MAY 1994
CFH 3.6m Telescope

SCIENTIFIC ADVISORY COUNCIL

Report on 45th Meeting

Submitted by Harvey B. Richer on behalf of the SAC

Ref: SAC/CSC 45 Forty-fifth meeting of the Science Advisory Council (CFHT Corporation, Waimea, Hawaii).

Resolutions and recommendations to the Board and the Corporation are given in the body of this report in English and in French following the report.

The Scientific Advisory Council held its 45th meeting on May 19th to 21st at the Hotel Clarendon in Quebec City, Canada. The SAC members present were Jerome BOUVIER, Claude CATALA, Ken CHAMBERS, Michael DeROBERTIS, David HANES, Esther HU, Gilles JONCAS, Nicolas MAURON, Yannick MELLIER (vice-chairperson) and Harvey RICHER (chairperson). The Corporation was represented by its Executive Directors Pierre COUTURIER and John GLASPEY. Persons invited to be present at specific times during the meeting were CFHT personnel Francois RIGAUT and Robin ARSENAULT, and Daniel DURAND and Dennis CRABTREE from the CADC.

The following items are included in this SAC report:

1. Report on Scientific and technical activities.
2. Report on Adaptive Optics meeting.
3. Results of review of the OASIS project.
4. Gemini North fiber link to CFHT Coude.
5. Report on MEGACAM.
6. Report on electronic submission of CFHT proposals.
7. Report on archiving CFHT data.
8. Immediate and Long Term Strategy for CFHT.
9. Next SAC and TAC meeting. Site for 1995 Users' meeting.
10. French translation of SAC recommendations.

1. REPORT ON SCIENTIFIC AND TECHNICAL ACTIVITIES

The Directors reported on the scientific and technical activities carried out by CFHT since the last SAC meeting in November 1993. We highlight these activities below.

1.1 BUILDING AND DOME

The ventilation system in the dome has been reworked in order that it functions as originally designed. Appropriate air flow through the building is necessary in maintaining good image quality in the dome.

The dome shutter experienced problems opening on several occasions causing lost observing time. Further, the seals between the shutter and the edge of the dome appear to "leak", letting rain and snow into the dome. After appropriate study, a major overhaul of the shutter will be carried out during the present calendar year.

As a safety feature, cellular phones have been installed in all CFHT station wagons that travel between Waimea and Hale Pohaku.

1.2 TELESCOPE

The following major improvements were carried out by the Corporation on the telescope in a continuing effort to make its operation optimal. (1) The new controller for the Cassegrain bonnette is nearing completion. It will feature an easy to use windows-based interface. (2) The Red M2 mirror of the coude train has been recoated with Ag and MgF_2 increasing its reflectivity by almost 25%. The UV mirror trains were recoated by a commercial company and used successfully in December 1993. (3) The prime focus bonnette is receiving a major overhaul in its wiring, encoders, limit switches and connectors. This work was necessitated by frequent failures and will be completed in time for the June prime focus run. (4) The transfer lenses for the coude infrared train were remounted resulting in improved image quality at the coude focus.

1.3 INSTRUMENTATION

1.3.1 CCDs

The Detector Group has expended much of its effort on improving the reliability of the CCD acquisition system. Problems that have occurred have

included loss of data when aborting or holding an exposure and poorly documented exposure time information in the FITS header. There have also been recurring hardware problems such as pixels with zero values and noise pickup on Loral3 images. The problem of the CFHT dewars remaining cold for less than a night has been solved by a remotely operated LN_2 filling system and by contracting with G. Luppino of IfA for several new dewars capable of remaining cold for significantly longer than a winter observing night.

The SAC was informed that Loral4, the thinned CCD recently obtained by CFHT, was likely made inoperable by an electrical surge during the testing phase. Although efforts will be made to repair the chip, the prognosis is poor.

Following detailed discussion of the detector situation at CFHT, the SAC made the following recommendation to the Corporation.

****Recommendation # 1****

It is the view of the SAC that CFHT continues to suffer from an insufficiency of state-of-the-art CCD detectors. In particular, due to the failure of Loral4, CFHT has no large format, thinned CCD. The SAC considers this to be the most important instrumental deficiency at CFHT. This situation has been compromising the science that has been done at CFHT for the past several years, and must be rectified as soon as possible. We urge that the Corporation explore all possible sources of such detectors, including negotiations with the MOCAM group, the University of Hawaii, or by joining or initiating a wafer run. Similar sentiments have been expressed by CFHT SACs over the past two years. The SAC urges immediate action.

The required specifications for such chips are as follows:

(a) large format, at least 2048 x 2048 pixels (b) pixel size below 18 microns (although 24 micron pixels would be sufficient for a CCD to be used with SIS) (c) quantum efficiency >40% in the blue and >80% in the red (d) low noise (<8 electrons read noise) (e) minimal fringing.

The second highest priority for required CFHT detectors, but a clear second behind the CCD detectors mentioned above, is a large format IR detector. This chip will be required for imaging with the AO bonnette and with OSIS. The specifications for this chip are (a) at least 1024 x 1024 pixels and (b) small pixel size, capable

of properly sampling the PSF behind the AO bonnette (0.04 arcseconds per pixel). Implementation of such a chip will likely require building a new camera to house it.

Although the SAC has placed the acquisition of a large format infrared CCD plus camera lower than that of optimal CCDs, the SAC stresses that it is imperative that CFHT begin planning NOW for this infrared array in order to avoid the situation that has developed with optical CCDs. SAC requests that the Corporation explore how this might be implemented and that a presentaion be made to SAC at the November 1994 meeting.

1.3.2 LAMA

A company capable of supplying a backup laser unit for LAMA has been identified. A proposal from the company is expected soon.

1.3.3 MOS

Twenty-four new mask holders have been put into service with MOS. The motor controlling the switchover between MOS and SIS works only sporadically and a new more powerful one has been ordered. The MOS/ARGUS configuration was built at the Paris-Meudon Observatory, and is now proposed by its builders as an additional observing mode of MOS. This configuration uses a 655-fiber bundle at the f/8 focus to feed the MOS, and allows for 2D spectroscopy at MOS. The optical and mechanical layout of this instrument results in a simple by-pass of the MOS mirror and mask, so that its installation requires only minor staff intervention. However, this configuration requires a grism orientation perpendicular to the usual one. In order to fulfill the requirement of a minimum set up time for CFHT staff, a dedicated grism wheel is therefore needed.

After discussion of MOS and the ARGUS mode within MOS, the SAC makes the following recommendation to the Corporation.

****Recommendation # 2****

The SAC recommends that the CFHT incorporate and support as a CFHT instrument the ARGUS mode within the MOS instrument. The CFHT should ensure the operational and observational efficiencies of MOS and MOS-ARGUS by acquiring, where necessary, new grisms to be permanently mounted in a dedicated grism wheel for each mode.

1.3.4 SIS

The SIS guiding system has been upgraded and it is now possible to fast guide using stars fainter than R = 18. With the current Loral3 CCD the scale with SIS is 0.0867"/pixel, the field of view is 3' x 3' and the spectral range over which SIS can be used is 0.36 to 1 micron. There are plans, through a French-Canadian collaboration, to extend the range of sensitivity of SIS out into the infrared, that is through the J, H and possibly K' bands. This project has been termed OSIS, and SAC makes the following recommendation to the Corporation concerning this project.

****Recommendation # 3****

SAC re-emphasizes the need of the scientific community for faint object spectroscopy in the near-infrared, covered in principle by the OSIS instrument. SAC recommends that the general procedure for acceptance of Guest Instruments be followed by the OSIS builders, and, therefore, that a complete document describing the performance of the current design be made available to all SAC members as soon as possible. A review of the scientific objectives and specifications should be presented at the next SAC meeting, in November 1994.

1.3.5 Fourier Transform Spectrometer

The InGaAs photodiodes recently obtained exhibited a lack of sensitivity when used on the sky with the FTS. New photodiodes with higher gain preamplifiers have been obtained and will be tested before the end of the 94I semester.

1.3.6 Coude Spectrographs

The following improvements have been carried out on the Coude spectrographs. (a) Camera mirrors on the f/4 spectrograph have been realigned to remove coma. (b) The image slicer for the UV on the f/4 spectrograph and that for the red slicer on the f/8.2 spectrograph were adjusted to improve throughput. (c) Extensive data have been obtained with the Gecko spectrograph in order to characterize its optical performance and determine operating parameters. The 2 "curved" echelle gratings were replaced and successfully tested. (d) The inner coude room has been declared off limits to all but a small number of trained

CFHT staff so that the possibility of damage, contamination or misalignment of the mirrors will be kept to a minimum.

Investigation of the fiber optics feed of Coude from the Cassegrain focus has continued at a low priority due to heavy work loads at OPM, DAO and CFHT. Since this situation is not likely to improve, alternative designers and builders may be looked for. Finally, there seems to be some interest in studying a possible feed of the GECKO spectrograph from Gemini North via a 250m optical fiber. The important issue to be investigated is the resulting efficiency of this setup. Should this configuration prove feasible and sufficiently efficient, an investigation of possible terms of a Gemini/CFHT agreement should be undertaken. This latter point led to the discussion found in section 4.

1.3.7 Herzberg Spectrograph

The Herzberg Spectrograph was used successfully for near UV observations of several nuclei of comet Shoemaker-Levy. However, one and a half nights of engineering time were required to fully test and verify the operation of the spectrograph which had not previously been used for 20 months. Given the unique capabilities of the instrument (UV capability, moderate resolution, high throughput) and its excellent recent performance, the SAC concluded that it would be premature to decommission it at this time. For this reason the SAC makes the following recommendation to the Corporation.

****Recommendation # 4****

Recognizing that there has been some renewed interest in the unique capabilities of the Herzberg spectrograph, the SAC recommends that the Herzberg Spectrograph not be decommissioned in Semester 95I, but rather be maintained as a CFHT instrument, providing that no significant investment of CFHT resources is required and that interest is demonstrated within the user communities. The SAC also recommends that the CFHT retain HRCAM until such time as it has been clearly demonstrated that the SIS provides at least comparable image quality to HRCAM.

1.3.8 Image Quality

Since fewer FOCAM runs are being scheduled each semester, images from the MOS and SIS modes are now being automatically saved on optical disk to

help monitor image quality at CFHT. Defocussed stellar images without the wide field corrector have been obtained at prime focus in order to measure the coma introduced by telescope flexure. It is planned that much of this aberration will be removed by tipping the primary mirror once it has been fully mapped.

1.4 Computers and Software

Some developments in the area of computers and software are listed below. (a) Some instrument control forms have been revised to reduce the possibility of observer induced errors. (b) Procedures to automate the setup of the Gecko spectrograph are being developed using the large database of spectrograph device positions obtained over the past several months. (c) A new commercial problem-tracking software package has been purchased by CFHT and is currently being implemented. (d) The archive project with the CADC is continuing and apparently working well. (e) Usage of the World Wide Web network access to the CFHT home pages by mosaic has increased enormously. Several users' manuals are being converted to this format and will thus provide up-to-date access to the status of CFHT instruments for observers at the time of writing proposals for telescope time and prior to their arrival in Hawaii for observing.

1.5 Visitor Instruments and New Projects

1.5.1 Adaptive Optics Bonnette

The optical bench and wavefront sensor for the AO bonnette are nearing completion at DAO. The acceptance tests by CFHT for these may take place this June.

1.5.2 MOCAM

There has been excellent progress on the CCD mosaic camera. The CCDs have been integrated into the dewars at DAO and delivered to Toulouse where integration of the entire system including the control and data aquisition software will be carried out.

1.5.3 OASIS

Three CFHT engineers and a resident astronomer attended a review meeting in Lyons on the OASIS integral field spectrograph which is proposed for use behind the AO bonnette. The committee recommended that the project be fully funded and proceed as quickly as possible so that there be spectrographs available to the community capable of properly utilizing the superb images to be produced by the AO bonnette. SAC had further comments regarding the OASIS project and these can be found under section 3 of this report.

1.5.4 BEAR mode of FTS

This visitor configuration consists of the combination of the FTS with the Redeye wide-field camera, resulting in the possibility of 2D spectroscopy with high spatial and spectral resolution. The field-of-view of this instrument is 20 arcsec, with a spatial sampling of 0.3 arcsec/pixel. A practical upper limit for the resolving power is R=10000. After the departure of Doug Simons, support for FTS/BEAR was transferred to Francois Rigaut, and a "dry-run" of instrument setup that took place in April 1994 was very successful. The observation of the bright planetary nebula NGC 7027 showed that this instrument is likely to bring results of high scientific interest, at least for the study of bright objects including those in the solar system, but also possibly in other fields, such as star formation, young stellar objects and circumstellar envelopes.

2. Report on the Adaptive Optics Meeting

The SAC, together with CFHT, organized a meeting on the science that can be done with the AO bonnette (called PUEO). This meeting was held just prior to the SAC meeting. Below are some key points from this workshop.

The Workshop "Science with PUEO" was highlighted by the presentation of a number of leading programs that are likely to be performed with CFHT's AO Bonnette which should provide spatial resolution of the order of 0.1-0.2" FWHM at visible and near-IR wavelengths starting early in 1996. Those fields which will benefit most from PUEO appear to be solar-system studies, the investigation of circumstellar matter around young and evolved stars, rich stellar systems such as globular clusters, extragalactic astronomy including galactic cores and nuclei, AGN's, and, to a lesser extent due to the faintness of the objects involved and the lack of suitably bright reference stars, the study of distant galaxies.

While the presently planned instrumentation (imaging in the visible and near-IR, low-resolution integral field spectroscopy in the visible with OASIS) seems to cover the most urgent needs to take advantage of the high spatial resolution of PUEO and perform the most interesting programs, a real demand was expressed during the workshop for the development of a low-resolution near infrared spectrograph (see Recommendation #5), as well as for more exotic instrumentation such as a polarimeter and a coronograph, and for a fiber link between the AOB and the f/4 Coude.

This workshop also offered an opportunity to discuss remaining issues and concerns related to Adaptive Optics at CFHT. One of the major concerns regarding PUEO instrumentation expressed during the workshop is the pixel size of Red-Eye behind the AOB which, as presently planned (0.082 arcsec/pix), does not provide an adequate sampling of the diffraction-limited PSF (see Recommendation #1). Other key issues raised during the workshop included the possibility of achieving good photometric and astrometric accuracy with the AOB. The possible need for dedicated CFHT staff to run the AOB, at least in the early phases of operation, was also mentionned. Finally, it was widely acknowledged that the use of an artificial laser star for wavefront sensing would make the AOB even more attractive by giving access to a much larger fraction of the sky and, therefore, enabling demanding programs, especially those of cosmological interest, to be undertaken.

3. Results of Review of the OASIS Project

The project review committee on OASIS formed by INSU met at the Lyons Observatory on March 28. After hearing presentations on the various aspects of OASIS the committee concluded that the highest priority was to develop the imaging and TIGER modes in order to get OASIS running behind the AOB as soon as possible. There is a general feeling at SAC that this instrument was developed without enough consultation between the builders, CFHT and the scientific community. As a result, it is not clear that OASIS will fulfill the spectroscopic needs of the programs that could benefit from the images produced by the AOB. In particular, both the review committee and previous SAC recommendations regretted the lack of near infrared spectroscopy in OASIS (see Recommendation # 5 below).

Considering that OASIS will nevertheless be a unique instrument, especially through its integral field spectroscopic modes, and the fact that competition in this field will not appear for a few years after the AOB becomes available at CHFT, SAC agrees with the committee's main conclusion that the priority is to have an integral field spectrograph working behind the AOB as soon as PUEO becomes available.

**Recommendation # 5

SAC takes note of the latest developments of the OASIS instrument built by the Observatoire de Lyons and CFHT. SAC analyzed the conclusions of the project review committee and concur with the committee that the development must be pursued without delay in order to benefit from an imaging mode and an integral field spectroscopic mode as soon as the Adaptive Optics Bonette is available. In accordance with previous recommendations, SAC also re-emphasizes the need for a long-slit mode, a scanning Fabry-Perot mode, and an ARGUS mode. The latter mode in particular offers the advantage of greater flexibility for data reduction than the TIGER mode. SAC sees as mandatory that any integral field spectroscopic mode be provided together with a dedicated, user-friendly data reduction package.

Discussions that took place during the AOB workshop clearly emphasized the large scientific demand for a near-infrared spectrograph on the AOB. SAC regrets that such a NIR capability is presently not envisionned in the OASIS instrument and strongly recommends that the builders, with the help of CFHT, explore, at the minimum, the possibility to have a NIR extension of the imaging and long-slit modes.

Finally, SAC is concerned by the mechanical moment of OASIS which significantly exceeds the specifications of the AOB and recommends a thorough analysis of this issue.

4. Gemini North Fiber Link to CFHT

There are no current plans for the Gemini telescope on Mauna Kea – Gemini North – to be equipped with a high resolution spectrograph. Because high quality, high dispersion spectroscopy is a particularly powerful tool for studying stellar abundances, for example, the Gemini SAC has expressed an interest in fiber feeding the f/4 CFHT coude spectrograph (aka Gecko) from Gemini North.

While the distance between the neighbouring telescopes is about 100 meters, the total length of fiber required would be closer to 250 meters if the cable were buried underground. Currently, a fiber of this length appears impractical because of excessive light loss, but with expected improvements in fiber technology in the near future, this option may prove feasible.

A study is now underway to investigate fiber feeding the coude spectrograph from the f/8 focus at the CFHT using a 40 meter fiber. Thus far, the study appears to be successful, making the Gemini-CFHT proposal more encouraging.

There are two important aspects of concern to the SAC from this venture apart from its ultimate technical feasibility: The first is the nature of the fiber feed which will have to be built at the CFHT. Presumably its design will involve both the CFHT and Gemini and its cost will be borne by Gemini. The second is the compensation the CFHT corporation would require for use of Gecko by Gemini.

This proposal has strong scientific appeal and the SAC considers it important that the CFHT and Gemini continue to discuss both of these concerns, as well as investigating the technical feasibility. The SAC felt that a trading of nights would be of greatest interest to our communities. A "compensation algorithm" which weighted nights according to the nightly cost of each telescope met with some interest, although this is clearly a matter for further study.

Finally, although this is ultimately the Board's responsibility, the SAC requests that it be kept informed as to the progress of these discussions with Gemini. The SAC felt that its position should be incorporated into the following recommendation.

****Recommendation # 6****

The SAC notes the interest of Gemini North in using the GECKO spectrograph by means of a fiber optic link. The SAC encourages the Executive to further pursue this possiblity with Gemini and, following the verification of technical feasibility, to explore possible terms of such a collaboration and to provide a more detailed explanation for a future SAC meeting.

5. MEGACAM

Yannick Mellier presented to SAC a new project for building a wide field CCD camera for the prime focus of CFHT (MEGACAM). The camera is a mosaic of 8x8 2Kx2K thinned CCDs, with 15 micron pixels (0.205 arcsec/pixel) which would cover a total field of view of 55 arc minutes. Eventually, the builders propose to build another camera for the infrared which would consist of 3x3 1Kx1K IR detectors mounted at the prime focus. These camera would be

particularly well suited for CFHT which has the best wide field image quality in the world, from U to K'.

The scientists and the institutes involve in the MEGACAM project are L. Vigroux from the Commisariat a l'Energie Atomique (Saclay, France), D. Crampton from the Dominion Astronomical Observatory (Victoria, Canada), Y. Mellier from the Observatoire Midi-Pyrenees (Toulouse, France) and Nick Kaiser from the Canada Institute for Theoretical Astrophysics (Toronto, Canada). The main scientific goals are the observation of large scale mass concentrations from weak gravitational shear, the evolution of distant galaxies from wide field deep multiband photometry, and the detection of supernovae. A large number of other scientific programmes could also benefit from the use of MEGACAM. These are summarized in the preliminary draft proposal presented by Y. Mellier, which was originally submitted to the French/German community to build a wide field imaging telescope at Paranal (LITE). In particular, such wide field surveys could be the starting point for an accompanying deep redshift survey on future very large telescopes.

SAC was very enthusiastic over the scientific goals of the MEGACAM project and recognizes that the project must be discussed in detail at the next CFHT users meeting in May 1995. The builders were strongly encouraged to develop a more detailed document in time for the next SAC meeting in November 1994. Regarding the future of the CFH telescope in the era of 8 meter instruments, SAC is interested in identifying new projects which will make CFHT competitive. SAC believes that the MEGACAM project has the potential of being such a project.

6. Electronic Submission of CFHT Proposals

The Director proposed that observing time requests be submitted by electronic mail only beginning next semester (95I). His arguments were that (1) much preparation time will be saved at the agencies, (2) it will be an economy of paper and postal costs if the CADC is used as a mail exploder, (3) it will increase reliability, and (4) a template of the request form is already available via ftp. The main problem that SAC forsees is the transmission of the figures that accompany many of the proposals. Taking into account the possibility of numerous unforeseen glitches, SAC felt that a test period should be implemented before adopting such a procedure. Further, it was also noted that both ESO and NRAO give their

applicants the choice of using either paper or electronic mail. Therefore, SAC makes the following recommendation to the Corporation.

****Recommendation # 7**

SAC strongly suggests that CFHT, in consultation with INSU, NRC and the CADC, devise a procedure permitting the submission of observing time proposals via electronic mail. As a first step towards its implementation, a trial run should be made for proposals submitted for semester 95II with volunteers to test the procedure. However, as with other observatories, the applicant should always have the choice between submitting his/her proposal in electronic or paper form.

7. Archiving of CFHT Data

The CADC (Canadian Astronomical Data Centre) has developed an efficient procedure whereby all astronomical frames acquired at the CFHT are promptly and securely archived in a database which will prove to be scientifically useful, rather than merely a backup repository. The FITS headers of all frames taken at the telescope with CFHT-supported instruments are electronically transmitted to the CADC within a matter of hours and added to the archive; the frames themselves follow on optical disk when a sufficient number have accumulated. Procedures are in place to permit rudimentary pre-processing and calibration, and to provide cross-referencing by object name or position and other descriptors.

Access to data frames will be restricted within the proprietory period, but thereafter browse facilities will permit general access to any images in the archive; compressed versions of the images will be obtainable over the network for quick inspection. Some technical considerations remain to be resolved; for instance, observers should be encouraged and the observing software should be modified to provide astronomically descriptive FITS headers ("NGC 7027" rather than "Object 1"; "R" rather than "Filter 4"). In the long term, however, the archive will prove a valuable astronomical resource, especially given that the CADC provides a gateway to other similar archives (such as HST) wordwide. Further developments will be reported to the community at the 1995 CFHT Users' Meeting.

8. Immediate and Long Term Strategy for CFHT

CFHT prepared a document to aid in the continuing discussion between the SAC and the Executive about the possible long term strategies that could be adopted for CFHT. These issues are reviewed below and some ideas concerning the long term strategies are discussed.

8.1 Developments since the last SAC meeting

At the Board meeting in December 1993 the member agencies established a working group (Harris, Lequeux, Stockton) to develop a framework which would allow the communities and SAC to establish clear scientific priorities for operations in the mid and long term future. This working group did not present a report at the SAC meeting, although Gretchen Harris did provide a document discussing several of the relevant issues. Also of interest is the discussion being held by the optical/infrared panel (OIR) of the US Academy of Science Committee on Astronomy and Astrophysics (CAA), and the position paper on "Options for the AAO" by the Anglo-Australian Telescope Board.

8.2 Different initial conditions for our agencies

There are some obvious differences in the national contexts which have to be kept in mind:

(i) UH develops instruments which are tested on smaller telescopes and then used on larger telescopes, so UH will certainly want to maintain the ability to use visitor instruments on CFHT.

(ii) Canadians want to have reliable and optimized instruments on CFHT rather than prototypes. In this context the strategies available to the Canadian community are somewhat similar to the ones which have to be developed by the OIR panel.

(iii) The French community has many laboratories involved in instrumental development and has for many years proposed more visitor instruments than Canadian teams.

The policy for guest instruments defined by the SAC gave to CFHT staff more control on the acceptance of guest instruments. The different situations in the Canadian and French communities does not preclude convergence for the long term operation plan of CFHT, on condition that we openly discuss our objectives.

8.3 Present and short term situation

(i) MOS-SIS stands out above the other instruments as the most competitive, until the 8 meter class telescopes begin to operate similar instruments. A non-thermal IR extension of its use (OSIS) will provide a unique capability.

(ii) The cassegrain adaptive optics bonnette, complemented by an integral field spectrograph (OASIS), will make use of the exceptional quality of seeing at CFHT. The use will be limited to narrow fields limited by the isoplanatism, but it will be highly competive for the near term. CFHT will have to decide if it will also operate a laser artificial guide star for adaptive optics.

(iii) The wide field corrector available at the prime focus allows for a development of very large field imagery with a mosaic of CCDs and possibly large, non-thermal IR arrays. This is considered as an important niche to be occupied by CFHT. Presently FOCAM and HRCAM use this PF, MOCAM and possibly MEGACAM will give CFHT mosaic CCD cameras. HRCAM will be decommissioned as soon as SIS guiding for the tip tilt mirror with APDs sensors is proven more efficient, which is almost assured now.

(iv) The Gecko (coude f/4) spectrograph will have tough competition from similar instruments on larger telescopes. We will have to feed it by fibers from the cassegrain (and possibly from the prime focus) as soon as possible to make the set up easier and to complement the block scheduling of cassegrain and prime focus instruments by "bright time" usage of the coude spectrographs. On the longer term, it has a unique advantage of high spectral dispersion and its competitiveness could be significantly increased by a fiber feed from Gemini North.

(v) The Fourier Transform Spectrometer, complemented by IR and CCD imaging modes can give unique results, but will not be competive with cooled grating spectrographs on other telescopes.

(vi) Long term evolution of IR thermal instrumentation and the f/35 upper end has to be addressed very soon. A formal agreement to exchange time between CFHT and IR telescopes could be negotiated to complement our visible and non thermal IR instrumentation. Clearly the arrival of Gemini North, largely optimized for infrared observations, will drive different strategies in CNRS and NRC communities. It would be better to address this problem well in advance of potential conflicts between the two communities.

(vii) UV instruments, namely, the Herzberg spectrograph and the coude spectrographs are unique and will have only a limited number of competing instruments on larger telescope in the foreseeable future. But the Herzberg and

the coude spectrographs are not presently under high demand. Do we have to support them in order to maintain a niche for the future?

8.4 Long term strategy

Into the next century we cannot imagine a solution for CFHT without significant investment: on the mid-term we will have to specialize the telescope and to develop an instrumentation plan which will reduce the manpower needed to operate it. On the longer term the site we have on Mauna Kea might be better used by a larger telescope. Each of these topics (new instrumentation plan, implantation of an 8m or larger class telescope on the site currently occupied by CFHT) may well need new partners and a modified international agreement to permit CFHT to evolve.

New instrumentation in the short term should focus on aquisition of large format CCD's and large IR arrays. In particular the possibility of joining a consortium for a wafer run should be investigated. Another important area for the near term are fiber feeds from f/8 and/or PF to Coude.

Attractive proposals for new instruments in the mid-term include: i. IR camera with a large array. ii. MEGACAM iii. NIR spectrograph for AOB iv. New secondary in front of PF v. MEGAMOS at PF. *But how can new instruments be funded? Is the only path the development of guest instruments by the community? Should new partners be sought out?*

The possibilites for future operations divide into three categories: i. Continue as a multipurpose telescope with a wide variety of instrumentation. ii. Specialize with a new PF and cass environment. iii. Reduce to one configuration at PF or cass.

For the very long term one might consider replacing the telescope with an 8 meter (or larger) telescope, the obvious advantage being the unique image quality of the CFHT site.

8.5 The SAC established a subcommittee (Richer, Mellier, Chambers) to draft a position paper outlining various alternative strategies. SAC expects to discuss a first draft of this paper at its November meeting. This position paper is meant to complement the report of the working group.

9. Next SAC and TAC Meeting. Site for 1995 Users Meeting

The next SAC meeting will be held in Waimea at the CFHT offices on November 3–5 1994. There will be an opportunity for the SAC members to visit the CFHT dome on November 2. SAC members desiring to participate in this visit should contact Mercedes Stevens. The current schedule indicates that TIGER will be on the telescope at that time. The TAC will meet immediately after the SAC meeting finishes for the day on November 3 and if necessary on November 4. The May 1995 meeting of SAC will be held in France on the dates 17–19 of May. The CFHT users meeting will be held the two days previous to this on May 15–16. The preferred location is Lyons, but if this proves to be impractical, the meetings will be held in Toulouse.