

En fin de matinée du 16 mai, chaque président a présenté les réflexions et conclusions de son groupe de travail. Un rapport exhaustif a été fourni par B. Fort pour le premier groupe et il est publié in-extenso dans ce bulletin CFH.

Le groupe sur la haute résolution a insisté pour que la toute première priorité du programme d'instrumentation soit de faire bénéficier les utilisateurs de la qualité d'image exceptionnelle qu'offrent le TCFH et le Mauna Kea. Dans ce but, il faut poursuivre des réalisations qui permettent de combattre les causes de dégradations locales de la qualité d'image par l'environnement de coupole. Il faut également optimiser l'optique du télescope et produire un appareil capable d'effectuer un guidage fin par stabilisation d'images.

Dans le groupe infrarouge, un intérêt manifeste s'est dégagé en faveur de matrices de détecteurs infrarouges pour l'imagerie directe ou en association avec des interféromètres de Fabry-Perot et par transformée de Fourier. Une concertation des communautés autour d'un instrument CFH doit être établie en se basant sur les développements qui sont actuellement en cours dans plusieurs groupes français. Pour préparer l'avènement de ces instruments, il paraît opportun d'améliorer rapidement la qualité optique du miroir secondaire F/36. Un travail complémentaire doit être effectué pour évaluer les besoins des communautés pour un spectromètre à réseau refroidi entre 1 et 20 μm .

Le groupe de spectroscopie à haute résolution a, dans un premier temps, fait le bilan de l'utilisation des moyens actuels en insistant sur la grande communauté impliquée, sur sa productivité et sur les programmes scientifiques poursuivis. Il a ensuite défini plusieurs besoins immédiats tels que:

Amélioration de la qualité d'image au foyer coudé, guidage automatique, efficacité accrue des dissecteurs d'image, positionnement précis et commandé à distance du réseau, acquisition de détecteurs ayant un faible bruit et permettant de couvrir un plus grand domaine spectral, étude de la possibilité d'utiliser le réseau mosaïque blazé à 63°. Pour le futur, des propositions de nouvelles chambres (F/3,7 par exemple) ont été évoquées pour atteindre des objets plus faibles, ainsi que l'acquisition d'une caméra à comptage de photons pour l'ultraviolet et le visible. Le besoin d'un télescope auxiliaire coudé a été également discuté.

Le conseil scientifique consultatif s'est ensuite réuni pour tirer les conclusions de cette réunion et transmettre ses recommandations au conseil d'administration. En conclusion, chacun s'accorde à reconnaître le succès de cette conférence et il a été convenu de renouveler l'expérience dans deux ans.

MULTIAPERTURE AND FAINT-OBJECT SPECTROSCOPY AT CFHT

A working group of astronomers from Canada, France and the University of Hawaii conducted a discussion at the CFHT Users' Meeting in Montreal (May 1986) to consider the future of Multi-Aperture Spectroscopy (M.A.S.) at CFHT. The working session was divided into three parts:

- 1) presentation of scientific results obtained in the field
- 2) proposals for future instrumentation
- 3) discussion of recommendations to make to the Scientific Advisory Council

SCIENTIFIC RESULTS AND PROGRAMS

This topic was considered from the viewpoint of 3-dimensional spectroscopy. Many results were presented in various experimental ways:

- a) Fabry-Perot spectroscopy
- b) Long-slit spectroscopy with the UV Prime Spectrograph
- c) Scanning slit spectroscopy
- d) ARGUS spectroscopy, in which each point of the image is recombined on a slit with a fibre-optic (F.O.) dissector
- e) Multi-object spectroscopy (M.O.S.)

After this presentation, it was immediately clear that the CFHT Corporation does not have an efficient instrument for such observational programs. An initial consequence is that many, if not all of the bigger laboratory teams, have their own instrumentation including image detectors. The situation seems to imply unnecessary duplication of activity, but also shows that a high level of know-how exists in the CFHT community, a fact which can probably be used as a solid foundation to define a future instrument for the nineties.

The second interesting point was that there are a very large number of programs (at least 42 involving 108 scientists) which now require multi-object spectroscopy - from stellar astrophysics to extragalactic work, including cosmology. It seems clear that faint multi-object spectroscopy concerns a huge community and should have high priority on CFHT. There is also a more general trend of equipping four-meter telescopes with M.O.S. instrumentation. A 4-meter telescope can now produce a spectrum of an object having a V magnitude equal to 22 in a few hours (8 Å per pixel) and it is now possible to study objects spectroscopically which a decade ago were only observed in broad-band imagery. This enables us to deal more with physical problems and to open new domains for astrophysicists. Moreover, it should be noted that M.O.S. will have top priority on other future large telescopes.

There is also great interest in 3-dimensional spectroscopy from Mauna Kea, with the imminent launching of the Hubble Space Telescope (HST). This telescope will have a high-spatial-resolution imaging capability which will be difficult to compete with. However, it will have low spectroscopic efficiency. This will create an urgent need for faint-object spectroscopic surveys and high-spatial resolution spectroscopy (stellar envelopes and environments, active galactic nuclei, quasar environments, gravitational lenses, remote cooling flows, etc.). The 3.6-meter CFHT, with seeing sometimes as low as 0.4 arc-seconds will have an incontestable advantage in spectroscopy for several years. One immediate conclusion was the necessity to promote the availability of an ARGUS mode (see above) on a future multi-object instrument. General agreement was then reached on required characteristics for the instrument to be developed: (a) wide-field and low-noise CCD cameras with blue and red response, and (b) a multi-object spectrograph having high spatial resolution (0.5 arc-second) with wide-field imaging capability and an ARGUS (or similar) mode.

PROPOSALS FOR FUTURE INSTRUMENTS

Many people are very active in the instrumentation arena, but unfortunately for potential users, these people are on the outskirts of CFHT activity. The beginning of this session was devoted to a short discussion of the PUMA 1 system used on the f/2 Focal Reducer, similar to the European Southern Observatory (E.S.O.) EFOSC/PUMA 2 system. Its main advantages are the real-time fabrication of aperture masks and an existing interface with the RCA2 CCD camera. However, the system is not at its optimum performance level. It has rather low transmission (50%); it does not work below 4500 Å, and it is not currently available with a low-noise CCD camera. Such restrictions, which give a magnitude loss of about 0.8 in V, can probably be overcome within a year with a suitable instrument policy; i.e., the implementation of a low-noise CCD camera (Tektronix 512, Thomson 576, GEC 576, or Texas 1024), with a change of some optics. Another possibility is to modify the Herzberg Spectrograph, so that it can be used in a multi-aperture mode with a PUMA system and with optical fibres. A feasibility study for this latter proposal was presented by a Canadian team (with a contribution from Toulouse Observatory for a PUMA system) to the Scientific Advisory Council in November.

The ESSEFEM wide-field focal reducer uses an image photon-counting system with a field covering 1152 X 1728 pixels (4 intensified Thomson CCDs). It should be in operation on a national basis sometime in 1987. For very faint objects and low spectral resolution, it could be equipped with a PUMA system giving a real multi-spectroscopic field of 13 arc-minutes in diameter. It seems that this possibility should be seriously considered if a large-format CCD (such as the Tektronix 2048 x 2048) does in fact become available at CFHT.

Finally, a faint-object spectrograph for the Prime Focus has been suggested (with optics designed by G. Lemaitre). It is very similar to the UV Prime Spectrograph and the basic philosophy is to have very high-transmission and achromatic reflective optics. The major objection is that this fast Prime Focus spectrograph cannot take advantage of the real-time capabilities of a PUMA system. However, the concept should be considered seriously if only small-format CCDs will be available at CFHT.

RECOMMENDATIONS TO THE SCIENTIFIC ADVISORY COUNCIL

i) Image detectors.

It was not feasible to reach a practical decision about a new instrument before the CFHT CCD image detector policy is more clearly defined. Thus, the committee decided to recommend that the Board of Directors produce a future strategy regarding CCD development, with dates and alternatives. The salient points are: (a) the RCA2 CCD is the last of its type to be produced and cannot be considered as the basic small-format CCD of the future; (b) THE CFHT Corporation should define within a year a standard small-format and low-noise CCD chosen from those available (Tektronix, Thomson, GEC, Texas Instruments); (c) M.O.S. would greatly benefit from the use of a large-format CCD chip such as the Tektronix 2048.

ii) The PUMA system

Many people consider the PUMA system to be a powerful experimental approach which should be used on CFHT. The following recommendations were made: (a) any duplication of the PUMA system by CFHT should maintain the availability of this system with several second-generation instruments, and should allow for the fabrication of large masks; (b) the possibility of modifying the mechanics of the machine so as to have thin slits should be taken into consideration.

iii) Multi-object spectrographs

The first recommendation (for the short term) was that joint observational shifts and programs on the f/2 Focal Reducer with the PUMA 1 system should be encouraged for the second semester of 1987. This will give valuable collective experience on M.O.S. observations and data reduction techniques. The second recommendation was that a request for proposals be sent to the CFHT community by the Scientific Advisory Council in November 1986 and that the possibility of implementing M.O.S. mode on the Herzberg Spectrograph should be seriously considered in order to avoid spectrograph duplication at CFHT.

B. Fort