Figure 6 shows the layout of the entire system currently under development, as originally proposed by Chris Clark for the CCD. The controller is coupled to a separate computer (Sparc 1E engine) that serves as an interface between the controller and the HP9000. The Sparc engine and its accompanying 16 Mb of RAM and 700 Mb hard disk are linked to a fiber optic transmitter in a single VME Crate. The fiber link is used for high speed data transfer from the controller to the array computer, where images can be buffered, coadded, or manipulated in a variety of ways. The observer will have a window environment to use for camera control and image manipulation. A large format stand-alone monitor will provide additional image display functions. The overall system will appear very similar to the observer as the present CCD data acquisition package, except of course it will be faster and more powerful.

The timetable for development of the DSP controller specifies having the new 2k CCD running off of this system by June 1991. Soon thereafter, additional controllers will be built for use in Waimea and the summit and a multichannel mode will be implemented that uses the 4 amplifiers built into the Lick1 2k CCD. At this point, we expect to have our bare NICMOS multiplexer and begin work on running the multiplexer with the controller. By the fall of 1991 we expect to have complete control of the multiplexer with the DSP system.

Dewar Design: A preliminary dewar design has been completed and is shown in Figure 7. In order to provide redundancy and flexibility in summit operations, two nearly identical dewars will be built. The only difference between the dewars will be that one will house high resolution reimaging optics (0.2" pixels at f/8) and the other will house wide field optics (0.5" pixels at f/8). Higher resolution modes (0.04" and 0.1" pixels) will be provided at the f/36 focus.

By the time this report is published, we expect to have most of the details of the dewar design completed. Fabrication of the dewars will be contracted out to a third party who will subcontract out to the machine shops and electron beam welders needed to construct the dewars.

Timetable: We are expecting delivery of the dewars near the end of 1991. Custom ground and coated optics should also arrive by then, though the vendor for the optics has not been selected yet. The design and acquisition of the optics will be controlled entirely in Waimea. Wiring and integration of the optics and an engineering array in one of the dewars will then be completed in early 1992, followed by several months of lab testing in Waimea. Such tests will be phased into engineering observations at the summit near the end of the first semester of 1992. Assuming all goes well, we expect to make the camera available for general use during the second semester of 1992.

D. Simons, C. Clark, S. Massey

MOS/SIS Status Report

Although the project has slipped a few months with respect to the projected completion date set in 1988, considerable progress has been made on the MOS/SIS second generation instrument since the last report in this bulletin. The Paris-Meudon Observatory has delivered the central octagonal support structure as well as the wide field multi-object spectrograph (MOS) sub-assembly to the Dominion Astrophysical Observatory. Laboratory tests held in Meudon before shipment showed an excellent behavior of the mechanical assembly, being as good or better than the specifications. At the reception of the units at DAO it was found that the travel had no impact on the measured mechanical performances.

While the team in Meudon is busy finishing the SIS high spatial resolution spectrograph, the DAO is proceeding apace to integrate the control system, as well as the optics for the octagon and MOS sub-assemblies. Extensive optical, mechanical and control tests will follow. The SIS assembly is expected to be delivered to DAO in July, only to be applied the same treatment by the DAO experts. Acceptance tests will also be conducted by CFHT during this period. The goal is to ensure that, upon arrival at CFHT (expected early in 1992), the MOS/SIS will already be a sound instrument and that the commissioning period will quickly proceed.

At CFHT, the user interface is being designed, including refined tools and procedures for multi-object spectroscopy tested with the MARLIN focal reducer.

O. Le Fèvre

Report on the Herzberg Spectrograph New UV Configuration

The Herzberg spectrograph is now better equipped to collect light in the UV domain. A new grating with 1200 lines/mm blazed at 3000 Å is now available. Also a new f/2 output module optimized for the UV was designed and fabricated at DAO which uses only one UV grade fused silica lens instead of a triplet like the other modules. This lens received a broad band monolayer anti-reflection coating centered at 3200 Å. In addition to this, the former WHITE optics for the spectrograph (collimator and camera mirror) and a new folding mirror were given an enhanced UV reflective coating. The blue Schmidt corrector lens

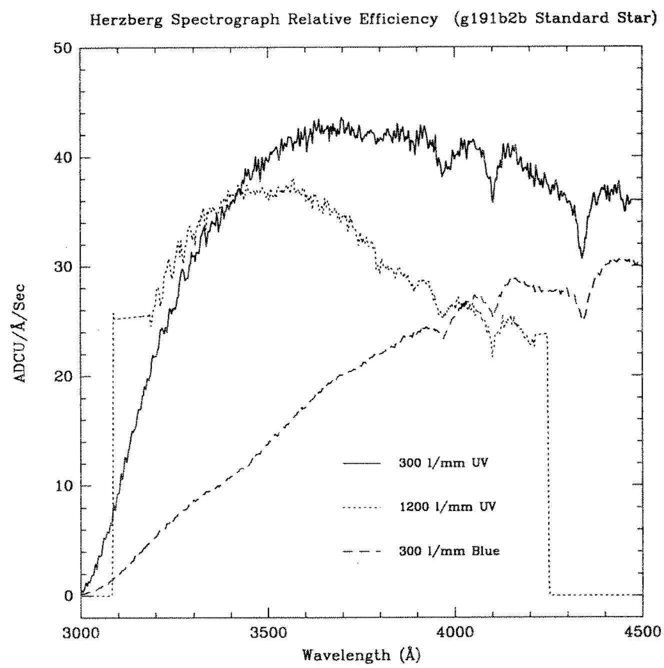

Figure 8

is used for this configuration. As a result of these changes the WHITE optical configuration is no longer available.

Figure 8 shows spectra for the standard star g1912b. The curve labeled 300 l/mm Blue is from observations made the previous year. The curves labeled 300 l/mm UV and 1200 l/mm UV were obtained during a recent engineering night. The difference in the noise in the data comes from the different integration time on the star (60 seconds for 300 l/mm Blue, 40 seconds for 1200 l/mm UV and 10 seconds for 300 l/mm UV).

The new UV optics + module is ~4 times more efficient than the Blue optics and module at 3200 Å and about 3 and 1.5 times at 3500 Å and 4000 Å respectively. The new 1200 l/mm grating is up to 1.2 times as efficient as the 300 l/mm at 3200 Å but is less efficient than the latter redward of 3400 Å. With the new grating, module and optics we are doing better than about 5 times blueward of 3200 Å and as good at 4000 Å as was previously possible with the best configuration at that time.

The full width at half maximum of most of the lines from the calibration spectrum show no significant degradation of the imaging quality from 3000 Å to 4500 Å.

S. Béland, T. Davidge

IR Secondary Status Report

The existing f/36 IR secondary mirror was fabricated in the early days of CFHT at a time when sub-arcsecond IR imaging was not possible. Although the cores of star images using this mirror have been quite sharp, optical tests of the mirror while in service on the telescope indicated that the mirror suffers from a steeply turned edge which, under ideal conditions, results in light excess in the wings of star images.

On-going efforts to improve telescope image quality led CFHT to award a contract for the fabrication of a new IR secondary mirror to Contraves U.S.A. in June of 1990. The new f/35 mirror will be slightly larger than the current one and will hopefully have a decidedly improved optical figure.

One change between the old and new mirror designs is in the placement of the weight reduction cavities. The mirror currently in use is a glued CERVIT sandwich with the cavities buried internal to the structure. Since it was felt that stresses due to differential expansion of the glue-line were at least partially responsible for print-though of the cavities seen on the optical surface, the new mirror was designed using a single piece of ZERODUR into which cavities were ground from the back side. (Light-weighting is required to reduce the mirror moment of inertia about the chop axis and thus reduce drive forces required for a given chop amplitude and frequency).

We currently plan to mount the new mirror on the same mechanical hardware used with the existing f/36 secondary mirror. Plans for an improved IR secondary mirror mount, drive, and upper-end are now under consideration and will be planned with an imaging adaptive optic system in mind.

Acceptance testing of the completed but uncoated mirror is slated for mid-June while delivery to CFHT is expected in late July. Initial use of the mirror on the sky is scheduled for October of this year.

D. Salmon

Coudé f/4 Spectrograph Status Report

The coudé f/4 spectrograph is progressing well on all fronts. Most mechanical components being fabricated in Canada are ready for final assembly and testing at the DAO. Delivery of most of these subassemblies should begin late in the Summer.

Definition of the electrical control system has been finalized by DAO and CFHT. Some of the necessary electronic hardware is now in hand in Waimea. Details of the cabling system interconnecting the devices in the spectrograph with the external controller are essentially complete, the cables have been purchased, and the connectors will be added soon.

Three different contractors are working on the collimator mirrors, the camera mirrors, and the corrector lenses and prisms. The wedge prisms have already been received in Waimea. All optical components should be in hand by September. The image slicers are being ordered as this issue is being readied to go to press.

At CFHT design work has been completed for several of the components of the slit environment. Fabrication of the crennel frame, the slit plate, and the comparison lamp unit should begin soon. The excellent progress on the detector environment will be detailed in an upcoming article.

If the current timetable is maintained, much of the month of October, 1991, will be required for the rather dirty work in the coudé room to carry out the installation of the support pedestals, the new cable trays, and the new crennel frame for the f/4 spectrograph. Since the installation of the optical-mechanical components can be carried out on the third floor during days without disturbing other operations, it is hoped that the first comparison spectra can be obtained before the end of 1991.

J. Glaspey, D. Salmon

An Astigmatism Corrector for HRCam

A variable astigmatic lens has been added to the HRCam optics in order to remove any astigmatism which might exist or develop in the primary mirror (or in HRcam itself). The power and orientation of this corrector are adjustable from the HRCam control keyboard. Power ranges from 0.0 to 0.8 arcsec (least confusion diameter) which is amply sufficient to correct the typical ~0.3 arcsec of astigmatism observed at prime focus. In use, the corrector is adjusted such that slightly defocussed stellar images appear round rather than elongated as they do when astigmatism is present. Early test during the April 1991 HRCam runs confirmed the good operation of the device which should help break the 0.4 arcsec "floor" below which optical aberrations have prevented sharpening the FWHMs.

The clever optical design (two counter-rotating cylindrical lenses of opposite power) is due to DAO's Harvey Richardson. Allen Moore (DAO) invented the tiny mechanisms needed to hold and drive this new device in the increasingly crowded optical path of HRCam. And Murray Fletcher put it all together, including the very friendly control software.

R. Racine, M. Fletcher, D. Salmon