



W. M. KECK OBSERVATORY

“Modern Astronomy on Maunakea: A 60-year Story (1960-2020)”

Guest Speaker: Bob McLaren, Interim Director, University of Hawai‘i Institute for Astronomy

W. M. Keck Observatory Astronomy Talk

September 2, 2020

DR. BOB MCLAREN’S ANSWERS TO QUESTIONS FROM THE ONLINE AUDIENCE

1. Are there any stories that Alika knew Hawaiian constellations?

Not that I am aware of.

From craig.breckenridge: He was employed for some time at LPL where he worked as a lunar cartographer, but I don’t know if he knew the Hawaiian constellations.

2. From Michael Lobanov: Is it still a good idea to build ground-based telescopes when we have Hubble like spacecrafts?

Yes, it definitely is. For a given size of telescope, it is far more expensive to put it in space and maintain it there than to place it on the ground. The Hubble primary mirror is 2 meters in diameter – the same size as the UH 2.2 meter, which is the smallest telescope on Maunakea. Each of the 10-meter mirrors on the Keck I and Keck II telescopes has 25 times the light collecting area as the Hubble, and the TMT will have about 120 times the light collecting area. The James Webb Space Telescope has a 6-meter mirror, still smaller than Keck Observatory, Subaru, and Gemini. For much of the work in modern astronomy, such as the study of exoplanets or the formation of the first stars and galaxies, size does matter, and it is simply not possible to put telescopes in space as large as those that can be built on the ground.

3. From Bob Lyness: What do you see as the most likely way forward that will satisfy both scientific and native Hawaiian needs? A ‘win-win’ so to speak.

I think the key is coming together to forge a common vision for the future. I feel that a healthy astronomy program should be an essential part of that vision. UH is committed to building relationships and views that bond as essential to the stewardship of the mauna.

4. From alan: great talk! Question: Where will TMT go if it cannot be located on Maunakea, and what will be the pros and cons of the 2nd choice location relative to Maunakea?

The alternative site is the island of La Palma in the Canary Islands (Spain). La Palma does not have quite as good image quality (seeing) as Maunakea, and because it is lower altitude, it is not as good for infrared observations. With the two other 30-meter class telescopes (GMT and ESO’s ELT) going to Chile, there is a real advantage to have TMT in the Northern Hemisphere, and La Palma is second best only to Hawai‘i in the Northern Hemisphere. From the Hawai‘i perspective, of course, a big con for La Palma is that Hawai‘i does not benefit from the many educational and community benefits that come with TMT.



5. From Shashank: Are any of the optical telescopes publicly accessible?

Generally, not, but there are at least two exceptions. The Maunakea Scholars program allows Hawai'i high school students to develop programs to use the telescopes. There is a competition to choose the best programs. Until recently there was a program called the Kama`aina Observatory Experience (KOE) that offered guided Saturday daytime visits to the observatories. It was necessary to suspend KOE because of the pandemic, but I expect it will resume.

6. From Frank Graham: Aren't telescopes based in space taking over the popularity or productivity of these fixed land based observatories?

Please see response to question #2

7. From cconklin: Aloha - I'm a fan of science and astronomy but how would you like to convince people that astronomy is worth studying and putting public \$ toward?

By publicizing the discoveries that astronomy is making today and has made in the past. There are many ways to do this, and all are important. Large scale efforts like NASA does and the COSMOS and NOVA television productions have had a huge effect. Then there are talks by individuals, such as the Keck Observatory series and Open House event that provide a more personal interaction, and the opportunity for Q&A. School programs are essential, both individual visits, and programs like Journey through the Universe. This is especially important for reaching younger students. Finally, local media can play a big role in telling the community about the latest developments.

8. From George Hamma: How much work is done at the mountain top compared with the lower headquarters facilities?

For obvious reasons, the only work that is done at the mountain top is work that cannot be done at the base facilities. The major part of this is maintaining the telescopes and the instruments, which is daytime work. In contrast to the situation in the past, the astronomers are hardly ever at the telescope at night. Some telescopes have two or so technical staff at the telescope at night and some are operated entirely from the base facility (UH 2.2-meter, CFHT, UKIRT, Gemini). I do not have precise data on this, but I would estimate that something like 70% of the entire activity is at the base.

9. From Chad Kalepa Baybayan: Can UH 2.2 serve as a replacement for Hoku Kea?

Not really. The UH 2.2 is needed for research programs by UH professional astronomers (including graduate students), leaving not much time that could be devoted to undergraduate use. The latter is much better served by a smaller telescope that the undergrads can have all to themselves. The proposed Educational Telescope at Halepōhaku is a perfect fit to their needs. It is small enough to allow hands-on use for instruction and it is much more accessible than near the summit.



10. From Jason Souza: Why did the UK remove itself from the program?

It was financial. The UK decided to join many other European countries in the European Southern Observatory (ESO). ESO has its observatories at several locations in Chile. The UK could not afford to both participate in ESO and maintain its presence on Maunakea.

11. From Michael Richards: What about the early relationship between the Maunakea and Maunaloa observatories?

The only early relationship I know about is the fact that Howard Ellis at MLO proposed the use of Maunakea for astronomy. As far as I know, there was not much interaction between the two observatories. They do different types of science.

12. From Ken S.: If TMT is not built on Maunakea, will the same reduction in the number of telescopes be carried forward?

That is not clear at this point.

13. From marshachiles: Why is there so much controversy with Maunakea?

Primarily because of its significant cultural importance to native Hawaiians, combined with the fact that the first 30 years of astronomy development took place before the degree of cultural sensitivity was clearly articulated and recognized.

14. From Keola Smith: Please update progress re: contractual agreement of observatories in order to move forward with TMT today.

The contractual agreements and permits for TMT have all been in place since late 2014.

15. From Mike: Was Maunaloa considered as a site for the telescopes, and if so, why was Maunakea chosen instead?

I believe the main reason is that Maunaloa is an active volcano and Maunakea is not.

16. From astra: Bob, at the very end of your talk you gave your opinion that it is better to have TMT than to not have it. I was wishing you had said why you believe that. Would you say why?

There are two main reasons. I believe that if astronomy research continues on Maunakea, we need to do the very best astronomy possible in order to justify that use. That is possible only with TMT. The second reason is that TMT will bring with it a great deal of community benefits (employment, educational outreach, funding for mountain stewardship) that we are not going to get any other way. TMT has powerful partners (national science agencies, Moore Foundation). With such a large investment on the mountain, they are going to want to ensure things are taken care of (stewardship, infrastructure, outreach), and they have the resources to do so.



17. From Keola Smith: You mentioned Jim Harwood spoke Hawaiian language fluently. Compare his participation with telescopic in Hawaiian community to today's Kanaka protest.

Sorry if I was not clear. It is Alike Herring that spoke Hawaiian and it was Jim Harwood that told me that. I honestly do not know whether this has any relevance to our current situation.

18. From Jon's iPhone: It sounds like each facility has a sublease from UH. Is that right, and if so what are the major terms?

The major terms are that each facility pays for its own operation and for a share of common expenses, such as road maintenance, snow removal, operation of the food and lodging facility, and the Visitor Information Station. Each facility also makes a one-time contribution to the improvement of the infrastructure (power, communications) and provides a share of the observing time (10-15%) for use by UH scientists. These terms are actually in a document separate from the sublease. The sublease provides the use of the site, and in the case of TMT requires a rent payment that ramps up to \$1 million per year.

19. From Dan: What percentage of infrared light is blocked to ground-based telescopes?

This is not a simple question, because it depends on what wavelength range you consider infrared and the altitude of the observatory. Beginning at a wavelength of 1 micron and going longer there are "windows" where the atmosphere is relatively transparent from Maunakea. The windows are around 1.2, 1.6, 2.2, 4-5, 10-13 and 20 microns. The atmosphere is then opaque until you get to the submillimeter radio region at around 300 microns.

20. From John Ordon: The future plans sounded like they are predicting no new sites. Is that a concession to the local resistance to astronomy on Maunakea?

It is an agreement to limit the total footprint of astronomy on the mountain. I think we would prefer to characterize it as an effort to maintain balance among all the interests on the mountain.

21. From Scott Roleson: How about something on adaptive optics?

It would take an entire separate talk to do justice to that topic. UH 2.2, Gemini, Subaru, and Keck Observatory all employ adaptive optics for some observations and all have laser guide star systems.

22. From Angel Diaz: Thank you so much for a very interesting talk! The telescopes on Maunakea are a distinctive and visible feature from the nearby shore area – in Waikoloa. I saw that the site plan for TMT is a little further than the other telescopes. From the artist rendering it looked like it was at a slightly lower altitude too. My question is, how visible is TMT anticipated to be from Waikoloa shoreline?

TMT would be visible from the Waikoloa shoreline, but the background will be the mountain side, not the sky, as with the other telescopes.