

NOVEMBER 1994

CFH 3.6m Telescope

SCIENTIFIC ADVISORY COUNCIL

Report on 46th Meeting

Submitted by Harvey B. Richer on behalf of the SAC

Ref: SAC/CSC 46 Forty-sixth 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 46th meeting on November 3rd to 5th 1994 at the CFHT headquarters in Waimea, Hawaii. The SAC members present were Jérôme 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. Other CFHT personnel were invited to attend. The following items are included in this SAC report:

1. Report on Scientific and Technical activities.
2. Proposal for a Joint Seeing Monitor on Mauna Kea.
3. Status of New Guest and Visitor Instruments for CFHT.
4. New Policy for the Purchase of Filters and Grisms.
5. CFHT on Mosaic and Access to the CFHT Archives.
6. Infrared Detectors at CFHT.
7. Network of Instrumentation Groups.
8. New TAC Members and New Vice-Chair of SAC.
9. Preparations for the Users Meeting.
10. Next SAC and TAC meeting.
11. 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 May 1994. We highlight these activities below.

### 1.1 BUILDING & DOME

Office space in the dome has been changed, with the fourth floor back room offices being converted to a new laboratory for the LAMA machine, and the former main darkroom becoming offices for the day crew. The new seals on the dome shutter were installed to reduce leakage of rain and snow into the dome during storms. This simple system should be considerably easier to maintain and replace.

### 1.2 TELESCOPE

The cassegrain bonnette was removed from the telescope and the electronics rebuild was completed and successfully installed in June, followed by relatively few teething pains. The cooling system for the primary mirror cell is almost completed and is about to be installed.

It may take a few months yet to gain experience with the control algorithm and discover whatever pitfalls lie ahead. The goal is to reduce the "mirror seeing" contribution to image quality by keeping the primary mirror from warming up during the day.

### 1.3 INSTRUMENTATION

#### 1.3.1 CCDs

The new GenIII version 2 controller has been successfully commissioned and released to observers thanks to much hard work by both the Detectors Group and the Software Group. The main features of this version are to improve system reliability (Stop and Abort can be used without hanging up the system), preserve data integrity and reduce the system overhead -- the readout time is now approximately 2.7 minutes for a full 2048x2048 raster plus overscan.

The first of the new large capacity dewars for CCDs was received from G. Luppino of UH. The first dewar will be used with an engineering grade device for testing and development of the controllers. A second houses TEK3, a 1024x1024 thinned array. The Detector Group will be carrying out a careful characterization of the new device using the CFH GenIII controller before releasing it for general Guest Observer use. A third dewar will be used for

another thinned array, possibly a 2048x2048 Orbit Semiconductors device recently thinned by M. Lesser for G. Luppino. M. Lesser is currently attempting to thin three of the 4096x200 Loral devices from G. Walker, one of which is being purchased by CFH. The status of the Reticon 2048x2048 is unclear, since the devices produced this past Spring turned out to be unusable.

#### 1.3.2 LAMA

The original laser lamp died and had to be replaced but the spare lamp was successfully installed and realigned without losing a significant amount of time on the sky for observers. A replacement YAG laser system has been purchased as a backup to the original system. A new laboratory for the combined system has been prepared on the fourth floor near the old observer's area, where the observers usually carry out the mask selection process. This should make it easier for observing teams to prepare masks themselves during a night's observing.

#### 1.3.3 SIS

The new SIS guiding optics and detectors were fully commissioned, with a new limiting magnitude for fast guiding at around  $R=18$ .

#### 1.3.4 Redeye Cameras

The replacement device for the Redeye Narrow camera was installed and successfully tested. Also, the Redeye controller was switched to the GenIIIV2 code to keep it in sync with the CCD version. The low-dispersion grism and support for redeye have been fabricated and await on-sky tests.

#### 1.3.5 Fourier Transform Spectrometer

The basic instrument configuration has been performing well, but the attempt started by D. Simons and J.-P. Maillard to implement the InGaAs photodiodes for improved sensitivity between 1.0 and 1.3 microns has proven to be more difficult than anticipated. Additional electronic work will be required before these can be considered available for general use.

#### 1.3.6 Coudé Spectrographs

Characterization of GECKO, the high resolution f/4 spectrograph continues but is being slowed by several consecutive failures of the Prolog controller system, the lack of reproducibility of the adjustments of the mosaic grating, and drifts

or sudden displacements of several motions on the detector environment. The 1872 Reticon stopped functioning just prior to the start of the July run. Several failed components were eventually discovered and replaced, but not in time for the runs that had intended to use it. This reduced the quantity of data obtained, since the CCD that replaced it had a much lower quantum efficiency.

### **\*\*Recommendation #1\*\***

*The SAC recommends that the CFHT proceed with the development of a Cassegrain fibre feed to coudé; but recognizing that the CFHT has no cross-dispersed spectrograph capability, the SAC suggests that the polarimetry module not be included in the present development, as the limited wavelength coverage available at coudé will make such a facility uncompetitive.*

#### Image Quality

The inclusion of SIS imaging data in the automatic image quality monitoring system has shown that SIS is providing image quality as good as HRCam.

## 1.4 VISITOR INSTRUMENTS & NEW PROJECTS

### 1.4.1 BEAR

The data reduction software developed by D. Simons for BEAR was transferred to F. Rigaut, who successfully implemented it in IDL. Data were processed in almost real-time during the September run, much to the satisfaction of the observers.

### 1.4.2 Adaptive Optics Bonnette

Work on the AOB continues, but not without some delays. The fabrication of the lenslet array for the wavefront sensor detectors has experienced significant problems and have postponed the acceptance tests of the WFS and optical bench assembly at the DAO in Victoria. The positioning assembly for the WFS has also experienced design and fabrication delays. Installation and alignment of the other optics is progressing well. The bimorph deformable mirrors have been produced and are being tested at Laserdot in France, as well as the control software. Development of the tip/tilt mirror support has progressed well at Observatoire de Paris-Meudon.

### 1.4.3 MOCAM

Development of the prototype 4096x4096 mosaic camera using the engineering chips progressed well, with installation of the Science grade devices starting in early October. Testing of the complete system is planned for several engineering nights on the CFHT later in November.

## **2. PROPOSAL FOR A JOINT SEEING MONITOR ON MAUNA KEA**

Gemini North has expressed interest in a seeing monitor facility for purposes of flexible scheduling. As a shared facility, this might be used for better site characterization and for the optimization in real time of observing programs on the various Mauna Kea telescopes -- particularly when adaptive optics instrumentation, such as the CFHT AO bonnette, may be in use. One possible implementation proposed by Doug Simons (formerly a support scientist with CFHT, and now employed by Gemini) is to use two existing radio antennae employed in recent atmospheric tests by SAO (the Smithsonian Astrophysical Observatory), in preparation for the submillimeter array, as the basis for a communal seeing monitor facility for optical and IR observations on the summit. The SAC raised questions about whether radio phase monitors could provide useful information on optical and IR seeing, and also about the degree to which measurements from the SMM site (by the JCMT and CSO) might be representative of seeing conditions on the summit. (It was noted that in tests done by ESO there was difficulty in using data from a seeing monitor to estimate telescope seeing conditions, when the two sites were widely separated). However, the SAC felt that in view of the potential benefits of a shared facility, and preliminary interest expressed by Gemini and Keck, that a more detailed investigation of ways of implementing such a facility should be made. The time scale set by the Gemini requirements would require this be ready by mid-1997.

### **\*\*Recommendation #2\*\***

*The SAC encourages the CFHT to explore the possibility of a common user seeing monitor facility, and to present a more detailed report at the next SAC meeting.*

## **3. STATUS OF NEW GUEST AND VISITOR INSTRUMENTS FOR CFHT**

While an increasingly large number of time request proposals involve use of CFHT instruments operated in standard configurations, a small fraction of them are based on either additional modifications of these

configurations, or even full development of new observing modes in these instruments. In many cases, no full assessment of technical issues and needed manpower are presented by applicants.

In view of the importance of coherently planned work, efficiency and reliability of CFHT instruments, SAC fully endorses the point of view of the Director, that, in case of insufficient preparation and prior contact with CFHT, and irrespective of the scientific value possibly recognized by Time Allocation Committees, the proposal will not be accepted by the Executive.

#### **4. NEW POLICY FOR THE PURCHASE OF FILTERS AND GRISMS**

Since CFHT is frequently asked to purchase filters or grisms by observers, the executive felt it was time to establish rules regarding such purchases. They proposed the following policy:

1. The Principal Investigator of a program who wants CFHT to buy a new filter or a new grism, must contact in writing the CFHT Director, justifying the request, before the deadline for submission of observing time requests. CFHT's Director will inform the appropriate TAC if CFHT will buy the required filter or grism, or not.
2. The forms for proposals will have to be completed correctly: the PI is responsible for making a clear statement on the filters and grisms which are required. In cases where the Director was not contacted in advance of the deadline, CFHT will not be committed to buy any filter or grism just because a proposal is selected by CFGT, CTAC or TAC.
3. The decision by CFHT on grisms or filters selected for purchase, will be communicated to CFGT, CTAC and UH TAC together with the technical appraisals of the time requests:
  - X if the filter or grism is considered for common use for the future, CFHT will purchase it.
  - X if the filter or grism is strictly related to the special observations requested by the observer, CFHT will help, if requested, in the specifications and the selection of vendors but the observer will have to purchase them.

X in some less clear-cut cases, if the observer agrees to leave the filter or grism at the disposal of other observers, CFHT and the observer will share equally the cost.

X if the number of filters and grisms requested in one year exceeds the budget allocated for this purpose, CFHT will ask TAC and/or SAC to prioritize the requests to be satisfied.

4. For filters, a three month delay between the order and the delivery is common. As soon as the schedule of observations for the semester is known, the procedure to order the filters has to start. CFHT will not be responsible for slow response from the observers or for unforeseen delays from the vendor.

For grisms, it takes between five and seven months to get a delivery, so clearly the order needs to be prepared well in advance of the telescope time request.

5. Requests not documented in the time request form and coming after selection process could be ignored and CFHT is in no way obligated to satisfy them.

SAC endorses this policy which will be explicitly stated in the next CFHT Bulletin.

The SAC was also requested to provide input to CFHT for the choice of filters for MOCAM. Here are the suggested filters with a short rationale for each one.

1 B (Johnson): since, with the advent of the Orbit (thinned) CCD, we should have a blue-sensitive chip.

2-4 Gunn g, r and i: These are key filters for extragalactic observers.

5-6 H $\alpha$  (6563/100), [O III] (5007/100): The key emission lines used in a wide variety of observational astrophysical programs. The widths of the filters are somewhat dependent on technical and cost aspects. We think the width should be at least 75 Å in order for the filters to have as wide an application as possible. But 100 Å wouldn't be too bad either. Not wider than this, however.

7 If there is money available for one more filter, we believe an [S II] (6725/100) filter would be useful. First, it would have an obvious use for those interested in [S II] emission in near-zero redshift systems (an excellent diagnostic line). It could also



be used as an "off-line" zero-redshift H $\alpha$  filter, important for "precision" photometry. This is much better than using an R filter. Moreover, for redshift 0.025 objects (where many AGNs reside), this could be the H $\alpha$  filter, and the zero-redshift H $\alpha$  filter could be the "off-line" filter.

## 5. CFHT ON MOSAIC AND ACCESS TO THE CFHT ARCHIVES

The CFHT staff has devoted a substantial effort to develop and improve the CFHT Homepage on the World Wide Web (WWW) which is accessible via Mosaic. This new tool provides a direct access to the most recent information regarding CFHT's activities, especially the latest news on instrumentation, and is therefore extremely useful to the CFHT applicant.

In particular, it avoids the publication delays of the CFHT Information Bulletin where this information used to be found. Thus, as long as the content of the CFHT Homepage is regularly updated so that it does indeed provide the latest information, it will provide the most important link between the users and the telescope facilities. The CFHT Homepage will become very popular as the WWW spreads within the community, and its continual development must therefore be actively pursued.

### **\*\*Recommendation #3\*\***

*The SAC congratulates the CFHT for producing an excellent World Wide Web document which is both clear and concise. We suggest that the MOS-SIS manual be brought on-line within the document as soon as possible as well as any manuals for visitor instruments which are or become available in this format. The SAC suggests that relevant information be updated frequently -- especially before proposal deadlines -- and that the date of the last update be recorded. Finally, SAC recommends an option be made available to the community which includes CFHT contact information for instrumentation responsibilities.*

The philosophy of the CFHT Archives is to make CFHT data available to the Canadian, French and UH communities, as the proprietary period expires. To this end, CADC, with the help of CFHT, has developed a STARCAT-based access to CFHT Archives under SUN architecture. As a consequence, the archives are accessible only from SUN stations. It turns out that several home institutes of CFHT users, especially in the French community, are not equipped with SUN systems. As a result, the archives are not accessible to a significant number of CFHT users, which conflicts with the very concept of public archives.

### **\*\*Recommendation #4\*\***

*SAC recommends that CFHT encourage CADC to improve the lack of access*

*to the CFHT archives by systems other than Suns by developing software for general access to the archives.*

## 6. INFRARED DETECTORS AT CFHT

The presently available Redeye cameras will not provide a correct sampling of the PSF of the Adaptive Optics Bonnette and of OSIS, nor will they cover adequately the field of these instruments. If no strong and immediate effort is made to remedy this situation, the CFHT will not be competitive in the area of near-IR imaging and spectroscopy when OSIS and the AOB become operational.

Several possible solutions were discussed. The first group of solutions consists in using parts of the existing Redeye camera, and imply a rebuild of its optics. There are three possible options along this line:

- Keep the NICMOS 256 x 256 array unchanged in the camera; a rebuild of the camera optics will lead to a correct sampling of the PSF, in order to take advantage of the superb image quality behind the AOB, or with OSIS. A serious drawback of this solution is the resulting dramatically reduced field of view, in particular in the case of OSIS.
- Replace the NICMOS 256 x 256 array in Redeye with an inexpensive 1k x 1k x 18 micron array, perhaps with only one quadrant operational. Such an array could be acquired at a reasonably low cost. This solution would still require a rebuild of the Redeye optics to properly sample the PSF, but the field of view, although still not optimal, would be twice that of the previous solution, for a moderate extra-cost. However, the implantation of a new chip in Redeye would require significant additional manpower. CFHT will probably not be able to provide it within the next year, a time frame that is dictated by the need to have a proper IR detector when OSIS and AOB become operational.
- Purchase a Grade "A" 1k x 1k IR array with 18 micron pixels, and install it in Redeye, after a rebuild of its optics. With this solution, both the requirements on the PSF sampling and the field coverage are met, but the difficulties mentioned above concerning the necessary manpower to install such a chip in Redeye are still present. A figure of approximately \$150,000 was quoted for this chip.

Another possible solution was proposed by D. Nadeau, and consists of using a NICMOS array in a slightly modified version of the MONICA

camera. This solution would provide a good sampling of the PSF, but the field coverage would be of only 10 arcsec. This solution seems inappropriate, although inexpensive.

Finally, the last class of solutions involve the acquisition of a new IR camera, independent of the Redeye design. Three options were discussed.

- A lease of the IfA QUIRC camera, for blocks of 2 months at a time. This solution would lead to a difficult scheduling situation, since IR observations would have to be planned to cover these blocks of 2 months. Also, this solution would probably end up being expensive in the long run.
- A trade of CFHT nights against the loan of QUIRC for blocks of time would eliminate the cost problem, but the scheduling problem mentioned above would still remain.
- Finally, the last solution, unanimously considered as the best one, involves the acquisition of a complete IR camera, with a 1000 x 1000 array with 18 micron pixels. The recognition that this was the only practical way to ensure the availability of a proper IR camera when AOB and OSIS become operational led to the following recommendation to the Board of CFHT.

#### **\*\*Recommendation #5\*\***

*The SAC emphasizes the strong and urgent need for a near-IR camera with an adequate sampling of the PSF and an optimal coverage of the field of the AOB and OSIS. This detector should be available at CFHT as early as 1996, when both OSIS and the AOB become operational, so that CFHT can be fully competitive in due time in the area of non thermal infrared imaging and spectroscopy.*

*Considering that the manpower necessary to develop such a camera in this time frame does not exist at CFHT, the SAC recommends the acquisition of a complete IR camera housing a 1000 x 1000 array, after CFHT has defined exactly what device is needed. The SAC recognizes that there is no solution for funding such an acquisition within the present CFHT budget in the required time frame, partly because of the AOB cost overrun. Consequently, the SAC recommends that an exceptional capital expense be provided by the agencies for this absolutely necessary acquisition.*

*Finally, this recommendation does not alter the highest priority set on the procurement of a large format thinned optical CCD, which is expected to be successfully completed shortly. This procurement, as well as the longer term optical CCD situation, can be handled within the present CFHT budget, provided the latter is not eroded.*

## 7. NETWORK OF INSTRUMENTATION GROUPS

The complex set of instruments available at the CFHT, coupled with the necessarily measured pace at which the CFHT Information Bulletin is produced, means that any helpful insights or "tricks of the trade" developed by one observer are slow to reach a broad audience. Understandably, news of problems is generally more quickly propagated through the user community, but often in distorted form, with the result that needless worries are generated.

For this reason, the suggestion has been made that the community consider the establishment of instrument-specific Networks of Working Groups. In the model discussed, one user would serve as an informal chair to whom could be transmitted, by electronic mail, anecdotal end-of-run remarks about insights gained and problems encountered with the instrument in question, especially when it is used in non-standard ways. (These reports would not supplant the usual end-of-run reports.) In the ideal model, the remarks would not simply accumulate in a scrapbook of unrelated ideas, but would be annotated, cross-referenced and summarized to provide guidance for future, and especially first-time, users. A collection of FAQs (Frequently Asked Questions) with answers would provide a friendly and helpful introduction to the instrument.

Clearly, to avoid the propagation of misleading or incorrect information, the Working Group information would have to be referred to the appropriate CFHT personnel as well, and a close link will need to be established. It would seem most advantageous, therefore, to use the Mosaic facility to this end, with the accumulated wisdom accessible through the CFHT home page.

SAC proposes that a trial of this concept would be in order, with MOS as the instrument in question. David Hanes, of Queen's University, will serve as the chair. When the procedures involved have been established through consultation with the CFHT, announcements will be provided to the community through the electronic mail network, as well as in the next CFHT Information Bulletin. We expect the trial to begin early in the first semester of 1995.

## 8. NEW TAC MEMBERS AND NEW VICE-CHAIR OF SAC

The new TAC member from Canada is Gilles Joncas with Dave Hanes continuing and Michael de Robertis completing his term. The TAC members from France are Claude Catala and Jérôme Bouvier. Ken Chambers is the Hawaiian representative. Yannick Mellier completes his term as vice-chair of SAC with the November 1994 meeting. The SAC thanks him for his truly excellent work. The new vice-chair of SAC is Claude Catala.

## 9. PREPARATIONS FOR THE USERS MEETING

With the agreement of the astronomers from the Observatoire de Lyon, it has been decided that the next CFHT Users meeting will be held in Lyon, at the Ecole Normale Supérieure (ENS) from May 15 to May 17 inclusive. The ENS is located in downtown Lyon, about 1 km from the TGV Perrache station. The address is:

ENS Lyon  
46 Allée d'Italie  
69364 Lyon Cedex 07

The ENS is fully equipped for such meetings, with large amphitheatres and rooms. At least 2 inexpensive hotels are located nearby which should be capable of accommodating the 80-120 expected attendees.

The Local Organizing Committee is not yet fully constituted and operational, but Georges Paturel and François Sibille have taken care of the initial facets of the organization. The CFHT person responsible for the meeting is Marc Azzopardi who was involved in the organization of the first Users Meeting.

This users meeting is the last one before 10-meter class telescopes become fully operational. In 1998, the second Keck, the Subaru and the first VLT should be almost finished and in this context we must address now the crucial problem of the future of CFHT for the beginning of the year 2000. Hence, the SAC decided to entitle this meeting "The Future of CFHT". A large fraction of the meeting will be dedicated to talks and open discussion concerning the possible scientific role of CFHT in the era of the 10-meter class telescopes.

## 10. NEXT SAC AND TAC MEETING

The next SAC meeting will be held in Lyon immediately following the users meeting. The dates are May 18 through 20 with the TAC meeting being held after the SAC meeting on Thursday the 18th.

## **LES RECOMMANDATIONS DU SAC**

### **1. Recommandation sur une Alimentation du Coudé par Fibres**

Le SAC a recommandé que le TCFH procède au développement d'un Cassegrain à fibre pour le Coudé; mais reconnaissant que le TCFH ne peut supporter un spectrographe à dispersion, le SAC suggère que le module de polarimétrie n'y soit pas inclu puisqu'il ne serait pas compétitif vue la couverture restreinte permise par le Coudé en longueur d'ondes.

### **2. Recommandation sur un Service de Surveillance du Seeing**

Le SAC encourage le TCFH à explorer les possibilités permettant aux utilisateurs de disposer d'un service de surveillance du seeing, puis d'en faire un rapport détaillé à la prochaine réunion du SAC.

### **3. Recommandation sur TCFH sur Mosaic**

Le SAC félicite le TCFH pour l'excellent manuel accessible par WWW qui est à la fois clair et concis. Nous suggérons que le document MOS-SIS y soit implémenté dès que possible, de même que tous les manuels correspondant aux instruments visiteurs. Le SAC propose que les informations appropriées soient remises à jour fréquemment - en particulier avant des dates limites de demandes d'observations - et que la date de mise à jour y soit précisée. Enfin, nous recommandons d'y ajouter une option qui précise les personnes à contacter pour les responsabilités de chaque instrument.

### **4. Recommandation sur les archives du TCFH**

La philosophie des archives du TCFH est de rendre les données du TCFH disponibles aux communautés Canadiennes, Françaises et Hawaïennes, lorsque les périodes de propriétés sont achevées. C'est dans ce but que le CADAC, avec l'aide du TCFH, a développé un environnement STARCAT d'accès aux archives du TCFH sous architecture SUN. Mais en conséquence, les archives ne sont accessibles qu'à partir de stations SUN. Il s'avère que plusieurs instituts d'utilisateurs du TCFH, spécialement dans la communauté française, ne sont pas équipés de stations SUN. Il en résulte que ces archives sont inaccessibles à une fraction importante d'utilisateurs, ce qui est en contradiction avec le concept même d'archives publiques.

En conséquence, le SAC recommande que le TCFH encourage CADAC à

améliorer cette situation en permettant un accès général aux archives.

### **5. Recommandation sur une Caméra Infrarouge**

Le SAC tient à souligner le besoin très urgent d'une caméra infrarouge proche qui échantillonne parfaitement la PSF et qui couvre de façon optimale le champ des instruments OSIS et OASIS. Ce détecteur doit être disponible au TCFH dès 1996, lorsque OSIS et OASIS seront opérationnels, de telle façon que le TCFH soit aussitôt pleinement compétitif dans le domaine de l'imagerie et de la spectroscopie infrarouge non thermique.

Compte tenu du fait que les moyens humains nécessaires au développement de cette caméra n'existent pas au TCFH, le SAC recommande l'acquisition d'une caméra IR complète pouvant contenir une matrice 1000x1000, dès que le TCFH aura défini précisément le système nécessaire au TCFH. Le SAC reconnaît qu'il n'y a aucun moyen de financer cette acquisition avec le budget actuel du TCFH dans les délais souhaités, en partie à cause du surcoût de l'A.O.B. Par conséquent, le SAC recommande qu'une dépense de capital exceptionnel soit fournie par les agences pour cette acquisition absolument nécessaire.

Cette recommandation ne remet pas en cause le niveau de priorité maximum affecté à l'acquisition d'un CCD optique aminci grand format et qui devrait aboutir rapidement. Cette acquisition, comme la situation à long terme des CCD optiques, peut être gérée dans le budget actuel du TCFH, pour autant que celui-ci ne soit pas tronqué.