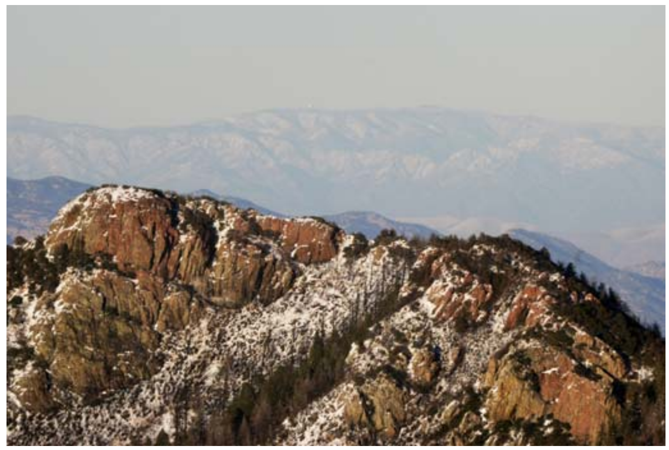
BIMONTHLY SUMMARY

January - February 2007



Top left: J.T. Williams at the Great Wall of China during his December 2006 visit (photo courtesy of Jia Lei, researcher on large spectrograph project at the National Astronomical Observatories of Beijing, and host for the day!) Top right: Clear skies after a January storm. The LBT is faintly discernable in the background on the horizon. Bottom left: A Brocken Spectre of Thomas Stalcup (MMTO), Matt Kenworthy (CAAO), Warren Brown (SAO) and John McAfee (MMTO) and the MMT. Bottom row right: Brocken Spectre of the MMT. All Mt. Hopkins photos courtesy of John McAfee (MMTO).

Personnel

Faith Vilas attended the American Astronomical Society meeting in Seattle, Washington, from January 8-10. She also gave a talk, as part of the FLWO public lecture series, entitled "Water, Water Everywhere: The Record in Asteroids" on February 27 in Green Valley.

In January-February, Faith also served on the selection committee for the KPNO directorship. On February 15, she also served on the Cassini Extended Mission Senior Review at JPL, Pasadena, California.

On February 5, Bill Stangret returned to regular duty at the telescope after a successful recovery following neck surgery.

Ian Shelton left the MMTO in late February for cooler climes in his native Ontario, Canada.

Grant Williams gave a talk, entitled "The New MMT: Technical Developments and Scientific Discoveries," at the Sun City Astronomy Club in Oro Valley on February 15. He also gave a talk, followed by a question and answer session, at a GED science class at Pima College Adult Education as part of a careers in science demonstration on February 20.

Creighton Chute, Brian Comisso, Dondi Gerber, Tom Gerl, John Glaspey, Cory Knop, and Ricardo Ortiz attended a Lock-Out/Tag-Out safety seminar in Tucson on February 6.

Cory Knop was appointed safety representative for the MMTO offices and labs on campus. He's developing a safety manual that, when complete, will define certified training required by town staff, emergency egress procedures, material safety data sheet (MSDS's), personal protective equipment, ergonomics, and fleet management.

As a member of the IAU FITS Working Group Technical Panel, Betty Stobie reviewed suggestions for modifications and clarifications to the "Definition of the Flexible Image Transport System" document. She reviewed the current document that has been revised to reflect the discussion of the technical panel. The panel hopes to publish a new revised document within the next few months.

As a member of the Program Organizing Committee for the Astronomical Data Analysis Software and Systems (ADASS) Conference, Betty has been working with fellow committee members to define special topics and identify potential guest speakers for the ADASS 2007 meeting in London, England.

Primary Mirror Systems

Primary Mirror Support

Two new Heidenhain length gauges were added to the hardpoint test stand setup. A Matlab script was written to transform raw test data into animated maps of the tested hardpoint platform. The additional gauges have assisted in mapping the motion of the hardpoint through its tension and compression cycle. The maps have demonstrated significant tilting of the hardpoint. This motion was suspected previously, but not verified until the recent maps of the hardpoint demonstrated continuous motion as well as repeatability in the tilting of the hardpoint.

The LabVIEW testing software has been further modified to increase the data acquisition rate for the primary hardpoint test stand.

We have designed a "phantom actuator" that may be installed in place of an actuator in the cell. This device will return signals to the cell crate, as would a normally functioning actuator, to help isolate problems in the cell. It will also display incoming signals to isolate problems coming from the crate. The phantom actuator has been tested and is now available to help isolate cell actuator issues. We used the device to help troubleshoot actuator #109, which was missing hardware to lock its input connector together. Since this was installed, it has functioned normally.

The test setup to investigate the behavior and characteristics of RTV (see May-Jun 2006 Bimonthly Summary) was checked by using two styles of accelerometers to verify specific resonant frequencies and the time response of the fixture. The tests that have yet to be analyzed include inducing a force into the RTV to study the tearing and shearing factors. This will give us a better understanding of how the RTV acts while attached to the mirror, and its life expectancy. All procedures and notes will be posted in SiteScape.

Thermal System

With guidance from the other members of the Electronic Group, Dondi Gerber continued layout of the primary mirror T-series thermocouple readout boards. Cory Knop is putting final touches on these circuit cards (thermocouple and thermopile) to ensure they pack into their enclosure properly, and that they are ready to send out for manufacturing. When implemented, each enclosure chassis will support a mix of up to eight cards (of either type) with a very simple method of expansion and repair of the boards. We hope to finish design of the microprocessor interface and the layout of the other T-type readout card during the next reporting period.

For documentation purposes, the original PowerPoint presentations from the "Type T Thermocouple Electronics Detailed Design Review" were posted on SiteScape for staff access.

Optics

Regular monthly CO_2 cleaning of the primary mirror continues; we are still getting good results.

Secondary Mirror Systems

f/5 Secondary Support

On January 3, Shawn Callahan and Brian Comisso completed modification of the f/5 mirror cell hardpoints. The north and southwest hardpoint mounting blocks were milled and reinstalled (see Nov-Dec 2006 Bimonthly Summary). A quick test of the mirror support system indicated all hardpoints were working and had returned to their nominal position. After being installed on the telescope, the southwest hardpoint displayed excessive forces at low elevations. On January 30, it was determined that the southwest and southeast hardpoints were in compression at 5 degrees elevation. Creighton Chute and Brian Comisso aligned all three hardpoints until all remained in slight tension at 5 degrees. A defective southwest axial Bellofram transducer was also replaced after it showed an oscillation. While the system appears to be working, some image shifts were noticed in late February.

With the impending transfer of hexapod control from the hexapod crate to a new PC-based controller, there will be a loss of a serial input for the mirror support data. Therefore, Brian Comisso moved the serial link cable to the Lantronix1 unit. Two RS232 connections (four wires) in the f/5 mirror cell had to be swapped to enable the Lantronix to communicate with the mirror cell. The f/9 force monitor card uses this port as well, and therefore cable swaps will no longer be required. Duane Gibson updated the appropriate GUI to reflect the data.

f/5 Upper Baffle

A redesign of the f/5 upper baffle support arms has begun because the existing arms can contact the secondary cell perimeter when the hexapod reaches travel extremes.

f/9-f/15 Hexapod

On January 15, the f/9 indicated image shift problems and erratic movement of the hexapod. During testing, Duane Gibson noticed that pod B was not indicating proper encoder counts when compared to the transducer counts. On January 24, pod B was swapped out by Creighton Chute, Tom Gerl, and Brian Comisso. The hexapod was loaded with 200 lbs and the movement was tested. All counts were proper, and subsequent tests on both f/15 and f/9 were successful. During the disassembly of the removed pod, excessive contamination was found on the optical encoder disc as well as improper spacing between the disc and encoder read head. The disc was replaced and the gap was readjusted to ensure proper counts. The spare unit is now operational.

Telescope Tracking and Pointing

Servos and Encoders

For detailed reports (updated on a 1-2 week basis) on the upgrades to the servos, the interested reader is referred to the report series in pdf format found at: *www.mmto.org/~dclark/Reports*. This web folder also contains web-browser enabled images of the Simulink diagrams being built into real-time code for those interested in the controller topology being deployed. Since all the details are available elsewhere, we will merely summarize the activity here.

Examination of the open-loop data collected in early January, and the closed-loop responses from testing the new controller, pointed to previously-unseen features in the elevation axis' structural modal response. The primary difference between results in testing the controller in 2004-5 and the recent tests is the appearance of a strong 20 Hz resonant mode that had sufficient energy to become a positive feedback in the closed-loop servo. The resulting oscillation made the controller unstable.

It would seem that the telescope, as modeled, has changed since the fall of 2006. One reason that may explain this change is an effort to tighten and stiffen the telescope front end. A 20 Hz notch filter was added to the elevation servo controller (and previous 85 and 161 Hz filters were dropped, since the accumulated phase lag through a long cascade of filters was itself making the loop unstable). This new topology so far seems successful, and allows more critical tuning of other servo parameters, which is now in progress.

The controller design iteration continues, with testing planned on both the f/5 and f/9 configurations. Any design changes with those series of tests should help develop confidence in operating the telescope with the f/15 equipment in place.

The ability to collect performance data routinely for comparison to the telescope performance specification, and evaluating improvements to the servo became important during the reporting period. To this end, a telemetry facility was added to the mount computer to capture slew and tracking data during normal operations. Tracking data are captured every time we acquire a new object for observation. After we slew to an object, we wait until the servo error is less than some threshold, then capture 120 seconds of data at 100 Hz. These data remain in a queue in the mount computer until they have been read out and logged to disk by a program dedicated to this purpose. The program runs on our mountain Linux server *hacksaw*. This facility has been quite successful and convenient and will be expanded to collect other forms of detailed telemetry for the mount computer, as well as the primary mirror support (aka cell computer).

A small Matlab reduction script for viewing both the tracking error time-series data and its power spectral density was written by Dusty Clark, and is planned to be included in the MMTO web-browsable engineering system for convenient analysis by the staff.

Fabrication drawings of the replacement bracket for the west elevation encoder mount were produced, and the bracket will be machined in early March. The new mount is a duplicate of the mount currently used for the east elevation encoder. The mount provides a better means of aligning the encoder with the tape, thereby improving telescope tracking.

The mount alignment telescope mounting hardware is being analyzed. The factory focuser stiffness was determined to be insufficient and a design to replace it is in progress. The loop brackets that secure the telescope tube to the MMT primary mirror cell are currently being analyzed for stiffness. One arcsecond on the sky is the error budget of the mount alignment telescope.

Computers and Software

Engineering and Operator Interfaces

Several dozen MMT engineering web pages were updated to use the JavaScript Ajax.Request class from the Prototype.js library. Other changes to web pages include increased use of the "mmtlogs" MySQL database and RRDTool PNG images.

The Ajax.Request class accounts for differences in the XMLHttpRequest class in different web browsers. The change was made to use a widely used Ajax library. A JavaScript file, updater2.js, was created that contains common code for using the Ajax.Request class for MMT web pages. The JavaScript "MMTDiv" class, defined in "MMTDiv.js," was also expanded to include many common MMT user interface features. A PHP class, also called "MMTDiv" and found in the "mmtdiv.inc" file, was created for server-side interaction with the JavaScript MMTDiv class.

A new web page (*http://hacksaw.mmto.org/engineering/aluminize/aluminize_combined.php*) was developed as a front-end to aluminization modeling. This web page combined four previous web pages that handled different "can" and "ring" filament geometries and different output array sizes. The web page uses existing compiled C programs to model the thickness of aluminum that is deposited on mirrors during aluminization. It presents the modeling results in a text summary, a FITS image, and a PNG image.

The capabilities of the widely-used Flash 9 plug-in from Adobe and the recently released Flex 2 programming environment were investigated. It offers greater efficiency as well as greater flexibility and power in interface design/implementation than HTML+javascript-based Ajax methods, but retains much of the ability to tightly couple with server-side PHP scripting, of which we make extensive use. The web-based cell error log viewer, "rerr," was re-written using this technology. The new version is at least 4 times more efficient than the Ajax version, reducing the CPU usage from 20% to less than 5% on *yggdrasil* during a primary mirror bump test. Both the Ajax and the Flex 2 versions use less than 1% CPU when the log file is not being appended.

To get around other limitations of the older Firefox version 1.5 that is installed by default under Fedora 5 and 6, we installed our own copy of Firefox 2 under the /mmt hierarchy. This newer version is significantly more efficient and has the ability to restore the previous session in the event of a browser crash. This is a key feature that will allow operators to quickly bring their interfaces back up the way they were if their browser crashes. Special commands were set up to allow the operators to run Firefox 2 as the "mmtop" user. This allows a common profile and set of web pages to be used by the various operators while allowing them to continue using the system-provided browser for personal use. The Java and Flash 9 plug-ins were also installed for use with Firefox 2.

Various engineering web pages were removed and replaced by new pages. A new web page was created that combines the all-sky camera with three webcams located in the chamber.

Hexapod Software

The hexapod network server code has been successfully ported from VxWorks to Linux. This allows us to retire another VME crate and instead run the network server code on *hacksaw* along with our other TCS services. The Linux server was deployed in mid-February and has been used throughout the current f/5 run with no problems. Testing remains to be done in the f/9 and f/15 configurations, but since the actual code changes were fairly minimal and well-tested with f/5 we don't expect there to be any complications.

The f/5 hexapod was tested with the high resolution UMAC data gathering utility and was found to have following errors similar to f/9. Tuning the servo parameters reduced the following error to an acceptable level. It should now be possible to make focus and collimation adjustments without changing the object position significantly. This should allow us to make focus changes while taking imaging data (e.g., with Megacam). The new servo parameters have been in use during the current f/5 Hectospec/chelle run and have shown a clear improvement in performance. The Hecto operators report that with the previous tuning guide stars would routinely bounce out of their guide boxes during focus changes, but now stay very steady with little, if any, noticeable movement. Later, we will tune and test the f/9-f/15 hexapod.

Improved Error Analysis Facility

As the overall control system at the MMT grows in complexity, our operators are confronted with a plethora of information, making it difficult to monitor all possible subsystems. One example is the occasional event when one of the mount drives is powered down because of a safety chain dropout. In the past, this was often detected indirectly through audible clues or the loss of a guide star. We now have a direct indicator of this event. We are developing a single centralized error reporting interface that will ultimately raise a red flag to get the operators attention, and then direct them to the subsystem in question and the specific problem that caused the alert. This MMT subsystem status web page (*http://hacksaw.mmto.arizona.edu/engineering/sysstat/*) uses a small number of status indicators to show the overall status for subsystems such as cell, mount, and thermal. The web page attempts to automate monitoring of MMT subsystems, relieving the operators of this task. At present, approximately 100 status questions are queried to determine the overall status of the subsystems. New variables are being developed for the cell and mount crates to summarize system status. These variables will be queried by the "sysstat" web page as they become available. We expect this system to grow and be refined over the coming months.

Service Request System

Dallan Porter launched the new MMT Service Request (SR) system. All of the previous SR entries have been imported into the new database, which is now online and available for use. The old SR system is being phased out. The URL for the new system is *http://www.mmto.org/staff/mmt/service/*.

New Staff Web Page

Dallan is also working on a new "Staff Only" web page for the MMT website. The new page will be a location where staff members can log in and get an overall view of what's happening at the MMT. The page will display dynamic information from several MMT databases, and will present the information in a useful and efficient manner. The page will contain a section that will summarize what is happening at the MMT for the current day. For example, it will show who the observer is for today, who the operator is for today, what instrument is installed, what SRs are currently open and their priority+status, and other useful links. In addition to displaying daily activity information at the MMT, the new page will provide an interface to view/add/organize images in the MMT image archives.

Observer Catalogs

Dallan is adding a new tool to the MMT observer catalog submission web page to provide observers with a visual display of their submitted catalog entries. The catalog targets are superimposed onto all-sky camera images to aid the observer in object selection. The tool is interactive and allows the observer to click on any target to display a plot of the calculated airmass and elevation over time. A beta version is already available to observers, and a link is provided when they submit their catalogs online.

All-Sky Camera Data Analysis

Betty Stobie has been working on analyzing archived all-sky camera data to look for transient phenomena (e.g., planes and meteors) and obtain quantitative measures of cloudiness and sky brightness. In the course of this analysis, she found a number of frames where bright sources did not subtract as cleanly as they should when difference images were created. In some of these frames, there were trails of planes or satellites that showed clear gaps in the trails. This was a clear indication that the data acquisition script was skipping frames from time to time. This is because the camera updates every 8.533 seconds while the script was waiting 10 seconds between framegrabs. These skipped frames complicated analysis of resulting difference images, so Tim Pickering re-engineered the acquisition script to use a high resolution timer. This appears to have fixed the problem with skipped frames. The acquisition script was also modified to do on-the-fly compression of the FITS data file.

Work is ongoing to make the transient source detection more robust and automated. Once the number of false positives and negatives reaches an acceptable level, this analysis will be applied to each image on-the-fly as they are acquired. Work is also ongoing to try to photometrically calibrate the images to allow monitoring of sky brightness and opacity. The lack of a filter complicates this task, but initial results are promising at least in terms of long-term stability. This should allow us to at least build an internal calibration database for monitoring night-to-night variations. Converting these instrumental magnitudes to standard photometric systems will likely be a much dicier proposition.

Instruments

Adaptive Optics

The new PC-based Reconstructor (PCR) system was used for science during the f/15 run from January 29 - February 6. The PCR was successfully used for the entire run. Some minor software problems were found and should be fixed before the next run in early April.

The PCR system uses a different camera controller that includes a small preamp enclosure that mounts close to the camera head. This preamp would not fit in the wavefront sensor rotator bearing, so the wavefront sensor was mounted in an alternate location. After the f/15 run, the rotator bearing was removed from the topbox and brought to campus to facilitate modifying the preamp enclosure so that it would fit. Brian Comisso lengthened the cable between the preamp enclosure and the camera head so that the preamp can now be moved back far enough to fit in the rotator bearing. While doing this, several problems were noted with the grounding scheme of the new camera controller/preamp combination. A few ground loops were found, as well as improper connections between chassis, analog, and digital grounds. We are currently testing the system to ensure that these modifications have not affected the performance of the camera controller.

f/9 Instrumentation

Red and Blue Channel Spectrographs

The new deep depletion CCD for the Red Channel spectrograph significantly increases the instrument's sensitivity beyond 9000 Angstroms. In addition, because the silicon is as much as 300 microns thick, the data will not suffer from fringing. For these reasons the instrument now has the capability to observe between the OH emission lines in the red when used in high resolution mode. We anticipate that this will result in an increased demand for the Red Channel echellette mode.

Therefore we have started the process of manufacturing new short slit plates to be used in the cross dispersed configuration. MMT observers currently have the option of using 180 arcsec or 20 arcsec long slits. However, the optimum slit length in the cross dispersed mode is ~10 arcsec. In the past, cross dispersed observations have utilized the 20 arcsec slit masked off with tape to approximately 10 arcsec.

Red Channel echellograms, provided by Gary Schmidt (SO), show that the minimum separation between cross dispersed orders 7 and 8 is 11.48 arcsec. The masked off 20 arcsec slit was measured to have a length of approximately 9.0 arcsec long. The masked off slit was tested with Red Channel in cross dispersed mode and we have determined that it is nearly the optimum length, i.e., no order overlap and sufficient sky. Based on this information, we chose to design the new slit with 9.0 arcsec lengths. Using the f/9 plate scale of 0.284 mm/arcsec, this corresponds to a physical length of 2.556 mm.

The slit widths were chosen to match the widths of the current 180 arcsec and 20 arcsec slits, namely 0.75, 1.0, 1.25, 1.5, 2.0, 3.5, 3.75, and 5.0 arcsec. The physical size of the slits was determined using the f/9 plate scale and the 12.5 degree tilt for the slit plates. The physical widths are 0.218, 0.291, 0.364, 0.436, 0.582, 1.018, 1.091, 1.454 mm.

Two of the new short slit plates were manufactured for use on the night of February 10. The diamond-turned polishing of the slit plates by the Steward machine shop was a difficult procedure, and perhaps something of an art. The first two plates were not smooth enough and they produced poor images in the guider. An effort will be made to perfect the polishing technique on test plates before the remaining slits are polished.

During the engineering night of January 9, a set of spectrophotometric standard stars were observed with Red Channel using the echellette grating in cross dispersed mode. The goal was to understand the general performance of the instrument in that configuration and to obtain data to be used in aiding observers with reduction techniques. An additional goal was to estimate throughput with the new detector, albeit with a narrow 1.0 arcsec slit. However, the night was not photometric. If weather and time permit, throughput data using a 5.0 x 9.0 arcsec slit will be obtained on the engineering night of March 28.

During engineering time in December, we found that the new deep depletion CCD for Red Channel was positioned too far back in the dewar, which prevented us from reaching focus by moving the collimator. The dewar was returned to ITL and the chip was moved 0.015 inches closer to the dewar window. During the day of January 9, we found that we could focus the spectrograph but that the CCD was still not nominally positioned in the dewar, i.e., that best focus wasn't at the zero astigmatism position of the collimator.

The design of the spectrograph specifies the position of the collimator in order to minimize astigmatism. Ideally the collimator would stay fixed, and focusing of the spectrograph would be achieved by moving the detector. However, both the Red and Blue Channel instruments were designed to focus by slightly adjusting the position of the collimator. However, this allows the spectrograph to be focused without having the collimator at the zero astigmatism position. In order to minimize astigmatism it is necessary to shim the dewars to place the detector at a position where, when in focus, the collimator is at a position that minimizes astigmatism.

The following day, January 10, was used to collect a set of data to measure the resultant astigmatism in the spectrograph. This is done by determining the elongation of the image of a pinhole with a high dispersion grating (taking into account the known anamorphic magnification) as the collimator is swept through focus. The instrument was configured with the 1200 lpm (1st/7700 Angstroms) grating and the "comb" aperture plate (a line of eighteen 1 arcsec circular holes on 10 arcsec centers). A set of HeNeAr calibration lamp spectra was obtained at different collimator positions. It was later found that the data had been binned by two in the spatial direction, not an ideal configuration for measuring small elongations. We are still attempting to match the measured data with results from a ZEMAX model.

In an effort to reposition the detector, the dewar was again returned to ITL and a warp was identified in the CCD cooling tower that caused the tower to touch the side of the snout, resulting in a thermal short when the chip was moved too close to the window. The warp was eliminated and the chip was moved toward the dewar window by another 0.010".

On February 10, Red Channel was focused and we found that the detector was, as desired, too far forward in the dewar. The best focus position of the collimator was 3.1 volts rather than the nominal of approximately 4.0 volts. This allowed us to place three small 0.010 inch shim "tabs" between the dewar and instrument. The astigmatism measurements will be repeated in March and the proper shim thickness installed.

A set of circular plastic shims, which match the Red Channel dewar bolt hole, are being manufactured. A similar set has already been manufactured for Blue Channel.

SCCS/ICE Modifications and Updates

Skip Schaller worked with Mike Lesser (ITL) to debug problems in the AzCam controller software for the Red and Blue Channel spectrographs. These involved power on initialization and problems with pause and resume. These problems seem to have been resolved, but one more round of testing is required to be sure.

Skip also started on phase two of the software upgrade to the Red and Blue Channel Spectrograph control software. Most of the functionality that is currently contained within the client-side GUI will be moved into the server. The client will then be reimplemented as a much simpler browser-based interface.

f/9 Top Box

Shawn Callahan and Don McCarthy designed a new camera installation in the f/9 topbox to allow simultaneous optical and infrared observations of an occultation by Pluto on March 18. With help from Grant Williams, an 85-mm Canon lens was selected to provide the best image scale.

In mid February, the SO guide camera was replaced with a fast frame rate iXon camera. It was then aligned to a dichroic above PISCES. The SO guide camera will be reinstalled after the occultation.

Science Camera

Shawn Callahan and Jill Cooper continue to refine the target of opportunity camera requirements and to model possible mounting locations.

f/5 Instrumentation

The design of permanent support arms for the Hecto fiber chain is in progress. The new arms will be more secure, easier to use, and require less motion of the fiber chain. They will be rigid beams that use a pin in place of the now used carabineer, and will fold out of the way into the ceiling space while not in use.

The incandescent calibration lamps mounted in the f/5 baffle did not operate properly when last installed. Mark Lacasse (FLWO) identified the problem in a connector, which was rebuilt with new pins and a back shell that had not been installed originally.

Documentation

Cory Knop developed a Telescope Operations section in SiteScape that centralizes information previously in the Dokuwiki and in the MMTO engineering web pages. This should assist the telescope operators in the development of an operator's training manual.

Cory is developing flowcharts for standard daily operations. His goal for this extensive project is to streamline activities by developing flowcharts as situations unfold (e.g., forest fires, troubleshooting, and general maintenance).

Cory is also in the process of generating digital copies of all H-files and critical paper drawings that are currently located at the FLWO basecamp. Once digitized, these documents will be added to SiteScape for ease of access.

Ian Shelton created thumbnails of some of the images in SiteScape that were originally in zip files.

LOTIS Aluminizing Project

In the middle of the night of January 17, the MMT belljar successfully made the trip (under state police escort) from the FLWO basecamp to the Steward Observatory Mirror Lab (SOML). After the very smooth trip, the belljar was unloaded and rotated vertical to mate the awaiting part of the LOTIS vessel. After an inspection, we were able to successfully mate the two halves.

After the first complete week of vacuum pumping with only the roughing trailer pumps, the system reached a pressure plateau. Preparations have been made to install the large turbo molecular pump and continue systematic helium leak testing. No significant physical leaks have been detected; rate-of-rise tests show that the out-gassing of interior surfaces is still dominating the chamber pressure.

Top left: The MMTO belljar awaits transport from the FLWO basecamp. In the near background, VERITAS 12-m telescope #4 awaits its final mirror segments.

Top right: The belljar is rotated vertical in the SOML parking lot.

Bottom: The belljar halves and cell spacer are successfully mated.

In February, Dondi Gerber spent a few days at SOML to observe and to learn the initialization process of aluminization. This began with setting up a small vacuum station, and a residual gas analyzer for detecting leaks in the chamber.

General Facility

Instrument Repair Facility

The Instrument Storage and MMT Building Modification Committee reviewed a number of different options for fire suppression for the planned instrument storage facility. On January 3, they made the following recommendation to M3 engineering:

> M3 will provide costs for a dry pipe sprinkler with incipient sniffing and power cutoff. This detailed estimate will be separate from the building estimate. This estimate should include all related costs such as a water tank relocation, larger water tank, fire pump, jockey fire pump, pump engine, freeze protection of plumbing, fire pump enclosure, and any required sprinkler test equipment.

The next phase of the building design should be available in March.

Ventilation System

We have had two instances of the blower control GUI not responding to a power down command in a timely manner. In each case, the operator was able to turn it off with the hand paddle in the blower shack. Thorough testing of the hardware has not identified the cause. A possible scenario may be associated with the latencies in software at the operator's console.

We have also had incidents of the blower starting as a result of power-on initialization problems with the fiber modems used to transfer commands to the blower. This problem has been identified and a design fix is in the works.

Other Repairs

We have had failures of two of the fourteen phones originally purchased to cover the twelve locations that system will support; we now have no spares. The next phone to fail will necessitate removing a location. Ken Van Horn obtained a quote from a local company to install a Toshiba system, which could be expanded to 20 phones and eight lines. This quote is now under review.

Noises in the operation of the bridge crane were identified as interference with a conduit, which has been fastened down more securely. Noises still come from the west side rail, which may indicate the need for maintenance.

The Carrier transformers mentioned in the last report have been placed in spares stock and are available as needed.

A rebuilt glycol pump was installed after the remaining old pump failed. The system now works better than ever, and the retired old pump will be sent for repairs.

Dennis Smith swapped out one of the dry air system's Neslab RTE-4s. The spare was used while this unit was repaired. It is now back on line. These chillers help condense and remove water from the mirror support high pressure air supply.

We have once again repaired the DustTrak by replacing the rubber diaphragm, which does not tolerate Ozone.

One of the four calibration lamp boxes was identified as non functional. The problem was traced to an external on/off switch, located in a hidden position, which had been inadvertently turned off.

The R. M. Young wind bird lost its tail in high winds recently and has been replaced with the spare. Parts have been ordered to repair the original unit.

Visitors

January 23: Wiphu Rujopakarn (Steward graduate student) accompanied representatives of the Ministry of Science of Thailand: Saran Poshayachinda, Deputy Director of the National Astronomical Research Institute of Thailand (NARIT), and Prathom Yamkate, Deputy Permanent

Secretary of the Ministry Of Science. The group was hosted by John Glaspey and Ken Van Horn (MMTO).

January 29: Amanda Preston (Advancement and External Affairs Officer, CfA Director's Office) accompanied Gay Wray and Dick and Barbara Blake on a tour/visit to MMTO and FLWO facilities. Gay Wray is a member of the board of the Roger S. Firestone Foundation, which funds the Smithsonian Astrophysical Observatory's Firestone Postdoctoral Fellowship at the MMTO. The Blakes (Amado, Arizona residents) are active with many local charities, are frequent gracious hosts, and contributors to SAO, FLWO, and MMTO fund raising/development events.

February 27: Two engineers from the Discovery Channel Telescope project, Byron Smith (Project Manager) and Heather Marshall (Mechanical Engineer) toured the MMT with John Glaspey.

Publications

MMTO Internal Technical Memoranda

None

MMTO Technical Memoranda

None

MMTO Technical Reports

None

Scientific Publications

07-1 The Evolving Luminosity Function of Red Galaxies
M. J. I. Brown, A. Dey, B. T. Jannuzi, K. Brand, A. J. Benson, M. Brodwin, D. J. Croton, P. R. Eisenhardt
ApJ, **654**, 858

07-2 Optical Spectroscopy of the Large Kuiper Belt Objects 136472 (2005 FY9) and 136108 (2003 EL61)
S. C. Tegler, W. M. Grundy, W. Romanishin, G. J. Consolmagno, K. Mogren, F. Vilas
AJ, **133**, 526

07-3 SDSS 0809+1729: Connections Between Extremely Metal-Poor Galaxies and Gamma-Ray Burst Hosts
L. J. Kewley, W. R. Brown, M. J. Geller, S. J. Kenyon, M. J. Kurtz
AJ, **133**, 882

Non MMT Scientific Publications by MMT Staff

None

Observing Reports

Copies of these publications are available from the MMTO office. We remind MMT observers to submit observers' reports, as well as preprints of publications based on MMT research, to the MMTO office. Such publications should have the standard MMTO credit line: "Observations reported here were obtained at the MMT Observatory, a facility operated jointly by the Smithsonian Institution and the University of Arizona."

Submit publication preprints to *bruss@mmto.org* or to the following address:

MMT Observatory
P.O. Box 210065
University of Arizona
Tucson, AZ 85721-0065

MMTO in the Media

No activity to report.

MMTO Home Page

The MMTO maintains a web site (*http://www.mmto.org*) that includes a diverse set of information about the MMT and its use. Documents that are linked to include:

- General information about the MMT and Mt. Hopkins.
- Telescope schedule.
- User documentation, including instrument manuals, detector specifications, and observer's almanac.
- Scientific and technical publications
- A photo gallery of the Conversion Project as well as specifications related to the Conversion.
- Information for visiting astronomers, including maps to the site.
- The MMTO staff directory.

Observing Database

The MMTO maintains a database containing relevant information pertaining to the operation of the telescope, facility instruments, and the weather. Details are given in the June 1985 monthly summary. The data attached to the back of this report are taken from that database.

NOTE: Beginning January 2005, the formula for accounting lost time on the telescope has been changed. Previously, time lost to weather was deducted from the total observing time before calculating time lost to instrument, telescope, and facility from the remaining balance. From now on, the time lost to each source is computed as a fraction of the total scheduled time.

And beginning June 2005, a new category, environment, was added to account for time lost to natural, uncontrollable, non-weather events such as flying insects melting in laser beams and forest fires.

Use of MMT Scientific Observing Time

January 2007

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	* Lost to Telescope	Lost to Gen'l Facility	Lost to Environment	Total Lost
MMT SG	8.00	94.40	50.20	0.00	2.00	0.00	0.00	52.20
PI Instr	19.50	229.45	129.85	3.25	0.00	0.00	0.00	133.10
Engr	3.50	41.15	19.85	0.00	0.00	0.00	0.00	19.85
Sec Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**31.00**	**365.00**	**199.90**	**3.25**	**2.00**	**0.00**	**0.00**	**205.15**

Time Summary Exclusive of Summer Shutdown

Percentage of time scheduled for observing	88.7
Percentage of time scheduled for engineering	11.3
Percentage of time scheduled for sec/instr change	0.0
Percentage of time lost to weather	54.8
Percentage of time lost to instrument	0.9
Percentage of time lost to telescope	0.5
Percentage of time lost to general facility	0.0
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	56.2

* Breakdown of hours lost to telescope
f/9 secondary 1.5
unresolved telescope/network weirdness 0.5

February 2007

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	Lost to Telescope	* Lost to Gen'l Facility	Lost to Environment	Total Lost
MMT SG	6.00	67.60	23.95	0.00	0.00	0.00	0.00	23.95
PI Instr	21.50	239.00	101.60	0.50	0.00	2.00	0.00	104.10
Engr	0.50	5.60	5.60	0.00	0.00	0.00	0.00	5.60
Sec Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**28.00**	**312.20**	**131.15**	**0.50**	**0.00**	**2.00**	**0.00**	**133.65**

Time Summary Exclusive of Summer Shutdown

Percentage of time scheduled for observing	98.2
Percentage of time scheduled for engineering	1.8
Percentage of time scheduled for sec/instr change	0.0
Percentage of time lost to weather	42.0
Percentage of time lost to instrument	0.2
Percentage of time lost to telescope	0.0
Percentage of time lost to general facility	0.6
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	42.8

* Breakdown of hours lost to facility
Neslab setpoint 2

Year to Date February 2007

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	Lost to Telescope	Lost to Gen'l Facility	Lost to Environment	Total Lost
MMT SG	14.00	162.00	74.15	0.00	2.00	0.00	0.00	76.15
PI Instr	41.00	468.45	231.45	3.75	0.00	2.00	0.00	237.20
Engr	4.00	46.75	25.45	0.00	0.00	0.00	0.00	25.45
Sec Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**59.00**	**677.20**	**331.05**	**3.75**	**2.00**	**2.00**	**0.00**	**338.80**

Time Summary Exclusive of Summer Shutdown

Percentage of time scheduled for observing	93.1
Percentage of time scheduled for engineering	6.9
Percentage of time scheduled for sec/instr change	0.0
Percentage of time lost to weather	48.9
Percentage of time lost to instrument	0.6
Percentage of time lost to telescope	0.3
Percentage of time lost to general facility	0.3
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	50.0