variety of reasons. It was decided that it would be possible to work within these limitations, and that observing could be performed in both rooms as needed. It is hoped that a later redesign will move the computer room, and make way for a single large control room which handles all observing tasks.

To start the detail design task, a floor plan of the present control room was made on AutoCAD. Various arrangements of control consoles and desks were drawn utilizing the available space. Front panel layouts were drawn, to give an idea of the space available for equipment. Consideration was given to the interaction between the T.O. and observers in making the plans and locating equipment.

The plan finally selected involved the least electronic relocation and cabling in the Telescope Control System. It essentially left the T.O. in his original location. The plan extended the control console across the entire room, and placed the observer on the left side of the room. Observer only equipment would be on that side, shared equipment in the middle, and T.O. only equipment on the right. The console would be extended up to the ceiling; putting TV displays at eye level, and infrequently used and read-only items mounted even higher.

In order to evaluate the ergonomic aspects of the proposed layout, a full scale, wooden mock-up was made of the console and desks. Equipment front panel drawings were pinned to the mock-up, and various staff members and users took turns "test driving" the mock-up. It was decided that the plan would provide ample space for both an observer and telescope operator, and all of their equipment. In fact, some empty panel space was left for expansion.

However, due to the limited floor space in the room it was decided that it would be best to ban all visitor instruments from the control room. It was also decided that the number of persons in the control room should be minimized. Concerns over lighting were noted, to allow astronomers to have a darkened work area while the T.O. has enough light to work efficiently.

3. Implementation

As no down time was given for the project, it had to be fitted into the schedule where possible. The only realistic time turned out to be the aluminizing shutdown in August. The project was broken into two main phases.

Phase one was the renovation of the control room and installation of the new console and desks. No observing functions were moved to the new facility at this time. Preparations preceded the shutdown, and the bulk of the work was done during the shutdown.

After the shutdown, the new console was used for observing as before. The problems noted by the T.O.'s were corrected as required. During this time, preparations were being made to move all the observing equipment to the main control room. This involved building a lot of new cables.

Phase two involved movement of the observing equipment. A coudé run was chosen as the best time, as no observing room support was required. All of the TV controls, leaky memories, and support equipment were moved and tested.

CCD observing started from the new main control room with a coudé run by John Glaspey. This was followed by two UV Prime spectrograph runs, and then two imaging runs using FOCAM.

As a full circle test, observations have again made from the observing room by teams with visitor instruments.

The switch to the new setup has not been without its problems, but generally all has gone well. We are still in a shakedown period, and are learning how to best have the T.O. and observer work together. It is hoped this area can remain flexible, to adjust to needs of individual observers.

4. Future

While the main control room is already looking very professional, it is not yet finished. There are plans to improve lighting and provide shelf storage areas. It may be necessary to install soundproofing to reduce background noise. And, there may be changes prompted by user's suggestions.

The new setup will certainly bring about changes in observing procedures. for the first time, it is possible for the telescope operator to control the television cameras and leaky memories. This should improve autoguiding by providing more consistent control of the TV system. The T.O. can also be asked to find a guide star, and initiate the AutoGuider. These procedures may be done as part of slewing the telescope to an object. Thus, it may now be possible to efficiently observe with only one astronomer.

However, the layout of the control console still permits observer control of the television system for those observers who wish to do so. Additionally, teams observing from the old observing room must either have the T.O. perform all TV camera manipulations, or dispatch one of their members to the main control room to assist in this function. On the other hand, the small size of the main control room makes it an undesirable base of operations for large observing parties.

5. Summary

The Main Control Room changes are certainly not the ultimate control room that everyone would like. However, considering that the project was performed under limitations of space, time, manpower, and budget, and the constraint of no additional down time, the results are more than was hoped for. The working group believes the changes are a major step forward for the observatory, and that the new control room can only help the quality of data obtained at CFHT.

William Cruise

August 1988 Engineering Shutdown

A 7 day planned shutdown was taken at the end of August with these objectives:

- Aluminize the primary mirror, previously recoated May 1986
- Correct primary mirror support systems deficiencies
- Install load cells as part of the axial defining pads, to enable monitoring primary mirror support behavior
- Renovate the telescope control room to accommodate combined observing and operating activities

- Relocate 25 KVA motor-generator from 2nd floor to basement and install 15 KVA UPS for computers protection
- Remove Coudé turret mirror (M3) handling arm from the telescope
- Assist Hawaiian Public Television crew filming primary mirror aluminizing process.

Most objectives were met. In particular, primary mirror coating was uniform at 870 Å thickness; the primary mirror support system was improved; removal of the M3 handling arm and associated counterweights has reduced telescope moving weight by 3200 kgs; the new main control room layout looks promising.

There were, however, some delays in the course of the work, when as-built and as-installed equipment were found to be different from available design information. In particular, installation of the load cells were aborted when, during lowering of the primary mirror back into its cell, it was discovered that the axial defining pad mechanisms had been modified from the original design, and that the full weight of 14 tons, when the mirror is off-air, is taken by the 3 axial defining pads, located at the outer edge of the mirror. Existing drawings and design information showed that the mirror, when off-air was intended to be supported at 24 locations, uniformly spread over the bottom of the mirror.

The resulting point load concentrations are under investigation, to determine if such conditions are acceptable, and to properly size the load cell weight range. Further engineering work is planned for 1989 to correct other remaining deficiencies (e.g. primary mirror radial support mechanisms, axial and radial defining pads, air pressure support system).

Jerry Sovka

SCIENTIFIC NEWS

Detection of Auroral Emissions on Jupiter at 2.2 μm with the FTS

The UV and the IR aurorae

In early January 1979, the Voyager 1 spacecraft began observations of the Jupiter system in the little explored region 500 to 1700 Å, in a closer view than ever before. The observations revealed an unexpected enhancement of atomic and molecular hydrogen emission, in Lyα and the Werner bands, in the polar regions of Jupiter (Broadfoot et al., 1979). The strong H_2 emission, only present near the poles, was interpreted as a signature of auroral emission, excited by high-energy particle precipitation along the Jovian magnetic field lines, comparable to the phenomenon observed on Earth. The UV Spectrometer on board Voyager 2 confirmed the previous detection. Subsequent observations were carried out with IUE (Skinner et al., 1984), supporting the Voyager's finding, but with poor spatial resolution (10x20 arcsec), and from the ground in the infrared, at 7.8 μm (Caldwell et al., 1980, 1983, 1988). This latter wavelength corresponds to the very intense υ_4 band of methane, which provides information about the Jovian stratosphere. In this experiment, the disk of Jupiter is mapped with a 2 arcsec aperture in a two-dimensional raster pattern. The scans revealed a brightening near both poles which were first thought to be related to auroral (i.e. nonthermal) effects.

However, with further study, significant differences appeared between the two detections. The UV emission is concentrated in zones around each magnetic pole: a) an oval known as the 'Io footprint', the locus near the surface of Jupiter where magnetic field lines through the orbit of Io intersect the atmosphere; b) an auroral arc characteristic of magnetic field lines exiting from the interior of the planet. In the infrared, the emission in both hemispheres is confined to a small spot, of about 3x6 arcsec. The northern spot is fixed, at latitude + 60°, while the southern spot moves in longitude. The position of the northern spot is found to coincide nearly with a magnetic anomaly (at 180° longitude in System III). From analysis of the infrared spectra of Voyager 1, Kim et al. (1985) reported the same localized emission in various hydrocarbon trace gases. High-resolution detection of few line profiles of hydrocarbons from ground-based observations, in C_2H_2 at 13.3 μm (Drossart et al., 1986) and in C_2H_6 at 11.6 μm (Kostiuk et al., 1987), confirmed the previous results. The most intense region, located in the northern hemisphere, is hereafter known as the *Auroral Hot Spot.*

To explain these striking differences, the following idea has been proposed: the aurorae in the two spectral regions, UV and thermal IR, have different source particles. A possible interpretation is a direct excitation of H_2 by the charged particles to produce the UV emission, while the infrared polar brightenings would result from an indirect excitation of the stratosphere (by secondary electrons, ions, etc.) with an intense thermal heating, resulting in a change in the photochemistry. Therefore, only the UV brightenings could be properly described as auroral signatures.

CFHT Observations: new emission lines

The auroral phenomenon and related effects has many implications for understanding the Giant Planet, for the structure of the Jovian magnetic field, the energy of the particles, the chain of reactions resulting from the precipitation of particles, the structure of the atmosphere in the polar regions and the circulation in the stratosphere. To help answering these difficult questions, the exploration of another accessible spectral window is crucial.

H_2 has vibrational transitions (quadrupole lines) in the 2.2 μm region, which have been theoretically predicted to be observable. Since the same molecule is involved in the UV emission and the 2-μm emission, the latter can give the opportunity of recovering all the information intrinsic to the ultraviolet. In addition, the solar reflected spectrum is weak (K