MMT Observatory
Smithsonian Institution &
The University of Arizona®

BIMONTHLY SUMMARY

May – June 2006

Top row: Peter Strittmatter and Faith Vilas say a few words at the MMT Science Symposium banquet. Bottom row: J.T. William's cake, specially decorated to remind him of the trials and tribulations of his final months as MMTO Interim Director. Photos courtesy of John Glaspey and Ken Van Horn (MMTO). Cake decorations by Howard Lester and Jill Cooper (MMTO).

MMT Observatory • The University of Arizona • Tucson, Arizona 85721 • PHONE: 520. 621. 1558 • FAX: 520. 670. 5740

Personnel

Dallan Porter was hired as a Computer Specialist, Telescope, May 8.

Mechanical engineering undergrads Todd Jackson and Jill Cooper started work at the MMTO May 10 and May 15, respectively.

Student mechanical engineer Ryan Odegard graduated in May and was subsequently hired as a temporary Associate Engineer for 1.5 months (May 16 through June 29) before going to graduate school at MIT.

Shawn Callahan was hired as MMTO Systems Engineer Coordinator (Principal Engineer, Mechanical), returning to MMTO from LBTO on June 5.

Elizabeth Stobie (Science Data Software Specialist) transferred from the Steward NICMOS group June 5.

Tom Gerl was hired as an Electronic Engineer June 5.

Mechanical engineering undergrads Daniel Sanchez Soria and John Di Miceli were hired June 6 to assist the mountain staff during the summer months.

Skip Schaller was hired as a Telescope Computer Specialist, Principal, June 12.

Marc Lacasse, FLWO staff scientist, began his support of MMTO f/5 instrumentation in June.

SPIE Conference

J.T. Williams, John Glaspey, Grant Williams, Tim Pickering, Dusty Clark, Shawn Callahan, and Creighton Chute attended the SPIE Astronomical Telescopes and Instrumentation conference in Orlando, Florida May 24-31. Work done to date on the MMT all-sky camera was presented in the form of a paper, a talk, and a poster. The work was presented again at the MMT Science Symposium in the form of a talk and poster. A poster and talk on the aluminization system were also presented. The aluminization paper and the all-sky camera paper and poster are available on the mmto.org website at *http://www.mmto.org/MMTpapers/*. Creighton Chute and Shawn Callahan attended conference workshops on "Telescope Systems: Materials Choices for Performance and Stability" and "Adaptive Optics," respectively.

MMT Science Symposium

Grant Williams, Tim Pickering, Duane Gibson, and Dusty Clark made presentations at the first MMT Science Symposium, June 14-15, 2006. Duane presented a poster entitled "Behind the Scenes: Data Acquisition and Analysis from MMTO Subsystems." This poster highlights six sets of logs that are used daily in MMTO activities, and the presentation of data from the logs to end users. Dusty Clark presented his SPIE aluminization poster, and Tim Pickering presented his SPIE all-sky camera talk and poster. Grant Williams gave an overview of recent and upcoming technical activities at the MMT.

The symposium was attended by scientists from Harvard-Smithsonian Center for Astrophysics, Steward Observatory, Whipple Observatory, Arizona State University, and University of Michigan. Several MMTO staff and Steward graduate students attended also. For a list of talks, posters, and participants, go to *http://www.mmto.org/symposium/schedule.shtml*. PowerPoint presentations are available at *http://www.mmto.org/symposium/talks.shtml*.

In addition to the symposium, a banquet was held to honor J.T. Williams for his many contributions to the MMT and other area observatories. The banquet included a "roast" and special presentation. Nelson Caldwell recounted J.T.'s many support contributions to astronomy over the millennia, as one of many presentations. A special presentation to J.T. included the announcement of the naming of asteroid 17081 1999 JT1 to be 17081 Jaytee, with the following citation: Named for Joseph T. ("J.T.") Williams (b. Nov 1, 1936) – MMT Observatory engineer instrumental in the development of the original cluster of six 1.8-m telescopes on the summit of Mt. Hopkins as well as the 6.5-m retrofit. He also developed the technique of aluminizing large telescope mirrors *in situ*.

Dr. Michael Meyer of Steward Observatory gives a presentation at the MMT Science Symposium. Photo courtesy of John Glaspey (MMTO).

Primary Mirror Systems

Primary Mirror Support

Shawn Callahan began working with engineers, students, and programmers to prepare a requirements document for the design of a hardpoint test stand. A conceptual design for the stand is being developed and will be ready for final review in July. Our goal is to use this stand to calibrate and repair the spare hardpoint in time for summer shutdown.

Changes to the proposed hardpoint test stand necessitated significant changes to the conceptual electronic design for the test and data acquisition system. We now propose to use a dedicated PC with PCI I/O boards rather than use a data acquisition unit (DAU). This will allow for faster data throughput and collection of incremental counting signals from independent digital length gauges for fully characterizing the LVDT (Linear Variable Differential Transformer) vs. hardpoint position on the test stand.

An experiment was proposed for early detection of failing puck glue (RTV) bonds. Using an accelerometer, puck position can be measured in response to a force step or impulse; a failing glue joint may exhibit a time/frequency signature that could be compared to that of a known-good glue bond to detect impending failure. Work using our existing double-acting cylinder fixture with load cell has begun; we will bolt in a variety of glued pucks and test the accelerometer outputs under controlled conditions to determine if this idea has merit.

Aluminization

The MMTO primary mirror belljar (7 meter diameter) was transported to the FLWO basecamp warehouse in early June by Sierrita Mining & Ranching (SMR) and MARCO Crane, in preparation for testing and coating the LOTIS 6.5-m primary mirror at the Steward Mirror Lab (SOML). An interdepartmental agreement was completed by Faith Vilas, J.T. Williams, and Steward's LOTIS management for test coatings and final aluminizing of the 6.5-m collimator. In exchange for this unique use of the MMTO vacuum coating system, MMTO will receive a mating "back" belljar and cylindrical tank section to make a complete vacuum coating vessel. Working with FLWO and the VERITAS project, preparations are made for test operations of this new chamber adjacent to the basecamp lower warehouse.

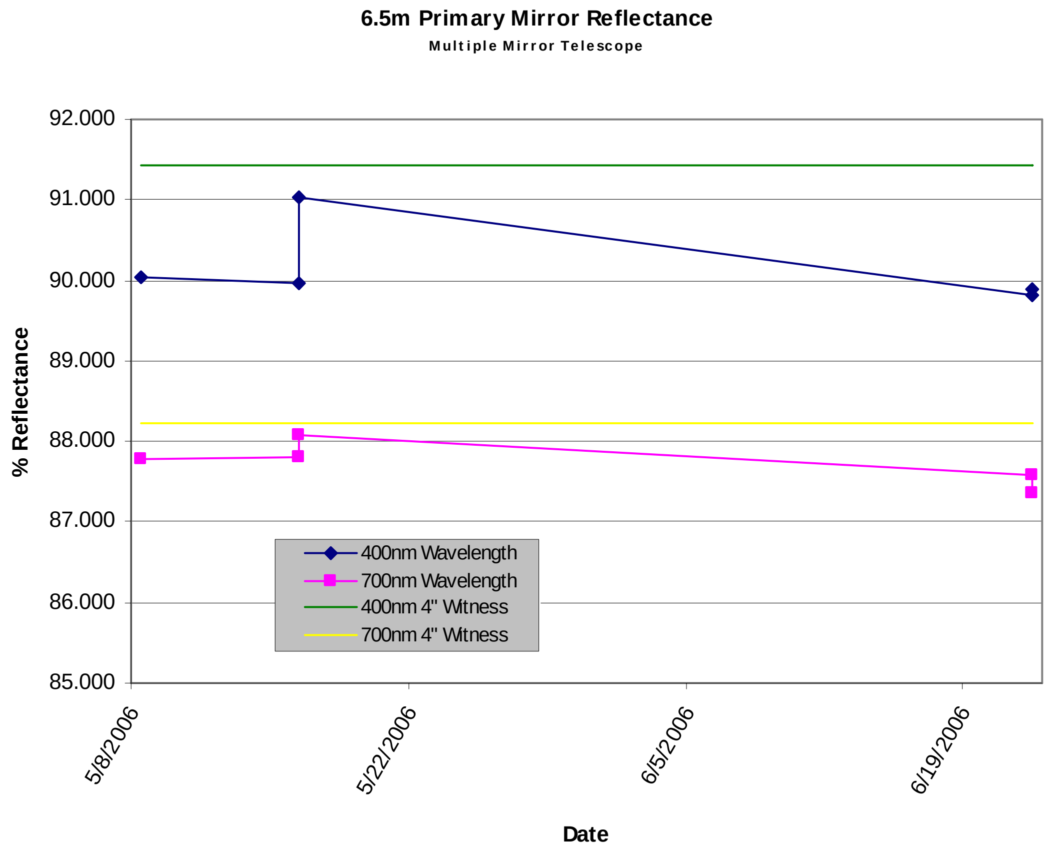
MMTO's 7-m diameter aluminizing belljar leaves the Mt. Hopkins summit for the FLWO basecamp, then to the Steward Mirror Lab where it will be mated to a new "back" belljar of the same design to form a "new" complete 7-m vacuum vessel.

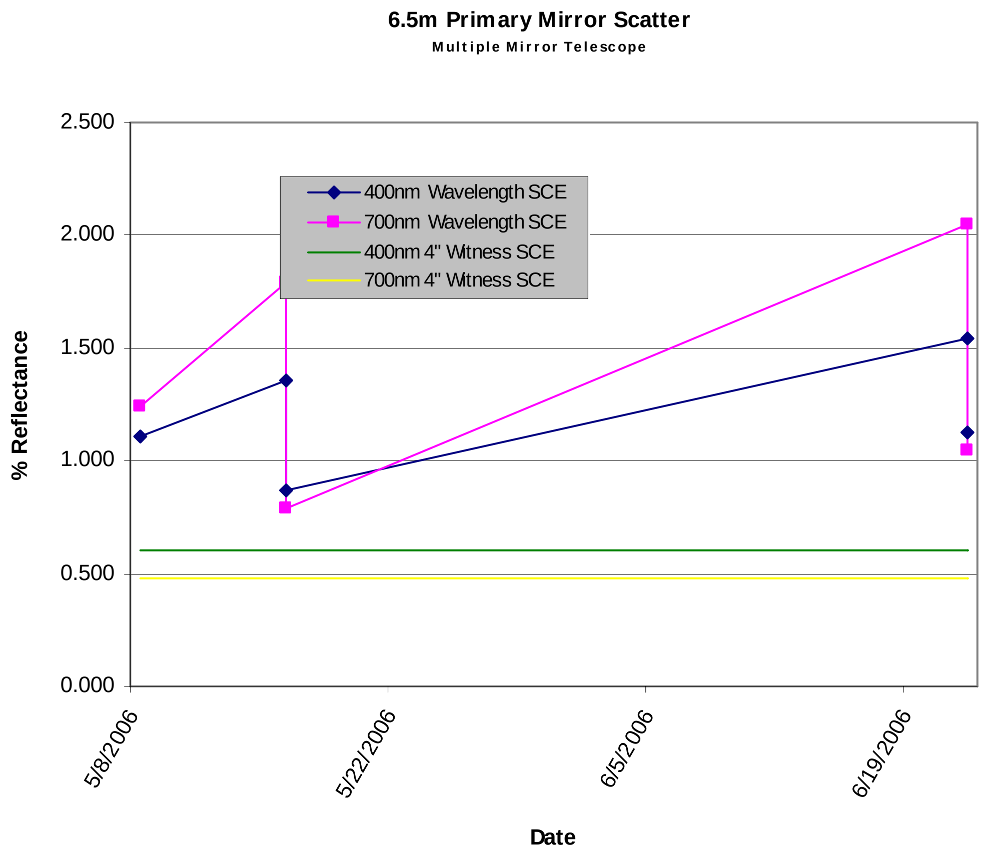
With the belljar at the basecamp, we were able to use the feed-through jig and separate the copper lead manifold for service. It was then sent to Anderson Painting for powder coating.

The steel handling structure for rotating the belljar was painted by two of our students, Jill Cooper and Todd Jackson.

Ricardo Ortiz replaced the oil and o-ring of the Varian V6000 turbomolecular pump.

Ricardo Ortiz et al are systematically monitoring optical reflectance and scatter, in the visual range, of the primary mirror aluminum coating. Monitoring of the f/5 and f/9 secondary mirrors is planned. The following plots depict changes due to accumulated contamination, and CO_2 cleaning results.


6.5m Primary Mirror Reflectance
Multiple Mirror Telescope
92.000
91.000
90.000
89.000
88.000
87.000
86.000
85.000
% Reflectance
400nm Wavelength
700nm Wavelength
400nm 4" Witness
700nm 4" Witness
5/8/2006
5/22/2006
6/5/2006
6/19/2006
Date


6.5m Primary Mirror Scatter
Multiple Mirror Telescope
2.500
2.000
1.500
1.000
0.500
0.000
% Reflectance
400nm Wavelength SCE
700nm Wavelength SCE
400nm 4" Witness SCE
700nm 4" Witness SCE
5/8/2006
5/22/2006
6/5/2006
6/19/2006
Date

Secondary Mirror Systems

f/5 Secondary Support

During the May f/5 observing run, Brian Comisso investigated the peculiar behavior, discovered by Tim Pickering, of the secondary support system. Brian determined that the lateral position actuators had become faulty. Upon examination, the southeast and southwest actuators were found to be separated from the glass. A design flaw in the breakaway mechanism was causing binding, which limited the breakaway travel. The breakaway mechanism on the tangent rods and the pucks were redesigned, fabricated, and installed. The electronics on the mirror support system were realigned by Dusty Clark. The f/5 has completed one run with the new hardware with no apparent problems.

The pneumatic actuators that extend the f/5 mid-baffle's lower annulus were replaced. The old actuators contained o-ring seals made of a material that deteriorates at high altitudes. The new actuators have different ends that allow the use of safety wire to prevent loosening.

f/9 Hexapod

Pod A of the f/9-f/15 hexapod failed during the June adaptive optics (AO) observing run. It was replaced with the spare unit. Disassembly and investigation of the failed unit showed the preload nut that holds the motor rotor on the roller nut shaft had backed off, leaving the rotor free to spin without transferring any force to the shaft. The nut in question is a special type that requires a hook spanner wrench to engage opposing slots in the sides of the nut. Since the nut is below the level of the hexapod body, the wrench must engage at an angle that makes it extremely difficult to get the nut tight enough. The Mechanical Group made a special tool to get a torque wrench on the nut, and it was tightened to the specified torque. We anticipate having to repeat this operation on all the other units as it's possible they will eventually exhibit this problem. We plan to do this work during the August shutdown.

During testing there were problems when using the test cables. They were abandoned to be tested later, and when tested they were fine. While the f/9 is dismounted the test cables will be retested.

Telescope Collimation and Optical Performance

f/5 Open Loop Corrections

During the spring, the open loop tools for f/5 were calibrated to compensate for the failed tangent rods in the f/5 cell. After the cell was repaired, the tools needed recalibration since the position of the mirror within the cell had changed by a few millimeters, back to its normal position. We hoped to get some engineering data to do the recalibration, but the early onset of the monsoon prevented it. Fortunately, we were able to get on the sky long enough to get one wavefront sensor (WFS) session in. This provided enough information to recalibrate the zero-points within the hex_predict tool. More information is required to determine whether the elevation-dependent terms have changed significantly.

Optics Support Structure

Secondary Hub

The secondary support spider arm bracing wires (included in the original OSS design) were installed. The wires were tensioned to produce a primary mode of approximately 37 Hz. Data obtained during the following AO run showed a significant drop in the amplitude of the 20 Hz vibration mode that has been plaguing their observations.

Telescope Tracking and Pointing

Servos and Encoders

There was no activity on the new encoder electronics due to other pressing projects, as well as attending the SPIE conference in Orlando, Florida.

Minor cables and support wiring were built or acquired to make switching between the existing servo hardware and testing the new servo system simpler and faster. The process to switch between the two is now down to less than 10 minutes.

Computers and Software

Logging of Seeing Data

A new "seeing" miniserver was implemented to monitor guider seeing and WFS seeing. Additional parameters will be added to the miniserver, as appropriate. The telstat monitor, the WFS software, and the SAO guider have been modified to take advantage of the new seeing server. The WFS software updates the value of wfs_seeing whenever a WFS frame is analyzed. The guider updates the value of guider_seeing whenever it calculates the FWHM of a guide star. The telstat display now shows both seeing values. The values are kept separate because the WFS seeing determination is more accurate and is not susceptible to systematic effects like telescope focus or collimation. The guider seeing is not as accurate, but updates more frequently. Systematic deviation from the WFS seeing can be a useful indicator of the telescope going out of focus. We are working with the AO group to have them update our seeing server with the values they determine with their system. These will provide accurate and frequent measurements that will allow us to do site characterization at a level that we haven't been able to do in the past.

Operating System and Computer Upgrades

Fedora Core 5 has been installed on several machines on campus. They were all upgraded *in situ* from Fedora Core 4 using the "yum" utility. This method, while not officially supported by Fedora, has proven to work very well and is much faster than booting into a special install program. It also allows a machine to be used during the upgrade process and can easily be done remotely. The rpm packages that are still maintained in-house have been rebuilt and tested on the upgraded machines. Upgrades of mountain machines will commence in late July.

A new server machine was ordered to take the place of hacksaw. It will be a dual-processor rackmount machine with a large RAID5 array similar to the mmto.org server. The current hacksaw is becoming somewhat bogged down with running all of the network services and data logging/archiving tasks as well as most of the operator's telescope control system GUIs. Putting the network services, databases, and data archives on the rackmount machine should free up the operator's workstation considerably. We plan to deploy the new server over summer shutdown, which should give us plenty of time to test and debug the new configuration.

Logging Database

Logging of additional parameters was added to the "mmtlogs" MySQL database. Selected parameters from the hexapod and mount crates are now entered into this database at 5-second intervals. Web pages that display data from the mmtlogs database were modified to include this high-resolution data.

Telescope Subsystems Control

Various activities were undertaken to allow direct control of telescope subsystems from web browsers while maintaining a high security level. Several factors are driving this move, including cross-platform compatibility, allowing engineering staff to use their own Linux, Mac, or Windows computers for telescope control, and ease in code development and maintenance.

A secure virtual host was added to the Apache web server that is running on hacksaw. This virtual host is invisible to the outside world and will be used for web pages involving active telescope control.

Various tests were performed to assess the feasibility of using "Ajax," a web development technique for creating interactive web applications for telescope control GUIs. Many existing GUIs used by the telescope operators update at a 1 Hz rate. A web browser using Ajax must be able to update at this rate while not consuming too many system resources. Testing was done with the Xajax PHP library, see http://www.xajaxproject.org/, which was found to be well-written and very easy to use. The testing shows that web pages using Ajax consume slightly more system resources than existing telescope operator GUIs, but are certainly a viable option to Perl/Tk and Ruby/Gtk2 GUIs.

A test web page for controlling individual pods of the hexapod was created. This web page updates via Ajax at 1 Hz and includes various optimizations to reduce system requirements on both the web server and the web browser client, as well as to minimize network traffic during each Ajax refresh of the web page.

Hexapod Control Software

Two changes were made to the hexapod software used to control the secondary mirrors. As a proof of concept, a new "open_loop" GUI was created that automatically applies pending open loop corrections (elevation dependent collimation and temperature dependent focus) at a specified interval. This has been used with complete success during exposures, and we expect to make this a regular part of the hexapod code.

We have made a change in the way hexapod moves are made, exploiting the ability of the UMAC motion controller to make coordinated moves of all pods. This is expected to be beneficial when a move requires some pods to move a short distance while others must move farther. The coordinated move facility will adjust velocities so that all pods begin and finish their motions at the same time, and should work nicely in conjunction with the automatic application of open loop corrections.

Non-Sidereal Tracking

A new tracking method has been added to the mount computer. This method allows a table of RA and Dec coordinates to be presented at a series of time points, and performs lookups and linear interpolation at the full tracking rate (100 Hz). This is useful for certain non-sidereal objects that do not have simple closed form models.

This code will have immediate use to track, for example, the moons of Jupiter (targets during one observing run), using data obtained from the JPL/Horizons web site at 1 minute intervals, but will certainly also be useful for other objects with peculiar trajectories. We have prepared a web interface to the Horizons site that obtains a coordinate table, performs minor reformatting, and then sends the table immediately to the mount and initiates tracking.

Primary Cell Support Software

New code has been written for the cell (primary mirror support) computer. The acromag 9330 driver has been rewritten to use interrupts and an on-board timer to trigger conversions, relieving the overtaxed MC68040 CPU. This will allow new code for enhanced network communication (and ultimately an improved set of GUIs) to be incorporated and developed for the cell. This code is now debugged and in regular service.

Miscellaneous Software

Modifications were made to various operator GUIs. The "edb_gui" GUI, used for non-sidereal catalogs, was changed to include keyword searches for objects within catalogs.

Instruments

Adaptive Optics

The June AO observing run got off to a rocky start due to hexapod problems. Troubleshooting these problems involved several cycles of dismounting and remounting the f/15 secondary. This work was done entirely by MMT staff, with no assistance required from the CAAO group. This is a good example of how well the transfer of responsibility for the f/15 secondary has progressed. Mirror handling and mounting/dismounting is now routinely performed by MMT staff.

The f/15 optical test stand was moved to the common building clean room and will be aligned in the coming months. This will allow repeating the actuator calibrations that were last done several years ago in the mirror lab. Additionally, the test stand will enable software development to operate the mirror with a larger average gap from the reference body. A larger gap is a prerequisite to chopping with the secondary, which is a desirable operating mode planned for the future.

Megacam

The installation procedure for Megacam has been updated to include verifying that both the cables at the rear of the electronics racks and the fiber optic cables on top are switched to the "Normal" (observing) connections. When Megacam was installed in June, the fiber connections were inadvertently forgotten and left in the "Lab" positions.

Chamber and outside ambient temperature data for the past six months were sent to Gabor Furesz at the Center for Astrophysics to aid in their analysis of Megacam behavior during runs earlier this spring.

SO Guider

The Steward Observatory (SO) Guider software was updated during the June f/15 run. The AzCam server code was updated to a version that will be compatible with the new ITL/Magellan CCD guider controllers. The new controller will be implemented this fall. The rack mount guider PC was renamed from "mmtazcam" to "mmtag" because there will soon be a new PC for the Red and Blue Channel Spectrographs. Therefore, using mmtazcam did not make much sense. The code on mmtag was updated to use LabView 8.0, and the LabView Runtime Engine on hoseclamp was also updated. During this work, the gain and read noise of the guider were measured to be 3.6 e/DN and 5.3 electrons, respectively. The full well is 103k electrons.

f/9 Top Box

The type III card in slot K of the f/9 top box was replaced to repair VideoScope Lens select.

General Facility

Carrier and Neslab Chillers

We have been informed by Carrier that the parts have arrived to update and finish the repair on the Carrier chiller. Repair is now scheduled for July 6.

Tom Gerl has begun documenting the Carrier Freon chillers in the pit. George Michels of Comfort Control Corp. was requested to come to the MMT to help us understand this system. He and Tom found that the fluid-flow interlock safety system for these chillers has been bypassed, and he identified other problems that should be addressed. When the cooling system for the building rack is implemented, modifications must be made to prevent condensate from dripping on the Copley Controls chassis. George also informed us that we should provide consistent moderate temperature glycol to the condensers. Ken Van Horn has asked him to submit a proposal to implement this temperature control. Tom discovered that the glycol temperature switch has been bypassed, probably since it had become nonfunctional, and Ken Van Horn will ask George to include switch replacement in his quote. Tom will continue to document the chiller system, and we will try to make both systems functional. One of the systems had been disconnected in order to provide power to other systems that were used during the 6.5-m conversion and during primary mirror aluminization. We will reconfigure to separate these extraneous parts.

One of the Neslab RTE-4 chillers that was sent out for rebuild was returned and is now installed in the telescope air system.

Other Facility Improvements and Repairs

The RainWise weather station was dismounted since it was no longer functional. The bearings on the R.M. Young wind instrument have been replaced. Bill Stangret built a bracket to mount another Young anemometer on the flag pole. The diaphragm on the DustTrak has been replaced again.

Tom Gerl received his new computer for his workstation in room 401. He has also started training on Orcad. Tom replaced ceiling tiles in the SAO instrument lab and is developing interlocks for the counterweight hoists. He is participating in most mountain activities to come up to speed with all systems.

Dennis Smith and Bill Stangret updated and tested the new facility fire procedures.

The rotating building track and wheel path was cleaned of small debris by Daniel Sanchez Soria. He also cleaned and re-lubed the telescope axial counterweights.

Bill Stangret cut an azimuth encoder access hole and built a cart for the port hole cover in the new instrument lift. He also built a Hectospec bolt tray holder.

Bill Stangret serviced the evaporative cooler for the RUPS room and installed additional drains in the RUPS room to clear the airlines of any condensation.

Bill Stangret replaced the alternator in the International air ride truck and built a holder for the gate controller inside the truck.

Preventive maintenance was performed on the sliding seals of the pit rotating ventilation air duct.

Power for the blower fiber I/F was moved from the drive room to the UPS for the network.

Visitors

May 4: Patricia Kennedy (SAO Deputy Director, Administration) and Robert Palleschi (SAO, Manager of the Financial Management Department) visited the FLWO facilities, VERITAS Kitt Peak Site, and the Steward Mirror Lab. They held administrative discussions with various members of the FLWO staff.

May 20: MMT staff hosted eyepiece viewing with the 6.5-m MMT as part of a GMT development event atop Mt. Hopkins. A good time was had by all.

Publications

MMTO Internal Technical Memoranda

None

MMTO Technical Memoranda

None

MMTO Technical Reports

None

Scientific Publications

06-19 MMT Survey for Intervening Mg II Absorption
D. B. Nestor, D. A. Turnshek, S. M. Rao
ApJ, **643**, 75

06-20 Asteroseismological Studies of Long-Period Variable Subdwarf B Stars. I. A Multisite Campaign on PG 1627+017
S. K. Randall, G. Fontaine, E. M. Green, P. Brassard, D. Kilkenny, L. Crause, D. M. Terndrup, A. Daane, L. L. Kiss, A. P. Jacob, T. R. Bedding, B.-Q. For, P.-O. Quirion, P. Chayer
ApJ, **643**, 1198

06-21 Quasars in the Cosmos Field
M. K. M. Prescott, C. D. Impey, R. J. Cool, N. Z. Scoville
ApJ, **644**, 100

06-22 The Active Galactic Nuclei Contribution to the Mid-Infrared Emission of Luminous Infrared Galaxies
K. Brand, A. Dey, D. Weedman, V. Desai, E. Le Floc'h, B. T. Jannuzi, B. T. Soifer, M. J. I. Brown, P. Eisenhardt, V. Gorjian, C. Papovich, H. A. Smith, S. P. Willner, R. J. Cool
ApJ, **644**, 143

06-23 Balmer and Paschen Jump Temperature Determinations in Low-Metallicity Emission-Line Galaxies
N. G. Guseva, Y. I. Izotov, T. X. Thuan
ApJ, **644**, 890

06-24 The Spatial Distribution of Brown Dwarfs in Taurus
K. L. Luhman
ApJ, **645**, 676

06-25 Early-Time Photometry and Spectroscopy of The Fast Evolving SN 2006aj Associated with GRB 060218
M. Modjaz, K. Z. Stanek, P. M. Garnavich, P. Berlind, S. Blondin, W. Brown, M. Calkins, P. Challis, A. M. Diamond-Stanic, H. Hao, M. Hicken, R. P. Kirshner, J. L. Prieto
ApJ, **645**, L21

06-26 The Initial Mass Functions of Four Embedded Stellar Clusters
A. Leistra, A. S. Cotera, J. Liebert
AJ, **131**, 2571

06-27 A Spectroscopic Survey of Faint Quasars in the SDSS Deep Stripe. I. Preliminary Results from the Co-Added Catalog
L. Jiang, X. Fan, R. J. Cool, D. J. Eisenstein, I. Zehavi, G. T. Richards, R. Scranton, D. Johnston, M. A. Strauss, D. P., Schneider, J. Brinkmann
AJ, **131**, 2788

06-28 Constraining the Evolution of the Ionizing Background and the Epoch of Reionization with $z \sim 6$ Quasars. II. A Sample of 19 Quasars
X. Fan, M. A. Strauss, R. H. Becker, R. L. White, J. E. Gunn, G. R. Knapp, G. T. Richards, D. P. Schneider, J. Brinkmann, M. Fukugita
AJ, **132**, 117

06-29 An MMT Hectospec Redshift Survey of 24 μm Sources in the *SPITZER* First Look Survey
C. Papovich, R. Cool, D. Eisenstein, E. Le Floc'h, X. Fan, R. C. Kennicutt, Jr., J. D. T. Smith, G. H. Rieke, M. Vestergaard
AJ, **132**, 231

06-30 The MMT All-Sky Camera
T. E. Pickering
SPIE, **6267**, 448

06-31 In-Situ Aluminization of the MMT 6.5m Primary Mirror
D. Clark, W. Kindred, J. T. Williams
Presented at *SPIE* conference, Orlando, Florida, May 24-31, 2006

06-32 CLIO: a 3-5 Micron AO Planet-Finding Camera
S. Sivanandam, P. M. Hinz, A. N. Heinze, M. Freed, A. H. Breuninger
SPIE, **6269**, 288

06-33 A High-Contrast Coronagraph for the MMT Using Phase Apodization: Design and Observations at 5 Microns and 2 λ/D Radius
J. L. Codona, M. A. Kenworthy, P. M. Hinz, J. R. P. Angel, N. J. Woolf
SPIE, **6269**, 560

06-34 Tomographic Reconstruction of Stellar Wavefronts from Multiple Laser Guide Stars
C. Baranec, M. Lloyd-Hart, N. M. Milton, T. Stalcup, M. Snyder, R. Angel
SPIE, **6272**, 25

06-35 Contrast Limits with the Simultaneous Differential Extrasolar Planet Imager (SDI) at the VLT and MMT
SPIE, **6272**, 786

06-36 Whack-a-Speckle: Focal Plane Wavefront Sensing in Theory and Practice with a Deformable Secondary Mirror and 5-Micron Camera
SPIE, **6272**, 1074

06-37 High Contrast L' Band Adaptive Optics Imaging to Detect Extrasolar Planets
A. Heinze, P. Hinz, S. Sivanandam, D. Apai, M. Meyer
SPIE, **6272**, 1235

06-38 Scientific Goals for the MMT's Multi-Laser-Guided Adaptive Optics
M. Lloyd-Hart, T. Stalcup, C. Baranec, N. M. Milton, M. Rademacher, M. Snyder, M. Meyer, D. Eisenstein
SPIE, **6272**, 1437

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.
- 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.

May 2006

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	11.50	92.15	4.00	0.00	0.00	0.00	0.00	4.00
PI Instr	18.00	144.80	15.00	13.75	0.50	0.00	0.00	29.25
Engr	1.50	12.15	2.00	0.00	0.00	0.00	0.00	2.00
Sec Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**31.00**	**249.10**	**21.00**	**13.75**	**0.50**	**0.00**	**0.00**	**35.25**

Time Summary

Percentage of time scheduled for observing	95.1
Percentage of time scheduled for engineering	4.9
Percentage of time scheduled for sec/instr change	0.0
Percentage of time lost to weather	8.4
Percentage of time lost to instrument	5.5
Percentage of time lost to telescope	0.2
Percentage of time lost to general facility	0.0
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	14.2

* Breakdown of hours lost to telescope
primary panic 0.25
wavefront sensor 0.25

June 2006

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	13.00	100.90	55.30	0.00	0.00	0.00	0.00	55.30
PI Instr	16.00	123.90	24.45	3.00	17.10	0.00	0.00	44.55
Engr	0.50	3.85	3.85	0.00	0.00	0.00	0.00	3.85
Sec Change	0.50	3.85	3.85	0.00	0.00	0.00	0.00	3.85
Total	**30.00**	**232.50**	**87.45**	**3.00**	**17.10**	**0.00**	**0.00**	**107.55**

Time Summary

Percentage of time scheduled for observing	96.7
Percentage of time scheduled for engineering	1.7
Percentage of time scheduled for sec/instr change	1.7
Percentage of time lost to weather	37.6
Percentage of time lost to instrument	1.3
Percentage of time lost to telescope	7.4
Percentage of time lost to general facility	0.0
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	46.3

* Breakdown of hours lost to telescope
hexapod 17.1

Year to Date June 2006

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	50.50	477.75	151.30	7.00	4.55	1.50	0.00	164.35
PI Instr	125.50	1228.05	423.60	103.10	23.15	5.00	0.00	554.85
Engr	4.50	44.25	5.85	0.00	0.00	0.00	0.00	5.85
Sec Change	0.50	3.85	3.85	0.00	0.00	0.00	0.00	3.85
Total	**181.00**	**1753.90**	**584.60**	**110.10**	**27.70**	**6.50**	**0.00**	**728.90**

Time Summary

Percentage of time scheduled for observing	97.3
Percentage of time scheduled for engineering	2.5
Percentage of time scheduled for sec/instr change	0.2
Percentage of time lost to weather	33.3
Percentage of time lost to instrument	6.3
Percentage of time lost to telescope	1.6
Percentage of time lost to general facility	0.4
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	41.6