

CATAC Report

Dec 20, 2017

Membership

Michael Balogh (University of Waterloo),
Chair

Sarah Gallagher (Western University), Vice-
Chair

Stefi Baum (University of Manitoba)

Kristine Spekkens (Royal Military College of
Canada)

David Lafrenière (Université de Montréal)

Harvey Richer (UBC)

Greg Fahlman (General Manager of NRC-
HAA, non-voting, ex-officio)

Don Brooks (Executive Director of ACURA,
non-voting, ex-officio)

Bob Abraham (CASCA President, non-
voting, ex-officio)

Doug Welch (Science Governor for Canada
on TIO Governing Board, non-voting, ex-
officio)

Stan Metchev (TIO SAC, non-voting, ex-
officio)

Tim Davidge (NRC, observer)

Luc Simard (NRC, observer)

Changes

Ray Carlberg, appointed by CASCA, resigned from the committee on April 19. We have yet to identify a replacement for this position.

Chris Wilson, appointed by ACURA, resigned from the committee in July. She was replaced with Kristine Spekkens on Sept 15.

Matters arising

CATAC's first report was submitted May 17, 2017. It included a detailed assessment of TMT science capabilities at the alternative site, ORM, relative to MK13N and also of the ELT on Armazones.

The report was made public and received some attention in the press. In particular:

- Nature reporter Alexandra Witze spoke to several CATAC members and published an article: <http://www.nature.com/news/canada-weighs-scientific-consequences-of-moving-a-mega-telescope-1.22063>
- Bryson Masse, a reporter for VICE Motherboard, contacted the CATAC chair for more information via email, and published an article on June 1: https://motherboard.vice.com/en_us/article/payy8g/thirty-meter-telescope-mauna-kea-hawaii-la-palma-canary-islands-astronomy-tmt

- Christie Taylor from Science Friday telephoned the CATAC chair for background information for an upcoming TMT segment, though Michael Balogh declined to participate in a live interview. <https://www.sciencefriday.com/segments/a-home-for-the-thirty-meter-telescope/>
- The CATAC chair was contacted by Timothy Hurley from the Honolulu Star-Advertiser, and quoted in a subsequent article <https://www.pressreader.com/usa/honolulu-star-advertiser/20170614/281479276400262>
- Ivan Semeniuk at the Globe and Mail has been following the TMT story, and contacted several CATAC members at various points through the year for information. <http://classroomedition.ca/thirty-meter-telescope-project-set-to-alter-canadian-astronomy/> and <https://www.theglobeandmail.com/news/national/in-hawaii-thirty-meter-telescope-project-gets-nod-from-judge/article35825275/>

CASCA meeting

The CATAC report was presented at the CASCA meeting in May 2017. This generated broad, constructive discussion. The main takeaway points for us were:

1. Certainly the site on Maunakea is preferable to all concerned, from a scientific standpoint. However, though directly prompted on several occasions, no one at the meeting indicated that siting TMT on ORM would be scientifically unacceptable.
2. There is a clear need for transparency on the TMT funding plan, and any phasing. The lack of clarity is having a negative effect and allowing rumours to sprout and spread.

Meetings

CATAC has met approximately biweekly via telecon. A record of these meetings is on our web page http://casca.ca/?page_id=8347 and, where possible, minutes are shared publicly.

Legal considerations on Maunakea

The political dynamic in Hawaii has changed with the Aug 13, 2016 election of Harry Kim as mayor of Hawai'i (the Big Island). His vision of Maunakea as a World Peace Park is an encouraging sign that there may be a political solution to the dispute on the horizon. Public opinion also appears to have shifted significantly, in favour of TMT. While these are encouraging signs, and a dramatic shift from the situation we were facing a year ago, there is a long way to go and with a site decision expected in April 2018, the main question is whether there is sufficient time remaining.

On Sept 28, following a lengthy contested case hearing, the Board of Land and Natural Resources (BLNR) [approved](#) a conservation district land use permit to UH Hilo (UHH), to build the TMT on Maunakea. As expected, opponents filed an appeal to the state Supreme Court on October 30, 2017.

There is a pending legal issue related to the Dec 16, 2016 vacating of consent for the UHH -TIO sublease. A Hilo Circuit Court judge revoked this consent because no contested case had been held. This decision has been appealed to the Supreme Court. In the meantime, the sublease is still a legal document; however there is a lack of clarity on the right of TMT to access the site at this time. The most recent news, as of Dec 8, 2017, is that UHH and TIO have formally requested that BLNR not initiate a contested case hearing.

The Office of Hawaiian Affairs (OHA) has threatened a lawsuit against the state, claiming “longstanding and well-documented mismanagement” of Mauna Kea. While clearly relevant, the OHA have gone out of their way to emphasize that this lawsuit is not related to TMT, a project on which they have taken a neutral stance. This is at the circuit court level and there will surely be further developments along the way.

Funding considerations

On June 26, CATAC wrote formally to Greg Fahlman as Canada’s financial representative on the Board of Governors for TMT. In this letter we communicated the concerns expressed by the community at the annual CASCA meeting, about the lack of information about the TMT budget and funding shortfall. We requested his help in inviting Project members to address the Canadian community in a public forum, and to encourage the Board and Project office to provide more frequent, detailed and relevant public communications of Project activities and prospects.

In response to this, an invitation was extended to Ed Stone (Executive Director, TIO) and Gary Sanders (Project Manager). They accepted, and delivered a frank and thorough presentation via Webex on Sept 26, 2017. The Webex was attended by thirty CASCA members in addition to CATAC. This was a wide-ranging discussion, but several key points arose, including:

- There is a lot of construction activity underway despite the delays. About 10% of the project has been completed, and 70% of items are under contract. All partners are engaged in very exciting technical and engineering work.
- The Project has developed a world market costbook that is a bottom-up assessment of the costs, including an estimate of the schedule and risk. The plan cannot be redone with precision until a site is selected, though several parametric model scenarios have been constructed. Improvements in the costing due to the schedule stretch are underway. A revised costbook will be ready for review in Q1 2018.
- The delay has incurred an increase in cost. Together with the three-year delay in construction start, the first light date could be five years later than planned, though the project is working to bring that down.
- The proposal to NSF defines a set of options for staging/phasing construction of TMT. Exercising all the options could reduce the cost by 15%: this would deliver a 26m aperture, diffraction-limited telescope. This does not cover the full funding gap, which was 24% at the time construction started, and has grown since.

- The Board maintains its goal to restart construction in April 2018. This is a very serious milestone.

As a result of an NSF award to TIO (subcontracted to AURA acting through NOAO), there has been a strong engagement of the US community with TMT. Observers from NOAO/AURA and NSF have attended TMT Board meetings for the past four years. The community is actively engaged in instrumentation development. Under the terms of the award, TIO was expected to submit a proposal to NSF as to how NSF could support US national engagement in TMT. A draft proposal has been prepared, but NSF will not receive this until a site decision has been made. A resolution may require a coherent plan that includes both TMT and GMT in some form.

Instrumentation

In part spurred on by comments in CATAC's first report, TMT has contracted a design study for an adaptive secondary mirror. This would enable ground-layer adaptive optics (GLAO), which may provide significant improvements in image quality. Another advantage is that this capability simplifies instrumentation, by removing the need to incorporate the "woofer" component of AO correction. However, a robust quantification of the improvement (as a function of wavelength, seeing, etc.) is needed, and simulations are underway as part of this design study. Results of this study will be presented at the February, 2018 meeting of the SAC. Though this would likely not be a first light instrument, if the study confirms sufficiently good performance it could still be an early capability.

On Sept 25, the TMT project and SAC issued a [call](#) for white papers to inform recommendations for the next TMT instrument to begin construction. These are due March, 2018, and will be reviewed by the SAC. The November Science Forum and associated workshops held in Mysore, India kicked off the discussions and collaborations to begin developing these white papers. Canadians are strongly encouraged to engage in this important process.

CATAC has been learning about developments with the two first light instruments, IRIS and WFOS. The science teams are currently engaged in making decisions/recommendations that will have important ramifications for these instruments. It is important that the Canadian community be informed and have an opportunity for input.

- IRIS successfully completed the second part of its Preliminary Design Review in September. The review highlighted science operations: operation modes, interaction with NFIRAOS, and the data reduction system that is a deliverable of the project. The IRIS science team includes three Canadians (Davidge, Coté, Marois). It is notable that no Canadians from the University community are on the science team, and we feel it is important that they be at least informed, and preferably engaged, in these developments. CATAC has encouraged our science team members to reach out directly with information.

- WFOS is at a critical point, where the Science team is considering several very different designs. One is fibre-based, in which the fibres can either patrol the full field of view or be bundled to form IFUs. Questions remain over the quality of sky subtraction, and the wavelength coverage. The other design is for image slicers to be mounted robotically on masks. This would enable high ($R \sim 10,000$) resolution spectroscopy, with very narrow slits. There are questions about the complexity and technical risk associated with this option. A third, simpler design would be a GMOS-like instrument; while also complicated, it is better understood, technically. Both the high resolution and the IFU capabilities are relatively new specifications, that have not historically driven the development of WFOS. It will be important to understand the science drivers, in particular as related to the Canadian community. As a starting point, the project scientist, Kevin Bundy, has accepted CATAC's invitation to meet via Webex on Dec 19.

Community engagement

CATAC actively encouraged Canadians to get involved in TMT via International Science Development Teams. This effort was very successful, and 28 applications were forwarded to the SAC on June 22. We now have 39 ISDT positions filled by Canadians (in some cases one individual serves on more than one team). This is a 325% increase, and much more representative of our role in the project.

CATAC also encouraged participation in the November TMT Science Forum. In a very welcome development, ACURA provided up to \$10,000 in travel support to University researchers. This supported three invited speakers (Artigau, Sivanandam and Venn) and one other participant (Bramante).

CATAC has submitted a summary of activities to each quarterly edition of the CASCA newsletter. Greg Fahlman circulated a summary of the July 24-25 Board meeting to the CASCA mailing list. This direct communication was appreciated by many and certainly encouraged by CATAC.

Upcoming

The Board remains committed to a start of construction in April 2018. The site at ORM is on track for a decision by mid-Jan 2018, once the Environmental Impact Statement is completed. CATAC will of course be following this closely. Once the site has been selected we expect things will move quickly and many longstanding questions will begin to be answered. CATAC will help to keep the community informed of these developments.

CATAC will work with Canadian members of the IRIS and WFOS science team to make sure the community is informed and engaged as these instrument and operation designs move forward.

CATAC expects to receive and read the white papers on instrumentation submitted to the SAC in mid-March 2018. We will provide advice and commentary to our SAC members. In anticipation of this we will be asking people to let us know if they are planning to make a contribution and, if necessary, we will encourage participation in the process.