

CTIO/CERRO TOLOLO

INTER - AMERICAN OBSERVATORY

From the CTIO Director's Office

Malcolm G. Smith

Highlights at NOAO South since the beginning of the year include the gathering momentum of the "Sites" program for Extremely Large Telescopes in Chile and elsewhere under Alistair Walker's leadership, the excellent performance of Phoenix at Gemini South involving strong support from our colleagues in Tucson, and the successful completion of the REU/PIA program for 2003 (see Alan Whiting's article in the Public Affairs & Educational Outreach section).

Recent operational highlights on Cerro Tololo have included successful repair of the significantly damaged shutter on the Blanco 4-meter dome—again with strong support from colleagues in Tucson (see following article by Tim Abbott). We have also completed the smooth handover of the small telescopes operation on Cerro Tololo to the Yale-led SMARTS consortium and (in the case of the Curtis Schmidt telescope) the University of Michigan (see following article by Alan Whiting). NOAO is a member of the SMARTS consortium and retains a significant share of the observing time for its user community.

The most immediate challenges for the current operations program include a major shift of effort to the commissioning of the Southern Astrophysical Research Telescope (SOAR) and its instrumentation (see following articles by Steve Heathcote), the preparation of a plan for new instrumentation on the Blanco 4-meter telescope under the leadership of Tim Abbott, improving the amount of

time available for staff research in light of the increased demands incurred by new and existing programs at NOAO, and ensuring continuity of the SMARTS operation beyond its first year.

This intense period of change is by no means easy. Significant numbers of the NOAO South staff attended the April NOAO staff retreat in Tucson to discuss the impacts of the current changes and future plans—particularly in regard to their still inadequate time for personal research. The staff at NOAO South continues to increase their enthusiastic involvement in the new initiatives set out in the latest Decadal Survey, namely the Giant Segmented Mirror Telescope (GSMT), the Large Synoptic Survey Telescope (LSST), and the National Virtual Observatory (NVO).

The local public affairs and educational outreach programs in Chile (described in more detail in the last issue of the *Newsletter*) continue to make huge strides, using strong leverage with and support from other national and international groups, such as the Project ASTRO program in the PAEO division of NOAO; the rapidly-growing RedLaser schools network in Chile; similar Chilean groups now being set up in Temuco, Talca, and Concepción in the South of Chile; as well as international education groups in Brazil, Greece, Canada, and Austria. Substantial work on controlling light pollution also continues at the local, national, and international level. Clearly, it is a very dynamic time to be at NOAO South!

Blanco 4-Meter Dome Shutter Failure

Timothy M. C. Abbott

On 10 February 2003, the Blanco upper dome shutter experienced a catastrophic failure. This shutter, weighing over 20 tons, is moved via two large chains (much like oversized bicycle chains) that are driven by a sprocket, gearbox, and electric motor assembly mounted at the top of the dome. On several previous occasions, one of the chains has broken while the remaining one held. Each time, it was a reasonably straightforward matter to repair the broken chain with spare links and continue as normal. However, since the chains must be kept under tension, they were difficult

to repair without installing additional links in the broken chain. This resulted in chains of differing lengths, which in turn produced different stresses in the two chains and caused the shutter to move unevenly while opening and closing. As the individual chain breaks accumulated, the difference between the two chains grew until, as we found in February, one chain was 22 links (3 to 4 feet) longer than the other.

As far as we are able to tell, on the evening of February 10, one side of the shutter carriage and track bound when the shutter

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Dome Shutter Failure continued

was opening. The drive chains then started to pull on the stuck shutter, instead of lowering it, until the bound carriage yielded. The shutter then fell some distance onto the short chain, snapped it, then fell further onto the long chain, snapping that as well. Only the emergency brake remained to stop the shutter falling further, but it appears that it landed on its hard stops before the brake could be engaged. The shutter struck with sufficient force to pull off 8 of the 20 hook rollers that attach the shutter to the dome, pushing one section hinge out from the dome and driving another inward.

Over the ensuing weeks, NOAO's mechanical experts swung into high gear and in a gratifying demonstration of North/South collaboration, a repair was effected without accident and with minimal loss of observing time. A total of only about one night was lost, although some runs were compromised by restricted dome motions, which

we enforced until we were sure the shutter was safely in place. At the end of the month, a freak hail storm caused us some consternation—"It never rains in February on Cerro Tololo!"—but no lasting damage was done.

It wasn't necessary to remove and rebuild the entire shutter, as was first feared, but instead it was safely secured from the top end. New chains of identical lengths were obtained and installed, and the shutter was operated with extreme care until we were convinced no structural damage had occurred. All is now functioning normally, if not better than before the failure. Once again, the Tololo mechanics demonstrated their skill with panache (see the earlier heroics related in the December 2002 issue of the *Newsletter*). We are deeply indebted to John Scott from Kitt Peak, who traveled to Chile and personally guided us through the repair, and to Tony Abraham and numerous others for invaluable contributions.

Small Telescopes Going Strong

Alan B. Whiting

In an innovative move designed to maintain community access to a wide variety of telescopes while allowing NOAO to concentrate its efforts on the larger ones, a consortium took over the task of operating three of the smaller CTIO telescopes on February 1. The Small and Medium Aperture Research Telescope System (SMARTS) consortium began running the 1.5-meter, 1.3-meter (ex-2MASS), and 0.9-meter telescopes, including scheduling observations and providing for routine and corrective maintenance of the telescopes and instruments.

NOAO is a major partner of the consortium and retains one third of the observing time. This time is available to the national community and is apportioned in the same manner as time for the larger 4-meter telescopes at CTIO and Kitt Peak—that is, through the semiannual proposal process. Other consortium members include Yale (where Charles Bailyn heads the consortium), Georgia State University (where Todd Henry leads a long-term project involving parallaxes of nearby stars), the State University of New York at Stony Brook, the Space Telescope Science Institute, Ohio State University, Northern Arizona University, and the American Museum of Natural History.

Though time is allocated similarly, the smaller telescopes offer an opportunity to do things in a way different from the larger ones, and the consortium is especially alert to the possibilities. As far as possible, each telescope will be used with a single instrument. Not only will this save the time and effort otherwise spent in disconnecting, moving, and reconnecting equipment, but the characteristics of the systems will remain stable, which is an important consideration in long-term projects. Also, a large amount of time on all telescopes is given over to service or queue-mode. This means that, for instance, a variable star may be followed weekly throughout a semester, even though each observation only takes a few minutes. This sort of truly synoptic observing is difficult or impossible to schedule in classical mode. Efforts are continuing to increase the flexibility and usefulness of the scheduling process.

The consortium now runs the 1.5-meter, used with the RC spectrograph, giving half of the time to queue and half to classical observing; the 0.9-meter with its 2K optical imager, likewise, in half-and-half mode; and the 1.3-meter with the dual-channel ANDICAM, which is entirely in queue mode. ANDICAM takes images simultaneously in the optical and

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Small Telescopes continued

infrared (IR). Additionally, all modes on all telescopes are available to NOAO observing time users.

An immediate task for the consortium is to organize and consolidate the information available on Web pages to make it easier for users to find and understand. For now, an overview (slightly dated) is given at www.ctio.noao.edu/headlines/smarts.html, and the telescopes themselves are described on www.ctio.noao.edu/telescopes/telescopes.html.

Note that using the ANDICAM requires some preparation, especially since it is done entirely in queue mode. Up-to-

date information to help in planning observations and preparing observing proposals can be found at www.astronomy.ohio-state.edu/ANDICAM.

Further plans for expanding and upgrading the small telescopes include adding the 1-meter (the former YALO telescope) with a 4K imager, providing a 2K infrared imager for the 0.9-meter, and adding an IR imager to the 1.5-meter for half the year (mainly for a galactic plane survey). The consortium is also actively seeking new members to increase its capabilities and resources.

SOAR Active Optics System Enters the Last Lap

Steve Heathcote & Victor Krabbendam

The Active Optics System (AOS) for the 4.1-meter Southern Astrophysical Research Telescope (SOAR) is at last nearing completion in the Danbury, CT, plant of contractor Goodrich Aerospace. The complete turnkey system includes the primary, secondary, and tertiary mirrors, together with the hardware and software that comprise their active support mechanisms. As of April, the primary mirror is very close to meeting its exacting surface quality specification—the next figuring run may well be the last—while the secondary and tertiary optics are already complete. Meanwhile, the primary and secondary support systems and the tip-tilt control system for the tertiary have been completed and tested, and are ready for assembly with their respective optics.

Upon completion of optical fabrication, the primary mirror will be integrated onto its 120-actuator cell. Once completely assembled, the primary mirror system will be interferometrically tested at Goodrich to empirically measure actuator influence functions, characterize mirror performance and demonstrate figure control to 19 nanometers RMS ($\lambda/26$ @ 0.5 microns). Although space in the test tower does not allow a complete end-to-end test with the three optics at their correct conjugates, final acceptance testing will be performed with three subsystems interconnected by their deliverable, preterminated cables to the AOS control system and a SOAR-supplied TCS emulator. This will enable extensive verification of the full system. Upon completion of these tests, the AOS will be packed and shipped to Chile, and should arrive (according to the current schedule) in September.

In the meantime, the SOAR team is hard at work on site, ensuring that all of the other hardware and software components of the telescope, as well as the first light instrument



The active support system for the SOAR primary mirror is ready and awaits the completed mirror. One hundred and twenty electromechanical force-feedback actuators support the 4.3 meter diameter, 10 centimeter thin, ULE glass face sheet, and control the correct surface figure as the telescope points around the sky.

package, are functioning properly. This means that everything will be ready for immediate installation of the AOS when it arrives. Both this advanced preparation on site, and the rigorous pre-shipment testing of the AOS, should ensure that the final integration steps will go smoothly and quickly. This would allow us to achieve SOAR first light around the turn of the year and be ready for the first shared-risk science use during the second part of the 2004A semester.



Staff Comings and Goings at SOAR

Steve Heathcote

With construction nearing completion, and preparation for operations beginning to ramp up, there have been a number of staffing changes at the Southern Astrophysical Research Telescope (SOAR).

SOAR Project Manager Tom Sebring departed at the end of February to take up a new position as project manager for the Next-Generation Lowell Telescope in Flagstaff, AZ. Tom has been with SOAR from the very beginning of the conceptual design phase in 1997. During that time he has been the inspiration behind many novel aspects of the SOAR design, and his steady hand at the wheel has helped steer the project around more than one significant bump in the road. He has also served as official project photographer, capturing many of the stunning images that have accompanied *Newsletter* articles on SOAR. We wish Tom all the best in his new endeavor.

Happily, Victor Krabbendam has agreed to step into the Project Manager position (while seemingly continuing to do most of the other things he was doing as Project Engineer)

for the remainder of the construction phase. Therefore, we do not expect to see any major changes from the steady course toward success established by the team thus far.

Senior Software Engineer Mike Ashe departed at the beginning of May. Mike began working for SOAR as a contractor in 1999, before being enticed to join the project team in Chile in December 2001. During this time, he has helped take SOAR's novel LabVIEW-based control system from an initial proof-of-concept phase to a fully functional system. Mike will be resuming his previous activities as an independent LabVIEW consultant based in Norwalk, CT.

Omar Estay joined the SOAR software team this past December. Prior to this, Omar studied for his degree in electronic engineering at the Pontifica Universidad Catolica de Valpariso. Omar caught our attention when he developed LabVIEW software to control the "R2D2" quantum efficiency measuring equipment while working as a summer student at CTIO. We are very pleased to have him as a full-time colleague.