencies and Institutions**
  - *Method:* Systematically determine whether there are Indigenous stakeholders and what their needs, values, and activities are prior to and during development of any new facility. Hold facility development to the same ethical standards as any partnership in the Profession.[245] Within this framework, local stakeholders (especially Indigenous) would be included in planning, construction, maintenance, and decommissioning of facilities, as well as in defining benchmarks for accountability.
  - *Impact:* Funding Institutions and land holders would create an ethics review board, in accordance with Goal 6, Suggestion 1, tasked with review and approval of facilities development, working in partnership with local stakeholders. Funding agencies can provide federally mandated and professionally established ethical standards, protections, and guidelines for individual human, cultural, artifact, and environmental impacts from facilities development.
  - *Programmatics:* Included in construction and maintenance cost.
- **The Profession and Funding Agencies**
  - *Method:* Require proposals using observational facilities that have Indigenous stakeholders consider the societal impacts of the observatory and its use on those communities. The panel suggests that a mandatory educational module be included in the time application, where this module would be developed in collaboration with Kanaka Maoli and focus on societal impacts and the equity-advancing values outlined in the section "A Values Statement for the Profession of Astronomy and Astrophysics," earlier.
  - *Impact:* Self-education of PIs on the process and impact of observatory construction on Indigenous lands.
  - *Programmatics:* Low-cost. Could be implemented immediately.