has more experience of such mirror, and therefore is in a better position to provide help and advice to CFHT.

The final electrodes geometry design were frozen in last April. Note that the electrode connections, which have been known to produce print-through on the optical surface, have been placed outside the pupil area, therefore not degrading the optical quality of the deformable mirror. A finite element model of the mirror has been completed by Laserdot and confirms an adequate behavior of this geometry.

A meeting took place at CFHT Headquarters in mid-April to finalize the control algorithm of the close-loop system. In a spirit of good collaboration, representatives of CFHT, Laserdot and Pr. F. Roddier, reached a consensus on the optimum control algorithm. Issues such as sampling time versus gain adjustments have been settled (the gain adjustment being favored, the sampling time remaining constant), servo-control of the vibrating membrane stroke for optimal sensitivity of the wavefront sensor, and at the time of this writing, two possible algorithms are competing for modal control scheme, but should be decided upon in the next weeks.

Progress on the mechanics have been made; the casting has been ordered (under the responsibility of DAO), and possible manufacturers for the optics have been identified (quotations have been obtained).

A detailed study of a first dedicated instrument for PUEO has been made; OASIS, being studied and designed by the Observatoire de Lyon, combines the following configurations:

- imagery 0.025" sampling, 90x90" field
- TIGER mode (micro lens integral field spectroscopy) with sampling from 0.1" to 0.5" and resolving power from 400 to 3040
- ARGUS mode (optical fibers integral field spectroscopy) with a sampling of 0.23" and resolving power of 280 or 1260
- PYTHEAS (grism+Fabry-Perot, see E. Lecoarer article of this issue) with sampling of 0.2" and resolving power of 9310 or 19450
- Scanning Fabry-Perot with sampling of 0.1" and resolving power of 3200 to 23500
- Long Slit of width 0.06" and resolving power of 1150

It is clear to CFHT that some of these observing modes in order to be useful require an elaborated reduction package.

CFHT has started work on the Pegasus User's Interface to control PUEO; this task will pick up to full speed in the second part of 1993. It is CFHT intention to make this user's interface friendly and usable for astronomers not fully acquainted with the subtleties of adaptive optics. The simple picture at this point would be to offer a simple but very fast (of the order of a few hundred Hz) tip-tilt correction, or a full automatic correction of all modes (19) with gain optimization; the modal control algorithm will, after a few iterations, optimize the gain applied to each mode (may imply slowing down correction of some). Lastly, a more elaborate mode will be available for so-called "experts" to tune-up the system to the best of their knowledge.

R. Arsenault, D. Salmon, F. Rigaut, J. Kerr

MOS-SIS News

MOS-SIS was the instrument the most used in the first semester of 1993: 74 nights or 48% of scientific observing time (70% of dark time). MOS-SIS does indeed correspond to a need in our community! Technically, MOS has performed superbly, with redshifts yields in excess of several hundreds for several teams on objects as faint as I=22.5. The opto-mechanical systems and the user interface are stable entities and have performed very reliably. The detector situation has been improved with new set-up parameters and the removal of the "dead" blue coating on LICK2 and the delivery for general use of the blue coated 2048^2, 15 µm pixels LORAL3 CCD, operational with the new genIII controller (many thanks to our detector group!). The LAMA machine has been performing OK, but with the occasional, and scary, occurrence of coolant leaks near the laser head. The purchase of a new laser cutting system is under investigation with the visit of several vendors and tests of their machines; the old unit will then become a spare.

A small number of technical improvements have been implemented (or will be soon) for the MOS spectrograph:

- New CCD guide field acquisition camera. This will enable guiding with the MOS PMTs and eliminate the current bonnette to MOS differential flexures (0.2 arcsec/h). The new CCD camera has been received, it will provide a sampling of 0.2 arcsec/pix for guide star acquisition to V=19. The PMTs will be able to guide to V=17. A modification of the current camera mount is underway to accommodate the new camera, and we expect tests on the sky to take place at the end of the MOS May run.
- Modified and new MOS mask holders. It has been found that the MOS mask holders allowed the aluminum foil used for the masks to wrap, and subsequently imply a poorer cut of slits by the LAMA. This problem has been solved with a new design from OPM and the 11 existing mask holders have been modified. Moreover, 25 new mask holders of the new design are being manufactured by OPM to allow for more flexibility in mask preparation and cutting.
- A tilt on the focal plane of the LICK2 CCD as been shown to degrade the optical quality. Precautions have been taken to reduce the tilt of the LORAL3 CCD to a minimum prior to the MOS May run. Test images show that the CCD tilt problem has been largely solved.
- The CCD LN2, fill time is currently inadequate (6 hours) and implies a refuelling in the middle of the night. An auto-fill solution with a dewar strapped under the Cassegrain bonnette is being used during the May runs.
- Install a filter in the calibration lamp unit to compensate for the halogen flat field lamp illumination as a function of wavelength. The filter has been ordered.

The story for SIS is not as rosy. We have experienced difficulties in operating the active guider since December 1992, even at the limiting magnitude of V=14 identified as the limit with the current guider optics and PMTs. Extensive investigation of the problem, when we were able to take SIS apart in April, has shown that one of the PMTs was not giving proper signals, and was probably flaky at the time of the observations. Moreover, the head of the fiber bundle carrying the guide star signal to the PMTs had slipped in its holder,and the PMTs were not seeing a focussed star. These problems are being solved. Although the upgrade of the guide optics and of the PMTs to avalanche photodiodes has been slowed down due to other priorities within CFHT (e.g. AO bonnette), we still hope to complete the design and fabrication of the new system by the end of 1993 for testing and release in January 1994.

We have seen some observers disappointed that MOS does not provide a stable PSF in the full 10'x10' field, and this fact needs to be clarified. The MOS optics have been designed to provide an image quality better than 1" over the whole 10'x10' field: although this is the largest field available for imaging at CFHT, it is not intended to provide in the full field the superb CFHT image quality one is used to, but superb spectra. Tests show that when the internal image quality is at its best at 25 μm (0.5 arcsec) at the center of the field it is 45 μm (0.94 arcsec) at the 5 arcmin radius. This in turn convolves with the atmosphere + dome seeing, e.g. a 0.75" (CFHT mean FOCAM seeing) will be 0.9" at the center of the MOS field, 1.2" at the 5 arcmin radius. Note that the MOS focus can be set to balance center vs. corners, i.e. degrade the center and improve the corners, and this is the preferred set-up for spectroscopy. In a similar way, the MOS focus can be set to optimize the image quality at the center: this provides excellent image quality over approximately 6'x6' (almost as large as the FOCAM field with the same CCD). The image quality is therefore perfectly suitable for low resolution spectroscopy (the prime goal of the spectrograph), for aperture mask design and mask set-up on sky as well as for photometric measurements (the photometric accuracy is preserved) or for PSF sensitive measurements in 6'x6'. However, programs that need a stable PSF, and the best image quality CFHT can provide, will best be done with the imagers FOCAM or HRCam.

I have built a data reduction package for multi-object spectroscopy under the IRAF v2.10.1 environment: "multired" was designed primarily for MOS-SIS data reduction but can be used for any classical multi-slit data. It is a high level set of IRAF scripts based on the IRAF packages onedspec and twodspec.

To get and install the package, ftp to ftp.cfht.hawaii.edu and log in as anonymous. Then:

cd pub/mos
get README

Print the file and follow the instructions on how to install the package on your machine.

The package multired contains the following tasks:

- multiall: full interactive processing of multi-slit spectro data, one slit at a time. For each spectrum image in a set of exposures corresponding to one mask, the bias and flat fields are optionally corrected, the sky emission interactively removed, all corrected 2D spectra combined, the wavelength solution computed by correlation to a reference solution, a 1D spectrum is interactively extracted and then calibrated in wavelength and flux
- multibatch: automated bias/flat/sky correction, sum of indiv. 2D spectra for multi-slits
- multiextract: 1D extract., wavelength/flux calib. from 2D spec. for multi-slits
- multiview: display/plot 2D and 1D spectra for a given slit number.

O. Le Fèvre

Coudé f/4 Progress & Status

The coudé f/4 spectrograph has now been successfully used by visiting observers, although it still has important problems that need solving before it is fully commissioned. High signal-to-noise spectra at a spectral resolving power of approximately 120,000 were obtained using the Lick2 CCD at several wavelengths from 3933Å to 6190Å.

Work on the spectrograph was slowed substantially over the Winter when hydraulic fluid lost from the telescope south bearing seeped down to the slit room on the third floor, coating both mechanical and optical assemblies. Once the spectrograph was back into operation, a second echelle was found to show different focus setting relative to the reference echelle, a problem first encountered last Fall with one of the other echelles.

No definite solution to this problem has been found, although accurate testing of each echelle is taking place as this article is being written. Analysis of the problem suggests that it would take a differential mechanical loading of just over 22 kg to produce the observed deflection of about one micron of the center relative to the edge. The echelle that shows the most curvature is replicated onto a low thermal coefficient of expansion material, meaning that only an impossibly large temperature difference between the front and back surfaces could cause the observed bending.

The coudé f/4 also has the distinction of being used for the first test of remote observing from Waimea. Exposures of a reference star were obtained with the Telescope Operator guiding while the observers watched the image transmitted over the computer network connection and displayed on a window of an Xterminal adjacent to the workstation running the Pegasus session. Both the observers and the TO were using speaker phones to maintain communications.

J. Glaspey

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Questions and comments about the Bulletin should be sent to the attention of **Dr. Robin Arsenault** at CFHT.

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