Canada-France-Hawaii Telescope Future Plans

— an information document for the Mid-Term Review Panel —

Marcin Sawicki[1], Pauline Barmby[1], Stephanie Côté[2], Daniel Devost[3], Greg Fahlman[2], JJ Kavelaars[1], Derrick Salmon[3], Doug Simons[3], Gregg Wade[1], Doug Welch[2], and Howard Yee[2]

1. Current landscape

The CFHT has served the Canadian astronomical community extremely well for more than three decades now. Despite its age and the advent of 8-metre class telescopes, CFHT has managed to remain competitive in recent years because of its superb site, hardware upgrades, and focus on specific science areas where it can excel.

CFHT currently operates three facility instruments, all in queue-mode: an optical wide-field imager (MegaCam), an IR wide-field imager (WIRCam), and an echelle spectropolarimeter (ESPaDOnS). While all three are aging instruments now, they remain productive, reliable, and in demand. MegaCam is the most used and perhaps the most forward-looking of the three as it is being upgraded with new filters that have a significantly improved throughput and an expanded field-of-view (an extra ~10%). Additionally, work to improve MegaCam's detector readout speed is underway, promising further efficiency gains, particularly at longer wavelengths. Furthermore, MegaCam remains competitive because of its unique U-band sensitivity (most other wide-field detectors are optimized for the red) and CFHT's excellent seeing. Recently-installed dome vents appear to have further improved the delivered seeing (preliminary indications are by ~0.1") — a gain that will benefit all CFHT instruments.

CFHT generally allocates observing time based on a competitive, proposal-driven process with regular proposal calls twice a year. These "PI-driven projects" account for ~60% of all science observing time on CFHT. Additionally, less frequent Large Program calls solicit multi-semester LPs every few years; currently there four long-running LPs (BinaMIcS, Matlas, Matysse, and OSSOS) with two new LPs starting observations in 2015A (LUAU and HMS). The regular, PI-driven projects are evaluated and ranked twice yearly by national Time Allocation Committees (TACs) on behalf of their respective national Agencies; LPs are handled by means of a separate "LP Agency" to which the national partners donate specific numbers of nights.

In addition to the three original, full partners (Canada, France, and Hawaii), China, Taiwan, Brazil, and (until mid-2015) Korea are associate parters; as such they do not have a role in the governance of CFHT but, in exchange for observing time, contribute significant funds that are used for instrument development.

2. Future instruments

In addition to the three existing instruments mentioned above, two new instruments are expected to arrive in the next few years, namely SITELLE and SPIRou. SITELLE is a visible-light Fourier-transform imaging spectrograph with a 11' field of view and a variable spectral resolution of R=1 to R>10,000. It is expected for commissioning at CFHT in the first half of 2015. SPIRou is a cross-dispersed echelle spectrograph and polarimeter that will work in the near-IR with R>70,000. It is designed to provide radial velocity determinations with a 1m/s precision. It is being built by an international consortium, with partial funding from CFHT, and will be used as a CFHT Guest Instrument. It is a technologically challenging instrument, expected at CFHT in 2017 or later.

On a longer timescale, the Maunakea Spectroscopic Explorer (MSE) initiative hopes to replace the current telescope with a 10-metre facility dedicated to highly-multiplexed spectroscopy. MSE development is being led by the CFHT-funded MSE Project Office.

3. The known unknowns

The CFHT's immediate future is characterized by significant tension between various elements: the arrival and commissioning of SPIRou; the desire of community members from both France and Canada to use CFHT for extremely large (100+ night) surveys either with SPIRou or the existing imagers (MegaCam, WIRCAM); the desire to maintain a significant program of regular, PI-driven science; and the possible deconstruction of CFHT in preparation for the MSE.

As mentioned above, there are several "moving parts" to the problem, and the timing of two of them is uncertain: (1)The date when SPIRou will be available is still not known, but likely to be after semester 2017A. (2) The start date of the potential CFHT deconstruction and replacement by the MSE is not known, although it will be no earlier than 2020 even in the most optimistic

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[1] CFHT Scientific Advisory Council member

[2] CFHT Board of Directors member

[3] CFHT staff

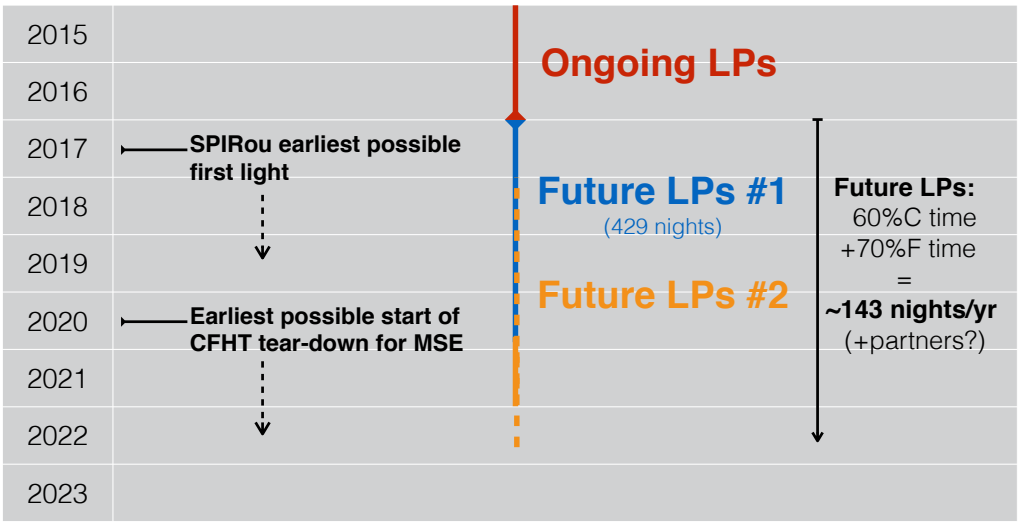

Figure 1. Plausible timeline for the CFHT over the next several years.

scenarios. The potential for timing conflicts here is real, but, given the uncertainties regarding complex new projects, it is difficult to perform any realistic projection or risk assessment.

4. Future timeline

At its November 2014 meeting the CFHT SAC recognized that very large, community-based, proposal-driven programs best allow realization of the full potential of the existing and future instruments, a notion subsequently endorsed by the CFHT Board of Directors. Under this scheme the majority of the time available to the Canadian and French communities should be devoted to such large programs for the period from 2017A to the possible deconstruction of CFHT, while retaining a reasonable fraction of telescope time (about ~1/3rd) for PI-driven science.

To accommodate the uncertainties mentioned earlier it is expected that there will be a staged, two-element call for future Large Programs (LPs) — see Figure 1. Under this plan, the first call for new LPs will be issued in the first half of 2015 for selection at the May 2016 SAC meeting. This will be for up to a total of 429 nights contributed by the Canadian (60% of national time) and French (70% of national time) Agencies, with potential contributions from other partners. LP proposals should each request at least 100 nights of observing time, and may request as much as the total available number of nights mentioned earlier. Observations will start in semester 2017A and proceed for at least six semesters. The proposed LP projects must have sufficiently flexible schedules to allow acquisition of the entire time allocation in the first six semesters (2017A — 2019B) but also to permit a data acquisition rate that is reduced mid-program with observations extended over a longer timeframe to accommodate the results of a second call for LPs. It is expected that a second call for LPs will be issued once SPIRou has been commissioned and its performance is known. The details of this second LP call will be determined in the future, subject to operational realities in effect at that time.

As is perhaps clear from the preceding discussion, the two-stage Large Program scheme will require monitoring and adjustment as events unfold so as to maximize the scientific output from the two sets of LPs while allowing a timely implementation of the ambitious MSE project.