



CTIO OPERATIONS

MOSAIC II

Successfully Commissioned

*Bob Schommer (bschommer@noao.edu)
for the Mosaic II team*

During July and August, the Mosaic II camera was commissioned on the Blanco 4-m telescope. The first shared-risk science observing in August was successful. The long September science run also provided excellent data (guided 600 exposures with 0.6-0.7" FWHM on several occasions) despite some cloudy nights due to a late Chilean winter weather pattern. We are currently (mid-October) performing lab tests and further improving the system robustness, and will be operating in the 8-channel mode for the remainder of the semester. We have found a small mis-space in the back focal distance from the Blanco prime focus Atmospheric Dispersion Corrector. This produces elongated images at the corners of the field. Some mechanical work should eliminate this and produce a very flat focal plane for the November science run. Check our web page for the latest news and system performance (www.ctio.noao.edu/mosaic/index.html).

CTIO Hydra Update

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The CTIO Hydra fiber positioner has proven to be robust and reliable. It positions fibers accurately and consistently. The bench spectrograph also performs as

expected. Overall instrument performance has been compromised because it has been necessary to use the Loral 1K x 3K CCD with the Air Schmidt camera on Hydra. This limits users to a maximum of about 60 independent targets at only fair efficiency. This was a choice we made in order to get the Hydra functionality on the air as quickly as possible, rather than wait on the final camera.

Now that MOSAIC is operational, resources have been freed to allow work to proceed on commissioning the design detector for Hydra. This is a SiTe 2 x 4K in a 400mm f.l. bench-mounted Schmidt camera. This new camera/CCD combination is expected to allow Hydra/CTIO to use all its fibers simultaneously and with significantly higher efficiency and resolution than at present. The new camera and CCD will almost certainly become operational sometime next semester.

The large (300 $\mu\text{m}/2''$) Hydra fibers have performed well to date. Slit plates 200 μm and 100 μm wide can be placed in front of the line of fibers in the spectrograph to improve resolution, albeit with some loss of light.

The small (200 $\mu\text{m}/1.3''$) fibers have been a disappointment. They proved to be quite brittle, apparently as a result of manufacturing problems. After they had been installed in Hydra, about half were found to have low or zero throughput. This means that even with the new camera/CCD combination, only about 60 independent targets will be selectable with the small fibers. Fortunately, the small fibers do not appear to break while being positioned, so we believe the number of targets that can be observed with the them will remain constant. This will provide enough fibers to be adequate for many programs.

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The primary motivation for using the small fibers is to obtain better S/N by excluding sky. Use of 1.3" fibers is indicated only for very dim objects when seeing is better than about 0.7", which is uncommon. We expect almost all observers will request the large fibers. Thus, scientific use of Hydra now is little compromised by the small-fiber problem. The defective fibers could be replaced, but it would be expensive and it is not an easy job. At present there are no plans to do so.

On the Road Again

Travelling with a Laptop Computer

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More and more visiting astronomers are asking if they can bring their own computers to CTIO with them and connect them to our network. You are welcome to do so, and we are taking measures to make the experience easier and safer.

Plugging In

We have installed spare ethernet connections at each telescope and downtown in the computer room and conference room, specifically for visitor computer use. These are 10/100 baseT connections (the ones that look like phone jacks on steroids). You should plan on bringing your own ethernet cable just in case, as our spares seem to disappear at an amazing rate and we may or may not have any available. Near each of these connections we have a label providing all of the general setup information (IP numbers, gateway/router, DNS, etc.) necessary for you to get up and running on our network. Please be familiar with how to change these settings on your computer before you come down. Given the variety of operating systems and network configurations that computers sport these days, we cannot guarantee

support for setting up visitors' computers. Finally, before plugging in please read and follow CTIO's guidelines for visiting computers (<http://www.ctio.noao.edu/sys/usys.html>). In particular, misconfigured Linux machines can play havoc with our local network.

Remote Connections:

Getting Out of and into CTIO Computers

We've taken a number of additional steps to improve the security of the CTIO network. Most importantly, we installed a firewall that separates the outside network (which now connects directly in La Serena) to our internal net, which includes both La Serena and Tololo. For most users, this change should be transparent, but if you've brought your own computer, you may find that some services, like FTP and telnet connections into your computer, are blocked from outside our network.

Whether you're on your own portable or logged in to one of CTIO's machines, we strongly recommend that you use the SSH (Secure SHell) software for logging into remote machines. This provides for secure remote log-ins in a way similar to *telnet*, *rlogin*, or *rsh* and for secure file transfers in a way analogous to *rcp*. This software package is available for most operating systems, and is free of charge to educational and noncommercial users, while an enhanced version is available commercially (follow the links on the CTIO security page for further information on SSH):

<http://www.ctio.noao.edu/sys/security.html>

We have installed the SSH on all our machines, and do not accept log-ins from machines outside the *ctio.noao.edu* domain except via *ssh*. This means that users who wish to log into our machines from outside must first install *ssh* on their home machines. You will still be able to log onto your home machine from CTIO without using *ssh*, using *telnet*, for

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example. However, we strongly recommend using *ssh* if you have it installed on your home machine, in this case to protect your home system.

FTP service is another security risk that we have severely limited. Regular anonymous FTP service for getting information from our systems (e.g., downloading instrument manuals, etc.) is only

available through our central server, www.ctio.noao.edu. Depositing files into the CTIO anonymous FTP area is not allowed. If you need to transfer files down here while you're observing, you can pull them in by FTPing from our machines to your home machine. Alternatively, we encourage you to use *scp*, the secure remote copy component of *ssh*, as an alternative to FTP to bring your files over.

CTIO Staff Garner AURA Awards

Ron Probst (rprobst@noao.edu)

In a ceremony held in the CTIO Library in May, AURA President Goetz Oertel distributed AURA science and service awards to several staff.

Science awards went to Nick Suntzeff, Co-Principal Investigator (with Brian Schmidt, Mt. Stromlo Observatory) on the High-Z Supernova Project, and to local project team members Bob Schommer and Chris Smith, for their efforts in using supernovae to determine the distance scale of the Universe. The startling conclusion reached by this group, and by an independent effort led by Saul Perlmutter (Berkeley), is that the expansion of the Universe appears to be accelerating. This result was named by the journal *Science* as the top scientific discovery for 1998. It has had great impact not only scientifically,

but also in the popular press, contributing to the public perception of astronomy as an exciting cultural endeavor. Far from resting on these well-deserved laurels, Nick will be on sabbatical in Australia in early 1999 to continue his work in this field in association with Dr. Schmidt.

AURA presented a service award to longtime CTIO administrative staff member Elaine Mac-Auliffe "for her sustained outstanding service in pursuit of the AURA mission in Chile." Elaine's dedication to the highest possible level of service in support of our mission is well known to CTIO staff and scientific visitors. Elaine is now Administrative Assistant to the Director of the AURA Observatory in Chile, and to the NOAO Associate Director of CTIO.



Update on 4-M TIP/TILT Activities

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The IR f/14 tip/tilt system has been in use for about a year and a half now. It has performed reliably and has delivered an improvement in IR image quality. We have continued to improve its performance, reliability, and ease of use, within a resource environment constrained by work on SOAR, Hydra, and MOSAIC.

We have just upgraded the optical tip/tilt sensor to one that is better suited to our small-field, high-speed application. This is an EEV CCD 39-02 with 80×80 pixel format, 4 e⁻ read noise, and QE in excess of 0.7 from 0.4 to 0.75 μm; 0.9 in the V band. We use reducing optics to optimally match its 24 μm pixels to the reference star FWHM for use with a quadrant-sensor algorithm. With lower read noise and higher QE than its predecessor, this sensor should give better performance on stars of intermediate brightness (V ~10–15) and permit guiding on fainter stars than previously. In initial tests under full moon and a hazy sky, we were able to guide robustly on a V = 16.5 star at a correction frequency of 20 Hz, a factor of two gain in speed. Correcting faster on a brighter star (V ~11.5, 130 Hz) produced an rms error of the star centroid of 0.01". This represents significant improvement in the minimum necessary speed, reference star faintness, and achieved correction with respect to previous performance.

Optimizing system operating parameters for best performance under different conditions requires experimentation with actual seeing-degraded images. Since the 4-m telescope is a very expensive

optical bench, we have set up an atmospheric seeing simulator, or "turbulator," for lab tests in La Serena. This is based on a simple design developed by a French group (Masciadri and Vernin, *Applied Optics* 36, 1320, 1997). It has allowed us to use our telescope engineering time to best effect as we work on improving the hardware and the algorithms.

Several background tasks to address system maintenance issues, invisible to users, have been accomplished or are ongoing. The piezo controller electronics from Physik Instrumente have been replaced and duplicated to provide a backup. Telemetry circuitry developed in-house has been added to the controller for easier setup and troubleshooting, from the control room, of piezo control behind the secondary. Printed circuit boards, which had been modified extensively by hand during system commissioning, are being replaced with final versions to avoid subtle failures later. Mountain personnel have been systematically trained in setup, operations, maintenance, and troubleshooting at the telescope, and in La Serena during lab tests. A second dedicated instrument PC was purchased to provide a backup, but unfortunately some internal components necessary for network communication on the mountain were damaged beyond repair in last April's lightning storm. This PC is now used in La Serena with the laboratory simulator. Finally, recovery from a severe mechanical miscollimation following removal and replacement of the entire system (for work on the prime focus pedestal in support of MOSAIC II) resulted in some mechanical modifications to prevent a recurrence.

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While the job of a tip/tilt sensor is to stabilize an image centroid (and our system does this very well), the ultimate goal is to deliver a tighter image to the science sensor. Other aspects of the wavefront error that we can control relate to optical alignment and the telescope thermal environment. Optical engineer Max Boccas has taken the lead on these issues. Telescope alignment, diagnosable in real time with the IMAge ANalyzer, has been improved. The mechanical modifications mentioned above also addressed a small random decenter of the f/14 secondary. Once we are satisfied that this is under control, we can institute a lookup-table active correction for the secondary similar to what is done now for the 4-m primary. We are also investigating alignment issues between the tip/tilt optics box and the IR cameras, and improving thermal control of the Cass cage environment and the primary mirror. These are now the areas where we expect improvements to impact FWHM with our stabilized images.

Science and Support: Whom to Ask About What

*Alistair Walker (awalker@noao.edu) and
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Due to sabbaticals and other comings and goings of the scientific staff, there have been some changes in staff responsibilities related to telescope, instrument, and visitor support. The reorganization of administrative responsibilities into AURA Observatory Support Services should be transparent to users, but a summary of whom to ask about what seems timely for these activities also. Everyone listed below can be contacted by email. Addresses are of the form (*first initial + last name*)@noao.edu, for example *msmith@noao.edu*.

Where two names are listed, please copy any query to both people.

Scientific and Technical Support

A useful summary of whom to ask about what can be found on our Web pages at http://www.ctio.noao.edu/obsaid/staff_resp.html. This is accessed from the CTIO home page by clicking on "Observing Resources and Forms," scrolling to the section "CTIO staff support," and clicking on "staff members to contact."

Astronomers who are awarded observing time at CTIO are assigned a staff contact scientist, named on the Proposal Report Form. This is your contact for astronomical and technical questions prior to your run. It is also wise to touch base with your contact upon arrival in La Serena. During your run, this is also the person to contact with any question that mountain Observer Support people can't answer. Your staff contact can be identified by consulting your Proposal Report Form or by following the Web links given above to the list for the current semester, e.g., http://www.ctio.noao.edu/obsaid/contacts_1999B.html.

Individual staff scientists have particular responsibilities for various telescopes and instruments. Your staff contact may refer a query to one of these local experts. They can also be consulted for information about our facilities before a proposal is scheduled, for example while preparing your proposal. Follow the Web links via "staff members to contact" to [.../obsaid/responsibilities.html](http://www.ctio.noao.edu/obsaid/responsibilities.html) for the current list.

The Telescopes Operations division (TELOPS) is responsible for operating and maintaining the telescopes and instruments on Cerro Tololo. TELOPS is divided into three sections. People in Observing Support are responsible for introducing

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observers to their telescope and instrument, and for nighttime operations. This team is backed up by Telescope Mechanics and by Telescope Electronics. Specific members of the Electronics Section are knowledgeable and responsible for various instrument systems. Names and lists are Web-accessible via the “staff members to contact” page. Normally, you would not need any advance contact with these staff. The division manager is Oscar Saa. While you are on the mountain, he is the person to talk to (together with your staff contact) if some difficulty that needs real-time resolution seems to persist.

If there is an instrument or telescope problem, the night assistant will call the relevant people to assist. On the 4-m this call-out is allowed at any time of night. On the smaller telescopes, there is a midnight cutoff. Almost all problems can be fixed by the Tololo support team, at times in consultation with staff in La Serena. Some problems take longer than others; if there is a failure lasting more than one hour, the observers are strongly urged to call their contact scientist. Our electronic nightly reporting system should also be used to ensure prompt follow-on response the next morning.

Administrative Matters

A great deal of necessary and useful information about planning your trip and professional travel within Chile can be accessed from the CTIO homepage by clicking on “Preparing for an observing run” and then “travel information.” The URL is http://www.ctio.noao.edu/misc/observer_info.html. Web forms that must be submitted in advance, to allow us to support your travel and observing plans, are found via “Observing resources and forms” on the CTIO homepage. If you need information or assistance from a knowledgeable human, one of these people can help:

- **Travel and Lodging Arrangements:** Julia Faltin (Tucson) and Marcela Urquieta (La Serena). Julia and Marcela will arrange transport and lodging within Chile for your professional visit (AURA facilities in Santiago, La Serena, and Tololo) after receiving details of your international travel arrangements.
- **Graduate Student Travel Reimbursement:** Julia Faltin. Julia can provide prepaid round-trip airline tickets from US point of departure to La Serena. If you wish to make your own arrangements and then request reimbursement, please contact her first to find out about allowable costs.
- **Paying Your Bill:** Marcela Urquieta. Food and lodging costs are payable in La Serena upon departure. Observers leaving on a weekend or going directly from Tololo to the airport may pay in advance. Cash, personal checks, VISA, and Mastercard are accepted.
- **DD Time Requests:** Alistair Walker and Elaine Mac-Auliffe. Director’s Discretionary (“open”) time is noted on the Web telescope schedules. CTIO prefers to assign this about two months in advance. An e-mail letter stating telescope, instrument, and dates requested, with a brief outline of the science to be achieved, is required. No travel or lodging support is provided for DD time.
- **Special Requests:** Alistair Walker and Elaine Mac-Auliffe. Anything out of the ordinary, such as permission to arrive on Tololo early, change observers, bring someone not on the original proposal, request an extended stay in the La Serena motel, etc. We try to be as accommodating as possible.
- **Colloquia:** Knut Olsen. We are always happy to hear visitors talk about the exciting science they are doing with our facilities!