NOAO Newsletter

Issue 69

March 2002







From the Editor:

The dedication of Gemini South, and the many positive implications of this symbolic milestone, is a theme that weaves itself throughout this edition of the *Newsletter.*

The existence of state-of-the-art telescopes and scientific instruments in both the northern and southern hemispheres is an idea that appeals to everyone, from the proverbial person-on-the-street to the most experienced staff astronomer.

Early adaptive optics-related results from Gemini North were a hit with the news media at the January AAS meeting. New instrument capabilities coming online in Semester 2002B promise to produce even stronger results at future meetings. Senior officials took advantage of the dedication event to make some meaningful statements about the nature of international collaborations and the value of dark skies.

NOAO hopes to be an active and effective outlet for your future discoveries with the Gemini telescopes, as well as with the evolving capabilities on our existing assets. Please share your findings with us early in the publication process, so we can work together to maximize their impact.

-- Doug Isbell

On the Cover

The Gemini South Telescope on Cerro Pachón, Chile, was dedicated on 18 January 2002.

Insets in the cover photo of Gemini South show [counterclockwise from the center] the crowd at the event, NSF Director Dr. Rita Colwell speaking to the assembled group, and Gemini Observatory Director Matt Mountain pointing out a feature of Gemini South to Chile's President Sr. Ricardo Lagos during a telescope tour that day.

Notable Quotes

"I want to state clearly at this point that, despite its apparent impracticality, the administration values discovery-oriented science, and aims to continue to support the grand quest for knowledge about the universe at the largest and the smallest scales…

Pushing back the ubiquitous frontier of complexity costs considerably less than similar progress at the receding frontiers of the large and the small. Consequently, those who rely on big facilities like particle accelerators and space-borne telescopes bear a heavy responsibility to choose carefully, manage wisely, and maximize the quotient of discovery versus dollars…

In view of its long history of making difficult choices, the astronomy community could provide leadership to other fields in making its criteria for choice explicit."

-- Selected comments from a January 8 speech by Presidential Science Adviser Dr. John Marburger at the American Astronomical Society meeting in Washington, DC.

Have you seen an interesting comment in the news or heard one during a NOAO-related meeting or workshop? *Please share them with the Newsletter Editor, editor@noao.edu.*

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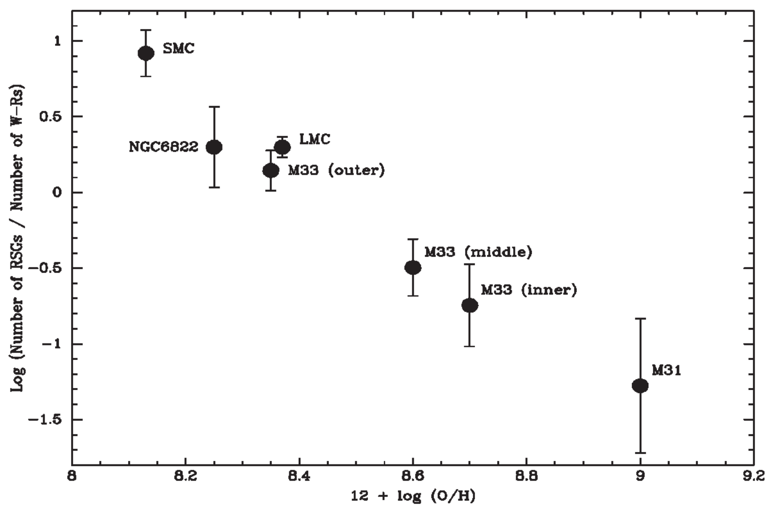
A Survey Starring the Galaxies of the Local Group

Based on a contribution solicited from Phil Massey (Lowell Observatory)

Phil Massey and Shay Holmes (Lowell), Paul Hodge (Washington), George Jacoby (WIYN), Nichole King (STScI), Knut Olsen and Chris Smith (CTIO/NOAO), and Abi Saha (KPNO/NOAO) are using the KPNO and CTIO 4-m telescopes and Mosaic CCD camers to obtain UBVRI, H alpha, [OIII] and [SII] images of all the Local Group galaxies currently active in forming stars. These images are being photometrically calibrated via observations with the Lowell Observatory 1.1-m Hall telescope and with the CTIO 0.9-m, and will result in catalogs of UBVRI photometry of roughly 100 million stars, using the narrow-band exposures to distinguish bona fide stellar members from compact HII regions.



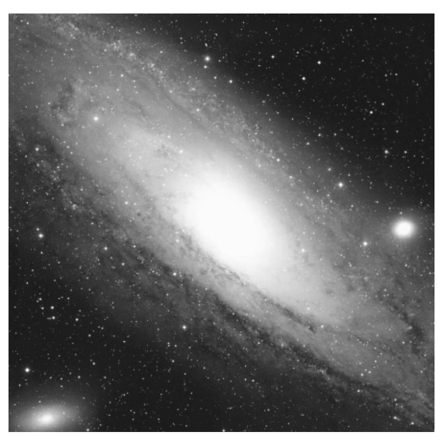
The He-burning stage of a massive star is split between the Red Supergiant (RSG) and Wolf-Rayet (WR) stage. At lower metallicity the mass-loss rates will be lower, and hence the fraction of time spent as a RSG should be longer.

The data are being used to study the massive star content of these nearby systems, to help answer many remaining questions about how massive stars form and evolve. For the first time, accurate measures of the blue-to-red supergiant ratios can be determined as a function of metallicity. The data are also being used to probe the initial mass functions in these systems. An example of the sort of results that this survey is finding can be found in accompanying plot showing the relative number of red supergiants and Wolf-Rayet stars as a function of metallicity.

Massey's team has obtained these images as one of NOAO's Survey Programs. These projects are intended to meet each team's scientific goals, and also to provide data that will enable the science of others. They have just released their images of the Local Group dwarf galaxies WLM, Phoenix, and NGC 6822; these data are available through links from their Web site (*www.lowell.edu/users/massey/lgsurvey*).

Other galaxies in their sample include IC10, IC1613, Pegasus, Sextans A and B, M33, and (most challenging of all) M31. The team is releasing data for each galaxy; all the fields have been obtained in all eight filters. The team expects that these images will prove useful to others, and will serve as the photometric and astrometric "finding charts" needed for spectroscopy by 8-10m class telescope of stellar sources in these nearby galaxies. In addition, the survey provides the large-area, high-resolution optical coverage needed for comparison with X-ray and IR surveys planned with NASA's Great Observatories, Chandra and SIRTF.

The Andromeda galaxy (M31) is presenting the biggest challenge, as 10 fields are needed to image the entire galaxy. So far the team has obtained data on seven of the fields, but are missing data for three adjacent fields to the southwest of the center. They will be applying for additional time to complete the project, and, if successful, plan to have all the data released by January 2004.



The Andromeda galaxy requires 10 overlapping fields to cover the majority of the galaxy currently forming stars.

Black Hole Mass And Eddington Ratio In Quasars

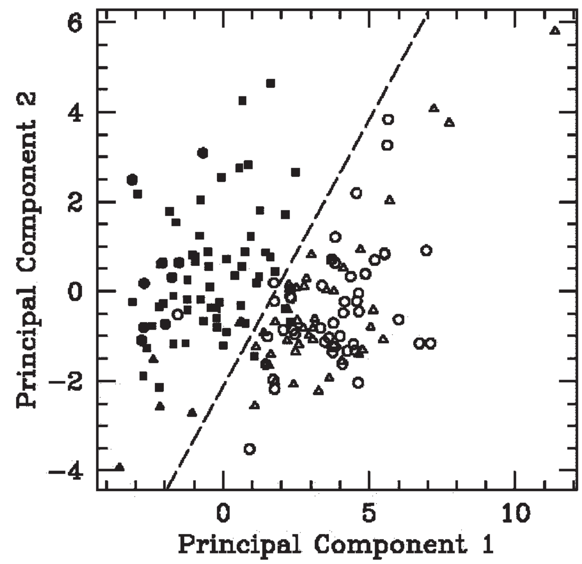
Based on a contribution solicited from Todd Boroson (NOAO)

Recent studies of the demographics of supermassive black holes in galactic nuclei have provided a powerful new tool for understanding the central structures and processes in quasars. Using the relations derived from reverberation mapping of quasars to calculate black hole mass, Boroson has shown that L/L_{Edd}, the Eddington ratio, plays a dominant role in the observed properties of active galactic nuclei.

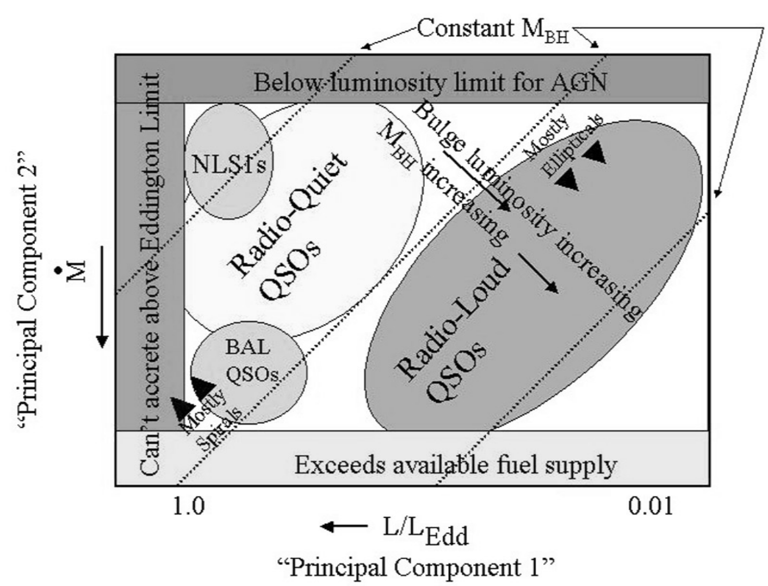
Boroson and Richard Green (NOAO) used the KPNO 2.1-m Goldcam spectrograph to observe the entire sample of PG quasars with $z < 0.5$.

Analysis of these spectra, together with continuum measurements from X-ray to radio wavelengths, determined that two principal components (or eigenvectors) account for most of the variance in these objects. Boroson supplemented these observations with similar measurements for 75 radio-loud quasars from the literature. An extension of the Boroson-Green analysis shows that (1) PC1 (the dominant component) is primarily correlated with the Eddington ratio, while PC2 is primarily driven by the accretion rate; (2) radio-loud and radio-quiet quasars are well separated in a PC1-PC2 diagram by a line parallel to lines of constant black hole mass (Figure 1); and, (3) broad-absorption-line quasars and narrow-line-Seyfert 1's (NLS1s) both occur at high L/L_{Edd}, but at opposite extremes of accretion rate.

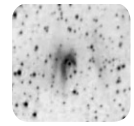
The result of all this is a simple picture that demonstrates the relationships between the physical properties (black hole mass, accretion rate, Eddington ratio) and the classification categories of active galactic nuclei (figure 2).



The enlarged quasar sample of 162 objects is plotted in the PC1-PC2 diagram. Radio-quiet objects are shown as solid symbols and radio-loud objects are shown as open symbols. Solid triangles are BAL quasars and solid circles are NLS1s. The dotted line, approximately parallel to a line of constant black hole mass, separates the radio-loud from the radio-quiet objects. Calculation of the black hole mass for all objects shows that they increase monotonically from upper left to lower right, with lines of constant black hole mass being parallel to the dotted line.



A schematic diagram showing the relationships between the physical properties associated with PC1 and PC2 and the classification categories of active galactic nuclei.



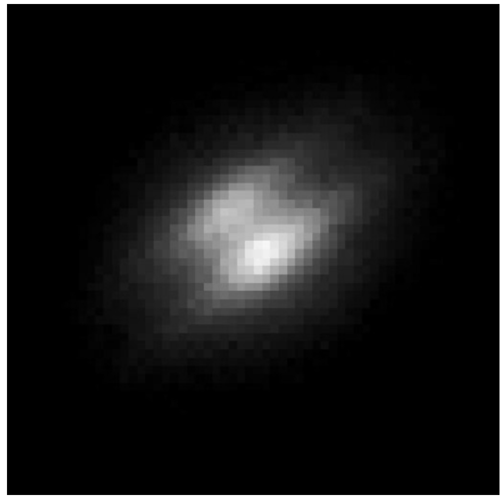
Edge-On Protoplanetary Disk in Quadruple Star System

From an NOAO Press Release

Ray Jayawardhana (Berkeley), Kevin Luhman (CfA), Paola D'Alessio (Instituto de Astronomia, Mexico) and John Stauffer (SIRTF Science Center) used Hokupa'a at Gemini North to discover a protoplanetary disk orbiting one of the stars in a young quadruple star system. The dust disk has a radius of about 120 AU and appears to be nearly edge-on. Only about 10 edge-on disks have been discovered to date; the new object is the first one discovered in a quadruple star system.

The disk (see image) was discovered in Hokupa'a + QUIRC IR images of a wide binary star system, itself a member of the cluster MBM 12, some 300 pc distant. In the images, one of the stars is revealed to be a pair of two closely bound stars. The disk appeared nearby as a faint and diffuse object, showing two elongated lobes separated by a dark lane. This morphology is the distinct signature of a protoplanetary disk that is being viewed edge-on and is blocking the light from the star at its center.

The star's light reflecting off the top and bottom surfaces of the disk produces faint nebulosities on either side of the dark lane. The disk will probably evolve into a young planetary system over the next several million years; it presently offers a window on the earliest stages of planet formation.



This close-up image of the edge-on disk has dimensions of 1.2 arcsecs by 1.2 arcsecs, with an image scale of 0.02 arcsec per pixel.

UCAC2: A New Astrometric Catalog

Norbert Zacharias (USNO)

The US Naval Observatory has used its CCD astrograph (UCA) to complete the southern portion of an all-sky survey from Cerro Tololo. In the past 3.6 years, this 20 cm aperture, wide-field instrument observed the entire sky from the south celestial pole to about +25 degrees declination. Over 180,000 CCD frames were taken with a 4K × 4K camera, with each frame covering a square degree of sky. Most of the data were obtained by three Chilean observers (D. Castillo, M. Martines, and S. Pizarro) utilizing the excellent sky conditions at the CTIO site.

On 19 September 2001, a team from the USNO arrived at CTIO to pack up the equipment for shipment back to the United States. After only four days and with great support from CTIO personnel, the four metric tons of telescope and equipment were ready to be shipped. On October 22, the shipment arrived at the Naval Observatory Flagstaff Station (NOFS) in Arizona where it is to complete the northern portion of the survey. On October 28, the astrograph was back together and had "first light" from the NOFS site. By October 31, only 43 days since observing stopped at CTIO, regular survey observing started up again.

Our second catalog (UCAC2) will become available late Spring or early Summer 2002, extending the density of the astrometric reference system beyond Hipparcos and Tycho on a similar accuracy level (20 to 30 mas to 14th magnitude and 70 mas to 16th). This will include all areas observed at CTIO, about 74% of the sky. Utilizing various early epoch data (AC, SPM,

continued

UCAC2 continued

NPM and others), proper motions will be included as well as references to photometry (2MASS and TASS).

The project is expected to take another two years to complete. In the meantime, preliminary UCAC data are already in use for 2MASS and SDSS astrometry, as well as for minor planet occultation predictions, SOAR and GEMINI guide star tests, and other applications. The final UCAC will provide the basis for the SIM input catalog astrometry.

Although not 100% complete - all “problem stars” (many binaries and others) and high proper motion stars will be excluded in UCAC2 - the catalog will provide the highest precision and accuracy astrometry for stars beyond about magnitude 10.5. For more details or to sign up to receive a copy of the UCAC2 on CD ROM see *ad.usno.navy.mil/ucac/.*

Io as Probe of the Plasma Torus

Ron Oliversen (NASA/GSFC) &
Frank Scherb (University of Wisconsin, Madison)

The McMath-Pierce main telescope is famous as a facility for solar research. However, it also has superb capabilities for nighttime observations that take advantage of its low scattered light properties (there is no central obscuration) and its high-resolution stellar spectrograph. It is well-suited for observations of faint emission lines superimposed on strong continuum sources, such as a planetary satellite where the apparent distance from the nearby bright planet is important.

For example, every year since 1990 (with an exception for 1995), McMath-Pierce observations have been made of the neutral oxygen red (6300 Å) emission from the atmosphere of Io (Oliversen et al., 2001, *JGR*, 106, 26183). These observations are unique; in fact this is the only facility in the world which has observed this emission while Io is in sunlight. Extensive observations of Io’s atmosphere at all parts of its orbit are important for a better understanding of Jupiter’s dynamic magnetosphere.

Jupiter’s rapidly rotating magnetosphere and Io’s intense volcanism combine to create dynamical physical features in the Jovian system, including Io’s atmosphere and plasma torus. Volcanic SO_2 gas and SO_2 surface frosts are the ultimate sources of an extended atomic sulfur and oxygen atmosphere. The atmosphere is constantly changing as it is shaped, excited, and lost through ionization and collisionally driven escape due to the impacting plasma. This plasma torus, composed mainly of sulfur and oxygen ions, rotates with Jupiter. (The Jovian rotational period is 9.925 hours while Io’s orbital period is 42.5 hours.)

Our observations show that Io atmospheric emission intensities are correlated with Io’s position in the plasma torus. This is critical to understanding Io’s highly variable and dynamic atmosphere and the plasma torus. For example,

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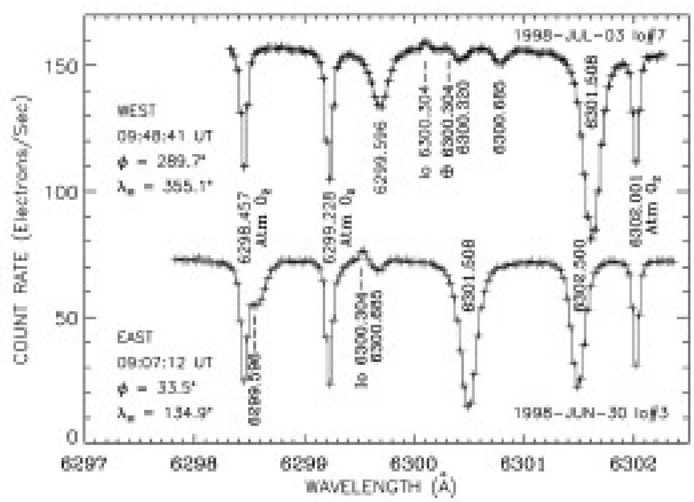


Io spectra are comprised of reflected solar continuum and absorption features, terrestrial absorption features, and Io [O I] 6300 Å emission. The relative position of the Io [O I] 6300 Å emission line changes due to Io’s orbital motion and the relative motion between Jupiter and the Earth. The Io spectrum taken west of Jupiter is offset upwards for clarity.

IO as Probe continued

as Io traverses the denser regions of the plasma torus, the atmospheric emissions get brighter. This means Io is a probe of conditions within the three-dimensional plasma torus. Io responds to spatial changes within the torus, thus providing a unique local perspective. Other remote plasma torus observations unavoidably intermix a range of physical conditions as they look through the torus, integrating along the line of sight.

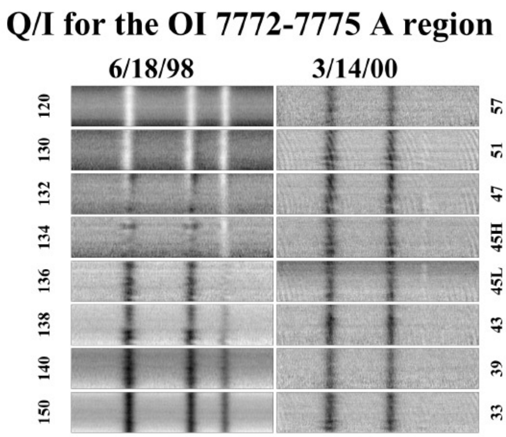
Additionally, a correlation between the [O I] emission intensity and line width indicates that molecular dissociation of SO_2 (and SO) by torus electrons may contribute to the emission through production of excited oxygen atoms.

Further studies continue to investigate the time-dependent behavior of Io's atmosphere and global properties of the torus. This work has been funded by NASA.

Scattering Polarization in the Chromosphere

Neil Sheeley (NRL) & Christoph Keller (NSO)

On 27 March 1966, Neil Sheeley placed the spectrograph slit above a large sunspot that was visible as a "notch" in the west limb of the 82-cm solar image at the McMath-Pierce facility, and obtained a spectrogram of the Zeeman splitting in chromospheric emission lines. Thus, when he was visiting the observatory in February 1997 during a Stenflo and Keller observing run with the Zürich Imaging Polarimeter (ZIMPOL), it seemed reasonable to ask what would happen if they were to place the slit slightly outside the limb, rather than inside as they had been doing in their study of photospheric scattering polarization. The answer was a challenging, but generous, "Why don't you do that?" So in June 1997, we began a project to explore the polarization characteristics of the off-limb chromosphere with a polarimetric sensitivity approaching 1×10^{-5}.



In four observing runs since that time, we have learned that the chromospheric observations require good seeing (to show the emission lines) and a clean heliostat (to avoid wide-angle instrumental scattering of the disk spectrum). The accompanying figure compares linear polarization measurements of the OI triplet at 7772, 7774, and 7775 Å in June 1998 (long after the telescope mirrors had been realuminized) and in March 2000 (only two weeks after realuminizing) for a sequence of position angles around the limb.

In June 1998, the line polarizations were unusually strong and reversed their polarities at a position angle near 136 degrees. The 14 March 2000 sequence with the clean heliostat mirror gave almost constant polarizations of about 3×10^{-3} consistent with our June 1998 measurement at 136 degrees. The March 2000 observations therefore confirmed the interpretation published in the Proceedings of the 2nd Solar Polarization Workshop (Keller & Sheeley, 1999) that the combination of scattered light and instrumental polarization can seriously affect off-disk polarization measurements.

Perhaps the most interesting observations to date concern the OI 7772, 7774, and 7775 Å lines whose maximum scattering polarizations are 19%, 29%, and 0.75%, respectively, for an idealized point source of unpolarized incident radiation. As expected, the 7775 line shows very little polarization ($\sim 1 \times 10^{-4}$) at a radial position 25 arcsecs onto the disk, and even less above the limb. By comparison, the polarizations of the 7772 Å and 7774 Å lines increase by an order of magnitude from about 3×10^{-4} to 3×10^{-3} over the same radial distance.

Under good seeing conditions, the linearly polarized OI spectra break up into discrete spicule-like features. We are currently attempting to understand and pursue several aspects of this result. It seems plausible that 5-10 km/s spicular motions would produce a Doppler brightening of the scattered OI radiation (analogous to the way that the solar wind produces a Doppler dimming of the scattered ultraviolet emission lines). If so, this would be the first polarization measurement of such a Doppler brightening in the chromosphere, as far as we are aware. One never knows where a simple question at the McMath-Pierce facility will lead.

Director's Office

No Pain, No Gain

Jeremy Mould

NOAO users who have seen the Fiscal Year 2003 budget request for the National Science Foundation may be wondering about plans for compensatory action to absorb the $1M cut in NOAO's funding amount (and a similarly reduced sum for NRAO).

A closer look, however, shows that strategic planning is at work. Major funding is provided next year for the Atacama Large Millimeter Array (ALMA), a facility that will have an unparalleled impact on our understanding of star formation and the dark ages of the Universe. This is the compensation for a general 2.8% fall in the Division of Astronomical Sciences budget at NSF, from which astronomy centers and grants are funded.

ALMA will take a lot more investment, of course, before we observers see a return. Less distant gratification comes from $4M in funding for a second year of the Telescope System Instrumentation Program (TSIP). This is a rapid response by legislators to the Decadal Survey. Funding granted to build instruments for the large telescopes of the independent observatories will return publicly accessible time on these new telescopes, awarded through NOAO in 2003. Unique and exciting facilities such as HIRES may become available to us in this way.

On the day of the NSF budget announcement, I received a call from a House Science Committee staff member asking me, "Where is the funding for LSST and GSMT?" Richard Green, Bill Smith and I had promoted these projects zealously in a visit to Capitol Hill at the end of last year. I replied to the staffer that these projects weren't ready for funding yet.

This illustrates another issue in NOAO's operating constraints in the coming year. To get projects such as LSST and GSMT ready for the proposal stage, we have to make engineering investments now, further squeezing our ability to support KPNO and CTIO in the ways that you might prefer.

As always, we are guided by our Users' Committee, which said at its last meeting, "…[our] consensus is that NOAO must advocate peer-reviewed, public access to a comprehensive suite of telescope apertures (2-m class through 10-m class and beyond), instrumentation, and data archives within the public/private astronomical system. In addition, we recommend that NOAO take a leading role in development of the Giant Segmented Mirror Telescope (GSMT), the Large Synoptic Survey Telescope (LSST), the National Virtual Observatory (NVO), and we encourage NOAO's full participation in the NSF TSIP program."

To ensure that we do have an LSST proposal for NSF to fund in two years, and that we do have a GSMT proposal in five years, and that we do have data pipelines ready to connect to the NVO when it gets funded, we are taking various belt-tightening measures — all without closing any telescopes — while forging ahead with the preparatory work on the Decadal Survey initiatives. Our 2003 program plan will introduce CheapOps at Kitt Peak; we are seeking instrumentation partners for the Mayall 4-meter telescope (see page 35); a consortium will reduce the cost of operating the older telescopes on Cerro Tololo (page 26).

The NSF AST budget means that a very tough year is coming for the national observatory. But it is a year from which we expect to emerge simpler, refocused, and eventually stronger.

Q&A

Karen M. Wilson

NOAO Financial Manager

Karen Wilson arrived at NOAO Tucson on 1 November 2001 as the new manager of administrative services and facilities operations. She brings a fresh perspective and diverse experience to these challenging tasks, having spent the last seven years as Secretary-Treasurer/Chief Financial Officer at Lowell Observatory in Flagstaff, AZ. She previously served in university administration as the fiscal officer at the University of Alaska-Fairbanks, and held earlier positions in the banking and brokerage industries.

Wilson's duties at NOAO include the development and application of administrative policies and reviews, and assisting NOAO senior management with day-to-day budgetary oversight and related long-range planning.

How did your experience at Lowell Observatory prepare you for your new job?

As senior financial officer, I was responsible for the fiscal integrity and business operations of the observatory, including the oversight of central administration functions. As Secretary-Treasurer of the corporation, I had direct involvement with all aspects of the observatory, including facilities, corporate decisions and logistical operations.

I've found a lot of similarities between the two observatories, particularly in their business operations, such as accounting, procurement, government compliance, and report preparation. Both organizations are eager to remain competitive in the community in the areas of receiving government funding, and in improving their facilities to attract top astronomers. Some common challenges include maintaining and upgrading the physical plant and its equipment, some of which is several decades old.

Experiencing the logistical, budgetary and operational needs of Lowell Observatory gave me an excellent base of knowledge for the demands at NOAO.

What has been your initial reaction to the people and budgetary practices of NOAO?

I am very impressed with the NOAO staff. They are extremely professional and dedicated to making NOAO a first-rate national observatory. However, they often seem to be working in a reactive mode, instead of a proactive mode. As for budgetary practices, it's apparent that the current needs of the astronomical community and the recommendations from the most recent Decadal Survey will dictate some changes in order for NOAO to fulfill its evolving mission.

What are your priorities in each major area of your responsibility?

My first priority is developing a "future-focused" atmosphere, which means raising the general level of awareness about how their daily responsibilities relate to the new direction of NOAO.

In Central Administrative Services (CAS), the priority is adapting current administrative services to meet the budgetary and programmatic challenges of the FY 2002 Program Plan and the NOAO Long-Range Plan. This includes infusing the new Work Breakdown Structure into all areas, financial management reporting, timekeeping, procurement and long-range budgeting.

Some of the processes that govern the interaction between CAS and other departments need to be more efficient. We are developing an interactive website that should provide better customer service. For example, we want to enable on-line purchase orders and travel requests, personnel benefits forms and procedures, and "frequently asked questions" to assist the staff in their daily operations. We want to make these tools part of daily operations and promote their availability to assist at the beginning of a project, rather than after the fact.

Continued staff training is also a high priority. NOAO Human Resources, under the direction of Sandra Abbey, will again be providing topical briefings and workshops to help NOAO staff gain new skills. We will also continue to refine and develop the electronic timesheets so that they simplify the payroll process and provide useful information to managers about the progress and costs of specific projects.

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In Central Facilities Operations (CFO), our main task is completion of the new instrumentation test lab and subsequent promotion of it, in conjunction with a broad review of the services we provide to assess their match with the changing needs of NOAO and the astronomical community. The interactive website will also include an area for CFO to inform staff of new policies and procedures.

I also want to increase the automation of the budgetary aspects of program planning, and personally interact with managers to provide them with a better understanding of their current and projected costs. Furthermore, I will conduct the Zero Base Review process of AURA Observatory Support Services (AOSS), which is the service unit of AURA's observatories in Chile. This process will begin in late April, with a presentation to the AOSS board this coming summer.

Farther into the future, what is your vision of new services or efficiencies that NOAO may pursue?

NOAO's future depends on how well we can focus on providing the best services within our budgetary constraints, through innovation in the ways in which we interact within our institution, as well as with other AURA centers. This means anticipating and preparing for the needs of the departments instead of reacting to them. One way this can be achieved is through better communication of the services that are available and focusing on the direction of NOAO as a whole.

If you do your job well, how does it affect the experience of the astronomers that use the facilities of the national observatory?

Central administration and facilities management should run so smoothly that they are almost invisible. Customer service is a very important part of that process, whether it is procurement support, answering questions in Human Resources, or maintaining the physical plant. How well we provide these services affects both our operational efficiency and the public's view of NOAO as a national asset. If my job is done well, then the CAS and CFO staff will have the tools, the education, the attitude and experience to do their jobs well, and thus routinely provide visiting astronomers with a positive and productive experience, with first-rate service.

Guest Column

Proposal Madness: An Upcoming Meltdown?

The combination of my recent move to the Space Telescope Science Institute, where I follow the proposal process closely, and the approaching launch of NASA's Space Infrared Telescope Facility (SIRTF) has placed a growing concern in my mind, which has potential ramifications across the US astronomical community.

Unless some changes are made, our already congested system of evaluating proposals for the use of major public astronomical facilities may be headed for collapse, with the final blow perhaps being the arrival of SIRTF as another hotly contested asset in the mix.

To be clear, I'm not complaining about the number of opportunities available to our community! We've waited a long time for sensitive, multi-wavelength facilities that can reach the faintest objects, and now we are approaching that exciting state. Rather, we must focus our attention on ensuring that we can use our energy most productively, maximizing the science while minimizing the administrative work needed to enable that science.

Most astronomers realize that the Hubble Space Telescope (HST) generates lots of proposals. For the latest cycle, STScI received 1,079 proposals. But it turns out we are not unique: to within astronomical accuracy, Chandra, NOAO, and NRAO each receive comparable numbers every year. It's a reasonable guess that SIRTF will also receive close to 1,000 proposals annually.

These facilities do not operate in isolated universes, meaning that the pools of potential reviewers overlap heavily. Given the burden of reviewing for just one major observatory—this cycle, a typical HST reviewer had to read 100 proposals—it's not surprising that reviewers are reluctant to agree to serve multiple observatories in the same year or even adjacent years. Thus the possible meltdown: when SIRTF also starts its review cycle, there literally may not be enough referees to go around.

Of course, the American Astronomical Society has thousands of members. But we cannot pick referees at random: they must have the correct expertise and experience, have no direct conflict of interest with the proposals under review, and be available for travel or at least consultation in the correct time frame. Further, we want panels that are diverse in seniority, institutional affiliation, and gender. If we just keep relentlessly making phone calls until we get enough acceptances to staff a panel, we essentially lose control of these goals.

Even mundane issues, such as scheduling reviews, are approaching gridlock. Here at STScI, we're considering

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Guest Column continued

changing the date of our annual review, traditionally in November, as part of a process to speed up the interval between proposal acceptance and data reaching the user. But consider the constraints: we omit January and June as candidate months (AAS meetings), August (IAU meeting, albeit only once per three years), September (first month of class at many universities), and December (holidays). This leaves seven candidate months for—whoops—seven major observatory reviews (HST, Chandra, SIRTF, and two each annually at NRAO and NOAO). And, of course, there are numerous other national meetings and reviews constantly in progress. So, what can move where?

Recently, Bob Williams of STScI convened an informal meeting of concerned parties from many of these major facilities. Not surprisingly, no single solution could be identified. Still, I share the belief of many participants that we may have to change some long-held traditions in astronomical peer review in the next few years if we want a system that is widely regarded as fair and reasonably efficient, while still yielding the best science. Some of the provocative questions that emerged include:

- *Should review panels have experts or generalists? While it's unclear which yields the best science in the long run, certainly the latter approach yields more degrees of freedom in picking panelists.*
- *Should we pay reviewers? It's consistent with existing federal policy, might yield a greater acceptance fraction from panelists, and most importantly, could encourage reviewers to take the job more seriously.*
- *Can we shorten the length limit on proposal text? Essentially all of the feedback we get from HST proposers is that they want more space, not less; yet clearly the total volume one person can read is limited by the product of the length limit and the total number of proposals assigned to the reviewer. It's hard to change one without changing the other.*
- *Should peer review also be an educational tutorial for the proposer, or instead simply a jury decision (up or down)? Perhaps if a proposer wants to know why a proposal failed, he or she should ask a colleague in the next office to read it, rather than expect truly informative, but almost always non-reproducible, advice from the peer panel.*

I don't know the answers to these questions. But I fear that if you're already sometimes skeptical about how the system works, you're going to like it even less in a few years, unless we make some significant changes.

Our community needs to invest some serious thought on these topics, and somehow channel it into a forum that can move this wisdom forward.

Bruce Margon
Associate Director for Science
Space Telescope Science Institute
margon@ststci.edu

The LSST: A Progress Report

Sidney C. Wolff

The Large Synoptic Survey Telescope (LSST) will perform deep digital surveys of large areas of the sky and enable the study of objects that vary on a range of time scales. Many research areas will benefit from the availability of this new capability, including the study of small bodies in the Solar System (i.e. the Kuiper Belt and near-Earth objects) and the characterization of dark matter and dark energy.

A meeting to review engineering progress on the LSST was hosted by NOAO and Steward Observatory in November. A second-generation optical design, based on the original design by R. Angel, was presented by L. Seppala (LLNL). This design provides a 3 degree-wide field with 80% encircled energy within less than 0.25 arcsec over the entire field. Feasible schemes for testing the 3.5-meter convex secondary mirror through a combination of profilometry and subaperture interferometry were presented by J. Birge (UA) and L. Seppala. The primary and tertiary mirror can be fabricated at Steward using previously developed techniques. C. Claver (NOAO) and J. Birge showed that the required alignment tolerances are within modern metrology precision.

The camera presents major technical challenges. The detector array is 55 centimeters in diameter; a readout time of only a few seconds is a must if the goal of surveying the entire visible sky every week or so is to be achieved; there is limited room for the filter and shutter mechanism; and, the entrance window is one meter in diameter. More detailed concepts for the camera will be developed during the coming year.

Over the next two years, NOAO plans to collaborate with the community in preparing a costed proposal for the LSST, which was recommended strongly for construction by the most recent Decadal Survey. If you are interested in contributing to this effort by helping define the scientific case, developing the science requirements, or participating in the engineering effort, please contact me at *swolff@noao.edu*.

U S G P

US GEMINI PROGRAM

Gemini Update and Opportunities in Semester 2002B

Taft Armandroff

The Gemini telescopes continue to mature and make progress toward full scientific operations, with accomplishments in many areas. Some highlights over the past few months include:

- The GMOS multi-object optical spectrograph has been commissioned on Gemini North and is beginning to perform scientific observations (see *www.us-gemini.noao.edu/sciops/instruments/gmos/gmosIndex.html*). The GMOS integral field unit will be commissioned next

- FLAMINGOS was commissioned on Gemini South and carried out queue imaging observations for approved science programs (see article below by Richard Elston)

- The Phoenix high-resolution infrared spectrograph was commissioned (see article by Ken Hinkle)

- NIRI is ready to conduct science (see article by J. Jensen)

- The Gemini South Telescope was formally dedicated (see article).

Although the Gemini 2002B Call for Proposals will not be released until 1 March for a US proposal deadline of 1 April, we have the following expectations for what will be offered in Semester 2002B. Please watch the USGP Web page (*www.noao.edu/usgp*) for the Call for Proposals for Gemini observing.

Based on Gemini Board actions, the science fractions on Gemini North and South will be 50% and 35%, respectively. The remaining time will be used for telescope and software engineering and tests, and for instrument commissioning. All the observing is expected to be in queue mode during 2002B.

One reason for this is the fluid schedule for engineering and commissioning greatly complicates travel planning for visiting observers. A high-level review of Gemini commissioning by AURA concluded that the telescopes should operate in queue mode for the next semester to give the engineering and science teams maximum flexibility to test and commission all the required systems, and to bring the telescopes to a high level of reliability.

On Gemini North in 2002B, the NIRI infrared imager/spectrometer and the GMOS optical multi-object spectrograph are expected to be offered. On Gemini South in 2002B, we anticipate the availability of the T-ReCS mid-infrared instrument, the FLAMINGOS near-infrared instrument (through the end of November), Phoenix (October 1 through the end of the semester), and the Acquisition Camera.

Please note that the start and end of the FLAMINGOS and Phoenix blocks will be determined by user demand. See the Call for Proposals on the USGP Web site for more details, and please contact relevant staff through our Help Desk (*www.us-gemini.noao.edu/sciops/helpdesk/helpdeskIndex.html*) for any questions.

Please be aware of several relatively unique capabilities that are available to the US community on Gemini in 2002B. The GMOS integral field unit (Gemini North) provides an outstanding opportunity for two-dimensional spatially resolved spectroscopy with fine spatial resolution. Phoenix (Gemini South) gives unique access to the infrared spectrum at high resolution at 8-meter aperture. Finally, T-ReCS (Gemini South) is the only mid-infrared instrument on an 8-meter telescope, yielding a new window on star formation and related topics.

For Semester 2002A, we saw a wonderful response from the community to the opportunities on Gemini, in both the number of proposals and in the importance of the proposed science. No less is expected for 2002B.

I became Acting Head of the US Gemini Program in late December, following the tragic death of Bob Schommer. Please feel encouraged to contact me (*tarmandroff@noao.edu*) with your questions, comments, and suggestions on US Gemini issues.

Gemini South Dedication

Taft Armandroff

The center of the Milky Way shows emission from hot gas that will either form stars or feed the supermassive black hole at the center of our galaxy. The image quality for this Brackett-alpha (hydrogen) line image is FWHM=0.25 arcsec. This image was obtained with the Abu thermal-infrared camera built by the National Optical Astronomy Observatory.
Photo credit: Gemini Observatory/NOAO/ Abu Team

The dedication of the Gemini South Telescope took place on January 18. More than 200 representatives from the Gemini partnership celebrated the arrival of Gemini's southern observing capability. Chile's President Sr. Ricardo Lagos and speakers from each of the funding agencies that made the Gemini Observatory possible participated in the ceremony [see images on the cover of this *Newsletter*].

"International ventures such as the Gemini telescopes project are vital to scientific progress. Now, more than ever, we need these efforts that transcend national boundaries and cultural divides."

-- National Science Foundation Director Dr. Rita Colwell, speaking at the dedication of Gemini South.

Attendees at the dedication were treated to many spectacular astronomical images from Gemini South featuring exquisite image sharpness. The US community can take special pride in these images because they were obtained using the University of Florida's FLAMINGOS near-infrared imager and NOAO's Abu infrared imager (see *www.us-gemini.noao.edu/media/GSDedication/science/science.html*).

Phoenix Commissioned at Gemini South

Ken Hinkle

NOAO's high-resolution infrared spectrograph Phoenix was installed November 28 on a side-looking instrument port at Gemini South. Up to four instruments can be mounted simultaneously on each Gemini telescope, and we expect Phoenix to be on Gemini South for most of next year.

The nights of December 15-23 were assigned for Phoenix commissioning. In addition to the author, Tom Geballe, Bernadette Rodgers, and Claudia Winge, from the Gemini Scientific staff, and Nicole van der Bliek, Bob Blum, and Patrice Bouchet, from the NOAO scientific staff, were present for at least two of the nights. There were also typically two telescope operators present, and representatives from the Gemini telescope engineering team frequently attended as well.

The commissioning time was divided between tests related to use of the instrument with the telescope, such as alignment, acquisition, guiding, etc., and measurements of instrument sensitivity. Some time was also used for telescope activities not related to Phoenix. In the end, the majority of five nights were devoted to testing the sensitivity of Phoenix on Gemini, with one night each spent testing sensitivity at J, H, K, and thermal IR. In addition, a start was made on the demonstration science program, "Determining the Oxygen-to-Iron Abundance Ratio in the Large Magellanic Cloud." K magnitudes as faint as 12.7 were successfully observed.

Two problems were discovered during the commissioning. The limiting noise source was found to be electrical pickup from the telescope drives. Gemini was previously aware of this problem and is investigating the telescope grounding. The other problem is movement in the Phoenix slit mechanism as a function of dewar orientation. As noted, Phoenix was installed on a side-looking port. The Gemini telescope control software keeps the Phoenix slit oriented in a specified direction, with a default of E-W. Thus, during the course of a night's observing, Phoenix can assume

continued

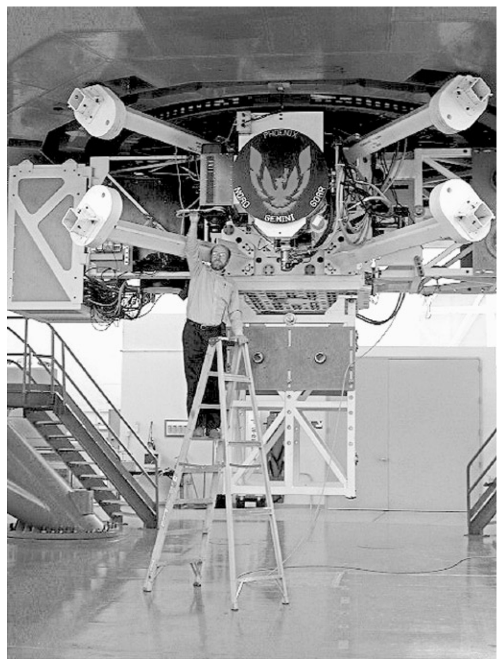
Phoenix Commissioned continued

nearly any orientation with respect to gravity. It had not been possible to test for flexure in these orientations during prior use at Kitt Peak; the only problem found was in the slit mechanism. The slit motion can be worked around, but nonetheless, the dewar will be opened at the next opportunity (April) to investigate this problem.

Benchmark observations included one of a 10.1-magnitude A0 V star observed for 20 minutes (two 10-minute exposures) at 2.3 microns, which yielded a spectrum with ~1200 ADU counts. The signal-to-noise (S/N) in the reduced spectrum is 75, slightly less than expected as a result of the electrical noise. The four-pixel slit was used, and smoothing over the slit width increased the S/N by the expected factor of 2 to 150. The electrical noise dominated the noise by K=13 and prevented the observation of sources fainter than this. H band results are similar to K band. As previously reported, Phoenix is somewhat less sensitive at 1.08 microns where a 10.2-magnitude A0 V star yielded a final (after smoothing) S/N of 60 as the result of the same 20-minute integration time.

In the 4.6-micron region of the thermal infrared, stars ranging from M=-1.6 to about M=6 were observed. At M=5.7, S/N=15 was obtained in 10 minutes (10 co-adds of 30 seconds each at two slit positions). The 4-pixel-wide slit was used and smoothing over the slit width results in S/N~30. At M=6 there was also a significant contribution to the noise from electrical noise originating in the telescope drives. Also at M=6, changes in the thermal background were starting to make significant changes in the zero level. Two stars were observed with M~6. For the star near the zenith at air mass=1.2, the background variations averaged out. They did not average out for a star that was setting with air mass=1.7.

The M=6 stars were visible in the difference of two imaging mode exposures of 10 seconds (10 co-adds of a one-second exposure). These images allowed the star to be centered in the slit. Due to the one-second minimum Phoenix exposure time, 4.6-micron images must be taken using both the neutral density filter and the appropriate order sorting filter. It will probably not be possible to image a star significantly fainter than M=6.



Phoenix is shown mounted to Gemini South, with Dr. Ken Hinkle standing on ladder under the telescope. The four "legs" are balance weights, required to bring the mass and center of gravity to within the Gemini specifications.

For fainter objects, it will be necessary to center the star in the slit using 2-micron imaging.

The first Phoenix block and most of the demonstration science run were scheduled to take place February 1-15. By early March, the results of this run will be used to update the Phoenix Web site so this can be referenced for proposal preparation. An exposure time calculator, an FAQ page, a list of available order sorting filters, and other documentation are provided at *www.noao.edu/usgp/phoenix/phoenix.html*.

During my visits to Gemini South, it has been obvious that the Gemini staff has been working very hard to get the telescope fully operational. The fruits of their labor are apparent. The image quality when I have been on the telescope was 0.3 arcsec FWHM or better at K, and on one night was 0.2 arcsec FWHM. Producing image quality this good requires constant attention to the performance of the telescope and this takes time, especially with new hardware and software. Typically 20-30 minutes were required to set up on each new object. With Phoenix used in the non-thermal 1.5- to 2.5-micron region, exposure times for stars with H or K magnitudes of 7 or brighter are less than a minute. Given the current large overhead in setting up on a new star, proposals to use Phoenix on Gemini for bright star spectroscopy obviously require special justification.

Phoenix is at Gemini South for the entire calendar year 2002. Gemini offered Phoenix to users from February through May 2002, and tentatively will be offering Phoenix from October 2002 through January 2003. In Semester 2002A, two blocks of Phoenix time have been scheduled for February 1-15 and May 3-16, centered around a closed period while the telescope primary is recoated. Phoenix was the most requested instrument at Gemini South in 2002A, with 20 U.S. proposals received. We recognize the frustration of users whose proposals were not scheduled. Less telescope time than expected was available in 2002A due to the Demonstration Science time and telescope engineering time. We believe more telescope time will be available in 2002B.

NIRI Update

Joseph Jensen, Gemini Observatory

Although no science observations could be completed in Semester 2001B, we have made progress toward our goal of starting regular science operations with NIRI.

Earlier in the semester, the University of Hawaii installed new bearings on the beam steering mirrors. These new bearings were tested in NIRI on the telescope in September, and flexure within the science channel was shown to be acceptable. By the end of November, we were back on the sky and performing final acceptance tests. Weather conditions were not good enough to proceed with system verification or science observations, but we did complete some basic engineering tests.

Science observations and additional commissioning work were scheduled for December 28-January 7 and again January 17-29. No science observations were completed, however. Weather conditions during the last month have been poor on Mauna Kea, and we lost almost all the time to wind, freezing fog, and snow. Only limited engineering work could be completed.

NIRI has been working well throughout the last two months, and is ready to go for science observations. We are optimistic that we will be able to perform system verification and queue observations as soon as the weather cooperates. We appreciate the efforts and patience of all the observers who dutifully prepared their 2001B Phase II proposals and worked hard to prepare their programs.

Gemini South Adaptive Optics Imager (GSAOI)

Jay Elias, Bob Blum, & Taft Armandroff

NOAO has been selected through an international competition as one of two teams to develop a conceptual design for the Gemini South Adaptive Optics Imager. The instrument is to be designed for use with the multi-conjugate adaptive optics (MCAO) system being built by Gemini for use on the southern 8-meter telescope. The proposals from NOAO and other groups were evaluated by a review committee convened by the Gemini Observatory.

The imager will cover wavelengths between 1 micron and 2.5 microns, and will be based on a 4K × 4K HgCdTe mosaic. This is sufficient to cover the well-corrected field of view of the MCAO system (about 80 x 80 arcsec) with a pixel scale matched to diffraction-limited images.

While the science case for MCAO is continually being refined and updated, its fundamental thrust is clear: to explore the formation and evolution of stars and stellar systems across the known universe. The MCAO+GSAOI facility will provide detailed data sets used to establish the stellar IMF in Galactic and Magellanic star forming regions, in some cases to well below the hydrogen-burning limit. Observations in open and globular clusters over a wide range of ages, metallicities, and densities will provide a wealth of new information on star formation histories and dynamical evolution processes. The ability to resolve individual stars in nearby galaxies will allow unprecedented studies of galaxy formation, evolution, and the history of star formation in a range of environments, including the earliest epochs of galaxy formation.

This unique facility will address the entire history of galaxy formation in a consistent framework from the local universe out to redshifts of five, the hierarchical formation of galaxy constituents at high redshift, the formation epoch of the stellar content of the most massive galaxies, and the nature and evolution of galaxy clustering.

The two selected teams, from NOAO and the Australian National University, will complete their respective studies in August, at which point Gemini expects to select one of the teams to complete the instrument. The GSAOI should be completed in time to assist with commissioning the MCAO system during 2004.

The NOAO GSAOI Team is led scientifically by Jay Elias and Bob Blum; Neil Gaughan will serve as the Project Manager. Technical personnel from La Serena and Tucson will be participating in the project.

For further details on the imager requirements, and on the MCAO system design and science case, see Gemini Web sites at *www.us-gemini.noao.edu/sciops/instruments/adaptiveOptics/MCAO.html* and *www.us-gemini.noao.edu/documentation/webdocs/mcao_sc.zip*.

FLAMINGOS Celebrates Its First Birthday

Richard Elston, University of Florida (FLAMINGOS PI)

FLAMINGOS recently completed its first year of operation following its first light at the Kitt Peak 2.1-meter in December of 2000. FLAMINGOS was commissioned just 2.5 years after the beginning of construction and the NSF grant which funded the instrument. This was also only three months after we had received our engineering hybrid array from the Rockwell Science Center.

Since that time FLAMINGOS has been commissioned and used by general users on four telescopes: the Kitt Peak 4-meter and 2.1-meter, the 6.5-meter MMT, and the 8-meter Gemini South telescope. In all, FLAMINGOS has been on a telescope for over 180 nights between December 2000 and January 2002. During this time we have also corrected a number of problems and have greatly increased both the efficiency and reliability of the instrument.

During recent imaging runs on Kitt Peak, we achieved imaging overheads as low as 10% when imaging in the J band with 100-second exposures, including telescope offsetting and writing data to disk. The background for spectroscopic observations has been reduced by nearly a factor of 1,000 in the K band, allowing background-limited spectroscopic observations at J, H, and K. Finally, the quality of images into the corners of the array has been dramatically improved.

Our greatest challenge was that FLAMINGOS was seriously damaged during transport to the Gemini South telescope on Cerro Pachón in Chile. Welds were broken on the handling fixture, and the dewar was slumped over and hanging from only one weld when the shipping container was opened. Inspection of the instrument showed that it must have received a very large mechanical shock followed by shaking.

The most serious damage was the shattering of a large Barium Fluoride lens in the camera and the breaking of a wire bond on the array. FLAMINGOS was restored to health and carried out the first queue science run ever at Gemini South, following the loan of an identical lens from CTIO staff and weeks of hard work by the FLAMINGOS Postdoc N. Raines and the Gemini South staff. A happy byproduct of the rapid repair of the wire bonding of the array by the Rockwell Science Center was that a broken lead to one of the 32 amplifiers was repaired, making the array fully operable.

Due to reduced commissioning time at Gemini South, we did not have time to commission Multi-Object Spectroscopy (MOS) at Gemini South and observations were restricted to imaging. But beautiful imaging data were obtained with a median DIQ of ~0.4 arcsec FWHM, with the best images being 0.3 arcsec FWHM. It requires a total recalibration of our thinking about image quality when nights with 0.7 arcsec FWHM are now considered BAD! Data were taken for a number of queue programs, and the bulk of the three-color images presented at the dedication of Gemini South in January 2002 were taken with FLAMINGOS.

Finally, during 4-meter runs in April and November 2001, we commissioned MOS spectroscopy with FLAMINGOS. Between these runs we found a more suitable material for making the MOS plates, improved the mechanical repeatability of the MOS plates to <0.5 pixels, improved flexure to <0.3 pixels/hour, and implemented real-time software to align MOS plates in less than 20 minutes. Despite poor weather and seeing (>2 arcsecs FWHM) during the November 2001 run, we had two good nights where we obtained MOS spectra for Elizabeth Lada's star formation survey program. The figure below shows a sky-subtracted MOS spectra covering from 0.9 to 1.8 microns in the Trapezium cluster of stars with $14<K<16.5$.

So what lies ahead for the second year of FLAMINGOS? We plan to commission MOS spectroscopy at the 2.1-meter in November, using the new guider system that allows telescope offsetting. We hope to finish the "JH" grism that has been shattered twice by the Richardson Grating Lab. In the interim, we have been getting good results using the "HK" grism in second order to cover the "JH" band.

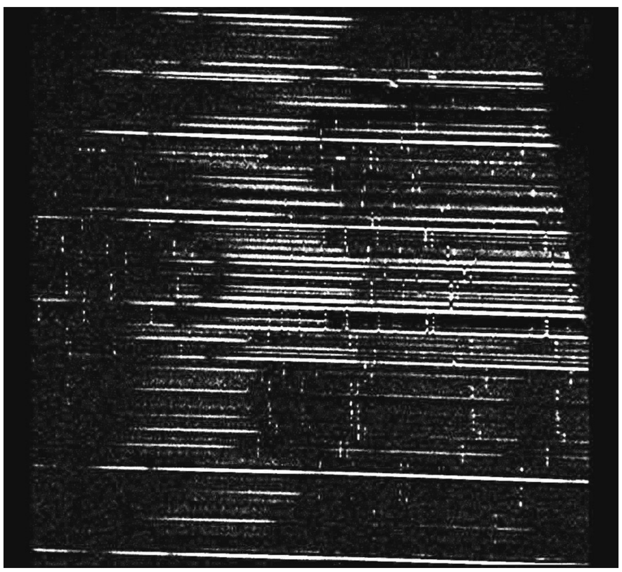
A new prism of IR-fused Silica was recently completed by Janos optical, and the grating replica should be applied by the Richardson Grating Lab in the next couple of weeks. This grism will give somewhat higher resolution in the H band and will make the data somewhat simpler to reduce since all the data from 0.9 to 1.8 microns will be taken in first order. We still hope to receive a science grade array for FLAMINGOS from the Rockwell Science Center. While the current engineering array is actually pretty good, large regions in the corners are unbonded. We plan to continue working on our array controller to reduce the number of failed reads, which now amounts to about 1%. Also, through implementing faster computing, we hope to at least halve our current overheads. Finally, we plan to commission MOS spectroscopy at the Gemini South telescope in July and August.

continued

FLAMINGOS continued

Table 1. Performance of HK Grism

Band	Order	Resolution per pixel of slit width	Throughput e-/sec/pixel, 3 pixel slit, Mag=0 Star	1 sig 10 minutes
0.9 to 1.35	2	2600/pixel	$3.1x10^6$ e-/sec/pixel	17.0
1.35 to 1.86	1	1970/pixel	$2.5x10^6$ e-/sec/pixel 17.3	



Sky-subtracted but uncalibrated MOS spectra of 14<K<16.5 stars in the Trapezium cluster (Elizabeth Lada, Spectroscopic Star Formation Survey of Giant Molecular Clouds). The spectra cover from 0.9 to 1.35 microns in second order and from 1.35 to 1.8 microns in first order with R~1000-1300. The total integration time was 90 minutes taken as 120-second exposures.

Notable Quotes

"Getting to this point has been a dream for US researchers for two decades, before we ever formed the Gemini partnership. Now that both of the twin telescopes have begun operations, astronomers throughout the United States will have access to a unique 8-meter resource, no matter what institution they're affiliated with.

At NOAO, we're particularly pleased to see Gemini building on the infrastructure and heritage our pioneers have built into the NSF's Cerro Tololo Inter-American Observatory."

-- NOAO Director Dr. Jeremy Mould, speaking at the dedication of Gemini South

US Gemini Instrumentation Program Update

Taft Armandroff & Mark Trueblood

The availability of highly capable instrumentation on the Gemini telescopes is crucial to their scientific success. This article gives an update on the Gemini instrumentation being developed in the US, with their status as of late January.

T-ReCS

T-ReCS, the Thermal Region Camera and Spectrograph, is a mid-infrared imager and spectrograph for the Gemini South telescope, under construction at the University of Florida by Charlie Telesco and his team.

T-ReCS has been completely assembled and tested. The team has been performing a series of flexure tests interspersed with mechanical enhancements in order to meet Gemini's stringent flexure requirements for this instrument. A program of minor electronics upgrades to minimize noise, in parallel with detector optimization, is also in progress.

The team is working hard to complete these two efforts, which will allow T-ReCS to undergo its Pre-Ship Acceptance Test.

GNIRS

The Gemini Near-Infrared Spectrograph is a long-slit spectrograph for the Gemini South telescope that will operate from 1-5 microns and will offer two plate scales and a range of dispersions. The project is being carried out at NOAO in Tucson under the leadership of Jay Elias (Project Scientist) and Neil Gaughan (Project Manager).

Cold mechanism testing is underway, as are optical subsystem tests. The GNIRS bulkheads, dewar shells, and related parts have been completed and assembled for a fit check (see photo). Warm imaging tests with the assembled instrument are expected to be underway in mid-March.

Overall, 86% of the work to delivery has been completed. GNIRS delivery is planned for Fall 2002.

Senior Engineer Gary Muller is shown with the fully assembled GNIRS bulkheads and dewar shells, which were delivered to NOAO in December.

Observational Programs

NOAO Nighttime Proposals Due for 2002B

Todd Boroson

Proposals for observing time for Semester 2002B (August 2002 - January 2003) with the Gemini North and South telescopes, the Cerro Tololo Inter-American Observatory, the Kitt Peak National Observatory, and community access time at the Hobby-Eberly Telescope and MMT Observatory 6.5-meter telescope are **due by Monday evening, 1 April 2002, Midnight MST**.

Proposal materials and information are available on our Web page (*www.noao.edu/noaoprop/*). There are three options for submission:

- Web submissions. The Web form may be used to complete and submit all proposals. The information provided on the Web form is formatted and submitted as a LaTeX file, including figures that are "attached" to the Web proposal as Encapsulated PostScript files.

- E-mail submissions. As in previous semesters, a customized LaTeX file may be downloaded from the web proposal form, after certain required fields have been completed. "Essay" sections can then be edited locally and the proposal submitted by email. Please carefully follow the instructions in the LaTeX template for submitting proposals and figures.

- Gemini's Phase-I Tool, or PIT. Investigators proposing for Gemini time only may optionally use Gemini's tool, which runs on Solaris, RedHat Linux and Windows platforms, and can be downloaded from *www.gemini.edu/sciops/P1help/p1Index.html*

Note that proposals for Gemini time may also be submitted using the standard NOAO form. Proposals that request time on Gemini plus other telescopes MUST use the standard NOAO form. PIT-submitted proposals will be converted to LaTeX at NOAO, and are subject to the same page limits as other NOAO proposals. To ensure a smooth translation, please see the guidelines at *www.noao.edu/noaoprop/help/pit.html*.

The addresses below are available to help with proposal preparation and submission:

Web proposal materials and information	*http://www.noao.edu/noaoprop/*
Request help for proposal preparation	*noaoprop-help@noao.edu*
Address for thesis and visitor instrument letters, as well as consent letters, for use of PI instruments on the MMT	*noaoprop-letter@noao.edu*
Address for submitting LaTeX proposals by e-mail	*noaoprop-submit@noao.edu*
Gemini-related questions about operations or instruments	*usgemini@noao.edu* *http://www.noao.edu/gateway/gemini/support.html*
CTIO-specific questions related to an observing run	*ctio@noao.edu*
KPNO-specific questions related to an observing run	*kpno@noao.edu*
HET-specific questions related to an observing run	*het@noao.edu*
MMT-specific questions related to an observing run	*mmt@noao.edu*

Community Access Time on the MMT and HET

Dave Bell (NOAO), Craig Foltz (University of Arizona) and Matthew Shetrone (McDonald Observatory)

About 27 classically scheduled nights per year of observing time on the MMT Observatory 6.5-meter telescope are available to the astronomical community through the NOAO proposal process, under a six-year agreement with the National Science Foundation.

The 6.5-meter MMT is performing well. A third attempt at in situ aluminizing of the primary mirror was successful and produced a surface with 91% reflectance. Improvements to the stiffness of the top end and mount servos have resulted in significantly improved disturbance rejection. The primary mirror thermal control system is now running routinely. For more information, check NOAO's MMT Web page at *www.noao.edu/gateway/mmt/* and MMT's public-access instrumentation page at *sculptor.as.arizona.edu/foltz/www/public_access.html*

About 16 equivalent clear nights of community-access queue observations per year will be available on the Hobby-Eberly Telescope at McDonald Observatory once the telescope is in full operation. During 2002B, about five equivalent nights are expected to be available for new programs. The available instruments will be the Low Resolution Spectrograph (including a 13-slitlet multi-object spectroscopy unit) and High Resolution Spectrograph. When used with an iodine cell, the HRS has yielded velocity resolutions of 1.8 m/s for S/N=200 exposures at R=60000. For more information, please see NOAO's HET Web page at *www.noao.edu/gateway/het/*.

The Gemini Time Allocation Process: An Update; Read This Before You Write Your Proposal

Todd Boroson

We have now been through several semesters of allocating time on the Gemini telescopes. I wrote an article in the September 2000 Newsletter after the first semester which included Gemini North, explaining the process and suggesting some strategies for success. This article is an update of that first article, with a description of some refinements to the process.

The manner in which time is assigned and observations carried out on the Gemini telescopes is somewhat different from NOAO-operated telescopes. Although one could argue that none of the semesters have been "typical," we usually have a few tens of nights to give out on each of the two Gemini telescopes. These nights are divided roughly in some prearranged way among queue- and classically-scheduled time. Some instruments, particularly visitor instruments, may be available only during certain times in the semester. With these constraints, there are several factors that determine whether a proposal is successful or not. Here is how the process works:

1. Proposers write and submit proposals using the forms and process set up by each country's national Gemini office or national TAC. For the US, this is the standard NOAO LaTeX proposal form that is available on the Web and submitted electronically to NOAO. (Proposers who are asking for Gemini time only may use instead the Gemini Phase 1 Tool.) Information about the capabilities Gemini is offering and expected performance comes from the Gemini Web site (mirrored by NOAO for US astronomers). In addition to the instrument desired, for queue proposals, proposers must indicate what quality of observing conditions they need. Conditions must be selected for seeing, sky transparency, sky background, and water vapor (for infrared observations). Read the permitted options carefully. Note also that you are "guaranteed" the conditions you specify or better. While you may think that the "or better" won't happen, we often use the time available with better conditions for highly ranked proposals.

2. Proposals undergo a technical review by US Gemini Program (USGP) scientific staff at NOAO, are evaluated scientifically by the NOAO TAC panels (membership of which is listed on our Web site), and are merged into a ranked list based on the TAC assessment. In past semesters when we have had a relatively small number of proposals, we have tried to consolidate them so they are not divided among all seven panels, but only between, say, two each of the galactic and extragalactic panels. This allows a better intercomparison of the science.

continued

Time Allocation Process continued

3. A US Gemini merging TAC (with representatives from the various discipline panels) then goes through the list in detail. The US nights to be allocated are divided into two telescopes, roughly half for queue and half for classical. [Note: only queue observing is being offered in 2002B.] The nights are further subdivided into the different bins defined by observing conditions. Once the merging TAC is satisfied that the proposals are in the proper ranked order, these bins are filled by going down the ranked list. When a bin is filled, a proposal that needs those conditions cannot go to the telescope unless it can be put into a bin with better conditions. To give us some latitude, the bins are initially overfilled by a factor of two. Every semester so far, we have had unfilled bins with conditions worse than median. There is potentially a lot of Gemini time available if you don't need the best conditions.

4. The resulting ranked list of proposals (about twice as many as are needed to subscribe the US time) is sent to Gemini. The Gemini operations team takes these lists from the six partners plus those from the host (Hawaii or Chile) and the Gemini scientific staff, and merges them into a single ordered list of programs. This list is filled top to bottom using a scheme that allows approximate balance of the partner shares to be maintained.

5. The International Time Assignment Committee (ITAC), including representation from each country, meets to discuss the merged queue of programs. The main charge to this committee is to deal with conflicts, such as proposals that went to more than one country (typically, the "cost" is split among the countries involved) or identical proposals from two or more countries (typically, an attempt is made to form a collaboration). The ITAC also decides how to deal with proposals for which a Gemini technical review has identified a problem. Finally, the ITAC decides how to divide the list into "bands." The bands are meant to be ranges of programs that can be considered of equal scientific priority, so that the staff executing the programs have a simple way to pick the best observation to make at any given time from a pool of reasonable size. The ITAC divides the queue into three, roughly equal bands. The final list is forwarded to the Gemini Director for approval.

6. For each approved program, a contact scientist at Gemini is designated. The contact scientist works with the PI to ensure a complete understanding of the observations desired. As the semester proceeds, the staff execute the observations, attempting to complete all the Band 1 observations before the Band 2 observations are started. At any given decision point, weight will be given to the best match between program and conditions, completing programs that have been started, and maintaining the balance of partner shares. Partner shares can only be expected to balance over two to three semesters.

In working through this process from beginning to end, it is clear that the constraints on conditions play a major role in determining which programs get into the queue. Proposers should understand that the tighter the constraints they put on the quality of the conditions for their program, the less time is available for that program. In the most recent round, several proposals requested more than 100% of the time that would be available to US programs with the conditions specified! In the merging TAC, we had to skip over a number of excellent programs because the conditions they requested were already used up by higher-ranked programs.

Why don't we select programs purely on the basis of scientific merit and use however much good quality time as there is? We have agreed with the other Gemini partners that we will share the time in an equitable way. We won't try to load the queue with programs that will use up all the best time, but will limit our request of the best time to the same proportion as we get of the total time.

Alternatively, we could put a lot of good quality time proposals at the bottom of the queue, with the idea that these will get executed if there is an excess of good quality time in a given semester. Our experience with the WIYN queue convinced us that this is a bad idea. Leaving programs in the queue all semester and never executing them results in (justifiably) upset proposers. If we run out of programs to execute midway through the semester, we can always go back to our list and contact proposers to see if they are still interested in getting data – the usual response is, "Are you kidding?"

And so the best advice from our experience so far is:

Do the math. Divide the number of nights you are asking for by the frequency of the conditions you require to calculate an "equivalent nights requested." See if this is a rational request. Understand that you are likely to get three nights of the best seeing with photometric skies only if you have the top-ranked Gemini queue proposal.

Think carefully about the data quality you need. Make sure that you specify conditions that will allow you to get that data quality, but not better. Read the instrument and telescope information carefully to ascertain what that is. Remember the lower quality time.

Don't get discouraged! Things will become easier as more time on Gemini becomes available, the facility instruments (with greater flexibility) are commissioned, and we all gain experience with the process of specifying the needed conditions and understanding how they map into data quality.

Observing Request Statistics for 2002A

GEMINI Observing Request Statistics

	GEM-SQ	GEM-NQ
No. of Requests	50	86
No. of Nights Requested	80.03	143.59
No. of Nights Allocated	16	22.9
No. Nights Allocated via DD time by NOAO Director	0	3
Nights Previously Allocated	0	0
Oversubscription	5.00	5.54
Average Request	1.60	1.67

The number of nights allocated for queue programs includes Bands 1-3.

KPNO Observing Request Statistics

	4M	WIYN	2.1M	0.9M
No. of Requests	82	30	44	4
No. of Nights Requested	266.8	81.1	215.2	10
No. of Nights Allocated	161	48.5	157.5	18
No. Nights Allocated via DD time by NOAO Director	3	0	3	0
Nights Previously Allocated	46	7	64	8
No. of Nights Scheduled for New Programs	118	41.5	96.5	10
Oversubscription for New Programs	2.26	1.95	2.23	1.00
Average Request	3.25	1.25	4.89	2.5

CTIO Observing Request Statistics

	4M	1.5M	YALO	0.9M
No. of Requests	81	23	7	27
No. of Nights Requested	249.2	124.5	15.7	143
No. of Nights Allocated	147	141	15.7	158
No. Nights Allocated via DD time by NOAO Director	8	0	0	0
Nights Previously Allocated	31	28	0	43
No. of Nights Scheduled for New Programs	124	113	15.7	113
Oversubscription for New Programs	2.00	1.10	0.42	1.27
Average Request	3.08	5.41	2.24	5.30

MMT/HET Observing Request Statistics

	MMT	HET
No. of Requests	7	3
No. of Nights Requested	19.10	4
No. of Nights Available	11	4
Oversubscription	1.74	1.00
Average Request	2.73	1.33

Gemini Instruments Possibly Available for 2002B

GEMINI NORTH	Detector	Spectral Range	Scale (“/pixel)	Field
NIRI	*1024 × 1024 Aladdin Array*	*1-5μm*	*0.022, 0.050, 0.116*	*22.5”, 51”, 119”*
GMOS	*3-2048 × 4608 CCDs*	*0.36-1.10μm*	*0.072*	*5.5’ multislit, imaging, IFU*

GEMINI SOUTH	Detector	Spectral Range	Scale (“/pixel)	Field
FLAMINGOS I	*HgCdTe 2048 × 2048*	*0.9-2.5μm*	*0.075”*	*2.5’ x 2.5’ (imager)*
Acquisition Camera	*1K × 1K frame-transfer CCD*	*BVRI*	*0.12”*	*2’ x 2’*
Phoenix	*512 × 1024 InSb*	*1-5μm*	*0.1”*	*Resolving Power ≤ 70,000*
T-ReCS	*320 × 420 SI: As BIB*	*8 -25μm*	*0.09”*	*28”x21”; R~ 80-100 @ 10 or 20μm R~ 1000 @ 10μm*

MMT Instruments Available for 2002B

		Detector	Spectral Range	Scale (“/pixel)	Field
Spectograph	*--Blue Channel*	*Loral 3072 × 1024 CCD*	*0.32-0.8μm*	*0.3*	*150”*
	--Red Channel	*Loral 1200 × 800 CCD*	*0.5-1.0μm*	*0.3*	*150”*
MIRAC3		*128 × 128 Si:As BIB array*	*2-25μm*	*0.14, 0.28*	*18.2, 36”*
MiniCam		*2 – EEV 2048 × 4608 CCDs*	*UBVRI*	*0.05*	*3.7’*
FSPEC (Near IR Spectrometer)		*HgCdTe array*	*JHK*	*1.2*	*Resolving Power ≤ 3500*
SPOL		*Loral 1200 × 800 CCD*	*0.38-0.9μm*	*0.2*	*20”*

HET Instruments Available for 2002B

	Detector	Resolution	Slit	Multi-object
Marcario Low-Res Spect.	*Ford 3072 × 1024 4100-10,000Å or 4300-7400Å*	*600 1300*	*1.0”-10”x4’ 1.0”-10”x4’*	*13 slitlets, 15” x 1.3” in 4’ x 3’ field*
High Resolution Spectrograph	*(2) 2K × 4K 4200-11,000Å*	*15,000-120,000*	*2”or 3” fiber*	*single*

KPNO Instruments Available for 2002B

Spectroscopy		Detector	Resolution	Slit	Multi-object
Mayall 4m	*R-C CCD Spectrograph*	*T2KB/LB1A CCD*	*300-5000*	*5.4'*	*single/multi*
	Cryocam/MARS Spectrograph	*LB CCD*	*300-1500*	*5.4'*	*single/multi*
	Echelle Spectrograph	*T2KB CCD*	*18000-65000*	*2.0'*	
	FLAMINGOS	*HgCdTe (2048 × 2048, 0.9-2.5μm)*	*1000-3000*	*10'*	*single/multi*
WIYN 3.5m	*Hydra + Bench Spectrograph*	*T2KC CCD*	*700-22000*	*NA*	*~100 fibers*
	DensePak[2]	*T2KC CCD*	*700-22000*	*IFU*	*~90 fibers*
	SparsePak[3]	*T2KC CCD*	*700-22000*	*IFU*	*~82 fibers*
2.1m	*GoldCam CCD Spectrograph*	*F3KA CCD*	*300-4500*	*5.2'*	
	FLAMINGOS[1]	*HgCdTe (2048 × 2048, 0.9-2.5μm)*	*1000-3000*	*20'*	*single/multi*

Imaging		Detector	Spectral Range	Scale ("/pixel)	Field
Mayall 4m	*CCD Mosaic*	*8K × 8K*	*3500-9700Å*	*0.26*	*35.4'*
	SQIID	*InSb (4 512x512)*	*JHK + L (NB)*	*0.39*	*3.3' circular*
	FLAMINGOS[1]	*HgCdTe (2048x2048)*	*JHK*	*0.3*	*10'*
WIYN 3.5m	*Mini-Mosaic*	*4K × 4K CCD*	*3300-9700Å*	*0.14*	*9.3'*
2.1-m	*CCD Imager*	*T2KA CCD*	*3300-9700Å*	*0.305*	*10.4'*
	SQIID	*InSb (4 512x512)*	*JHK +L(NB)*	*0.68*	*5.8' circular*
	FLAMINGOS[1]	*HgCdTe (2048x2048)*	*JHK*	*0.6*	*20'*
WIYN 0.9m	*CCD Mosaic*	*8K × 8K*	*3500-9700 Å*	*0.43*	*59'*

[1] Available December-January only.
[2] Integrated Field Unit: 30" x 45"field 3" fibers, 4" fiber spacing.
[3] Shared use. 80" x 80" field, 5" fibers

CTIO Instruments Available for 2002B

Spectroscopy		Detector	Resolution	Slit
4-m	Hydra + Fiber Spectrograph	SITe 2K CCD, 3300-11,000Å	300-2000	138 fibers, 2” aperture
	R-C CCD Spectrograph	Loral 3K CCD, 3100-11,000Å	300-5000	5.5’
	Echelle + Blue Air Schmidt	Loral 3K CCD, 3100-11,000Å	15,000	5.2’
	Echelle + Long Cameras	SITe 2K CCD, 3100-11,000Å	98,000	5.2’
	OSIRIS IR Imager/Spectrometer	HgCdTe (1024^2, 1.0-2.4μm)	1200 or 2900	1.2’
1.5-m	Cass Spectrograph	Loral 1200x800 CCD, 3100-11,000Å	<1300	7.7’

Imaging		Detector	Scale (“/pixel)	Field
4-m	Mosaic II Imager	8Kx8K CCD Mosaic	0.27	36’
	ISPI IR Imager	HgCdTe (2048^2, 1.0-2.4μm)	0.3	11’
	OSIRIS IR Imager/Spectrometer	HgCdTe (1024^2, 1.0-2.4μm)	0.15 or 0.4	1.2’ or 3’
1.5-m	Cass Direct Imaging	SITe 1K/2K CCD	0.44	14.8’
0.9-m	Cass Direct Imaging	SITe 2K CCD	0.40	13.6’
YALO	ANDICAM Optical/IR Camera	Loral 2K CCD	0.3	10’
		HgCdTe 1K IR	0.2	3.3’

C T I O
OPERATIONS

Operation of the CTIO Small Telescopes: A Request for Proposals

Malcolm Smith

NOAO is increasing its support for US users of the Gemini telescopes, while working hard to firmly establish new community-based projects such as the Large Synoptic Survey Telescope (LSST) and the Giant Segmented Mirror Telescope (GSMT). Here at Cerro Tololo Inter-American Observatory, our operations are increasingly focused on the Blanco and SOAR 4-meter telescopes.

As a result, CTIO plans to decrease its responsibilities for operating small telescopes. We therefore request your proposals for continued operation of the 0.9-meter, 1.3-meter and 1.5-meter telescopes at CTIO.

We hope and expect to receive proposals from institutions or consortia that are prepared to assume the full responsibility - technical, scientific, and financial - for operations of these telescopes. In order to achieve economies of scale and maximize scientific output, proposals to operate all three small telescopes as a group are strongly preferred. Institutions with interest in only a single telescope, or desiring only a portion of the available observing time, should consider partnerships with other institutions.

CTIO wishes to retain some access for its users to a CCD imaging capability similar to that presently offered at the 0.9-meter telescope. In exchange for providing the three telescopes and associated instrumentation, CTIO would retain access to 25% of the total observing time, integrated over all three telescopes, with at least half of this time being for CCD imaging. This time will be allocated through normal NOAO observing proposals. In addition, Chilean astronomers are entitled to 10% of the observing time.

Provision of the telescopes and their current instrumentation would be the extent of NOAO's contribution. Continued operation and maintenance of all items will be the responsibility of the proposer. Proposers are also urged to plan for early replacement of the 0.9-meter telescope control system.

Proposals should cover operations of these three telescopes for an initial three-year period, preferably starting in Semester 2003A. Specifications for the telescopes and estimated operations costs are available at *www.ctio.noao.edu/telescopes/TheFuture/specs.html*.

Factors to be included in the proposal evaluation include:

1) *Quality and significance of the proposed scientific programs*
2) *Educational impact of the proposed use*
3) *Plans for additional instrumentation for the telescopes*
4) *Plans for public outreach*
5) *Technical and financial resources available to ensure that the proposed program will be implemented successfully*
6) *Benefit to NOAO users*
7) *Benefit to the collective operations and scientific environment of Cerro Tololo and Cerro Pachon.*

Letters of intent to submit a proposal should be sent to Malcolm Smith and are due by 31 March 2002. Proposals are due by 31 May 2002; electronic submissions are preferred. Proposals will be reviewed by an independent panel of astronomers, and it is expected that the results will be announced before 30 June 2002. A copy of this announcement can also be viewed at *www.ctio.noao.edu/telescopes/TheFuture/NSF_prop.html*, or via a link from the CTIO home page.

The Start of the Super MACHO Survey

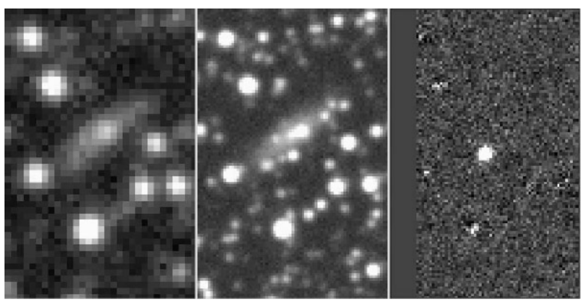
Andrew Becker (Bell Labs)

The Next Generation Microlensing Survey of the Large Magellanic Cloud (a.k.a. Super MACHO) began its five-year variability survey with the CTIO Blanco 4-meter telescope and the Mosaic II imager in November 2001. This NOAO Survey Program is a successor to the MACHO project, and also expands NOAO's participation in the microlensing community – prior involvement includes MACHO's extensive use of the CTIO 0.9-meter in a cooperative agreement with NOAO.

The collaboration is lead by Chris Stubbs (University of Washington) and includes, among others, Armin Rest and Ricardo Covarrubias (University of Washington); Andrew Becker (Bell Labs); Alejandro Clocchiati (Pontificia Universidad Católica de Chile); Kem Cook (Lawrence Livermore National Laboratory); Doug Welch and Dave Lepischak (McMaster University); and, Chris Smith, Knut Olsen, and Nick Suntzeff (CTIO).

The aim of the Super MACHO Survey is to increase the rate of detected gravitational microlensing events towards the Large Magellanic Cloud (LMC) by a factor of 10 over the original MACHO project. This ensemble of additional events, as well as possible exotic effects in the lightcurves of individual events, should allow us to place significant constraints on the location of the excess microlensing population detected towards the Magellanic Clouds.

In particular, in a LMC self-lensing scenario, the microlensing rate should scale quadratically with LMC source star density, while a foreground screen of Galactic halo dark matter would cause a lensing signal that varies linearly with background stellar density. Thus, we plan to use the contrast in lensing signal along the LMC bar as a discriminator between these two possibilities.



The left panel displays the MACHO project's template observation of an LMC field. The central panel shows Super MACHO's template image of the same part of the sky, exemplifying the increase in depth, resolution, and overall image quality we hope to exploit into an increased microlensing detection rate. The right panel shows Supernova 2002B in a galaxy behind the LMC, as discovered in the Super MACHO template observation. The template was subtracted from a previous Super MACHO image, yielding the difference image seen here [this panel was inverted for display purposes, so the signal appears positive].

In addition, our variable star catalog will allow interesting constraints on the LMC's structure and history: for instance, unveiling the intersection of the LMC's main sequence and its instability strip. Our data will also facilitate the establishment of an astrometric reference grid of background QSOs with which to gauge the proper motion of the LMC, a project already begun using MACHO data. The improvements in image quality, depth, and resolution offered at the 4-meter Blanco telescope are quite remarkable, and give us confidence that we can achieve these scientific goals.

A comparison of the relative image qualities between MACHO and Super MACHO can be seen in the two left panels of the Figure, which show template observations of the same region of the LMC.

The Super MACHO project operates in half nights: every other night, for approximately two weeks around new moon, and for three months each year. Fifty-two primary fields are monitored in a custom VR filter each night (optionally, 16 additional secondary fields), with exposure times optimized to detect globally the greatest number of stars given the distribution of stellar densities across our fields. Our models indicate we are able to directly monitor more than 100 million stars at high signal-to-noise, and we are sensitive to variability in an uncertain but comparable number of additional objects. The MACHO project has previously measured an optical depth to microlensing toward the LMC of $\sim 10^{-7}$; thus, we expect about 10 events per year.

continued

Super MACHO Survey continued

An important aspect of this project involves photometric and spectroscopic follow-up of detected microlensing events for exotic effects (due to binary lenses, parallax, or binary sources), which can help constrain the nature of the lensing object. In this regard, we expect to make use of additional NOAO and AURA resources, including Gemini South.

A primary project goal is to reduce all data in real time, allowing rapid response to newly detected transient events, and even moving objects, which at the south ecliptic pole are a rare but interesting breed. To facilitate the reduction of ~10 Gigabytes of science data per night, we have created an automated Mosaic II data reduction pipeline, as well as interfaces with the Mosaic II data acquisition and 4-meter telescope control and guidance systems, making the observing procedures as rapid and efficient as possible. Difference imaging techniques are applied to all data to remove the quiescent portion of each extremely crowded image, revealing only the variable sources. The latter is a large computational task, requiring multiple computer processors running in parallel. We were able to realize this real-time goal during a run in January 2002.

The pipeline has been overly successful in detecting new sources of variability: the number of uncatalogued variable stars has overwhelmed any microlensing signals! Hence much of the interval before next year's runs will be spent identifying and tagging intrinsically variable objects.

Longer-term goals of the project include real-time data dissemination and Internet-enabled access to the Super MACHO photometry and image databases, keeping in mind the upcoming Large Synoptic Survey Telescope project and its computational objectives. In the sense of data rate, Super MACHO can be considered a "one milli-LSST." We also hope to integrate our pipeline and analysis tools directly into a next-generation supernova search operating in parallel with Super MACHO.

As a preliminary yet interesting science result, we have successfully detected multiple supernovae in galaxies behind the LMC, a variability background we found in MACHO to have an event rate similar to the LMC microlensing rate. An example can be seen in the right panel of the Figure, which was announced by the IAU as SN 2002B. This result demonstrates the ability of the difference imaging method to dramatically reduce the confusion problems confounding crowded field photometry.

A zero-th order data release is currently in the works, consisting of publicly available deep Mosaic II images of our LMC fields, astrometrically registered to the UCAC1 catalog with a typical RMS of 0.09 arcsec. From these images, we have also created a list of second- and third-generation astrometric stars detected in the Super MACHO images. Please check *www.ctio.noao.edu/~supermacho* for future results and data releases.

New Observing Utility for Mosaic II

Chris Smith

A new observing tool for Mosaic II on the Blanco 4-meter called "mosocs" will provide better support for programs that repeatedly image the same field.

This script allows astronomers to create a file that completely describes a whole sequence of observations. Each observation is defined on one line, and this definition includes the telescope pointing, guide star position, filter, and exposure time. The script reads the file one line at a time, sending instructions to the telescope, guide camera, and instrument to control all the necessary parameters.

This tool is especially useful for programs that need to return to exactly the same location repeatedly (such as asteroid searches, supernovae searches, and the Super MACHO Survey), since it stores the position of the guide stars used for each pointing. For more information about this script and how to use it, please visit the Mosaic II Web page at *www.ctio.noao.edu/mosaic*.

SOAR Optical Imager Progresses

Alistair Walker

The SOAR Optical Imager (SOI) is one of three major instrument construction efforts presently underway at CTIO, with the others being the Blanco wide-field infrared imager ISPI, and the Nasymth Instrument Support Boxes and Comparison Systems for the SOAR telescope. It is one of the suite of first generation instruments being built by the four SOAR partners: Brazil, NOAO, Michigan State University, and the University of North Carolina (for more, see *www.ctio.noao.edu/soar/soar_instruments.html*).

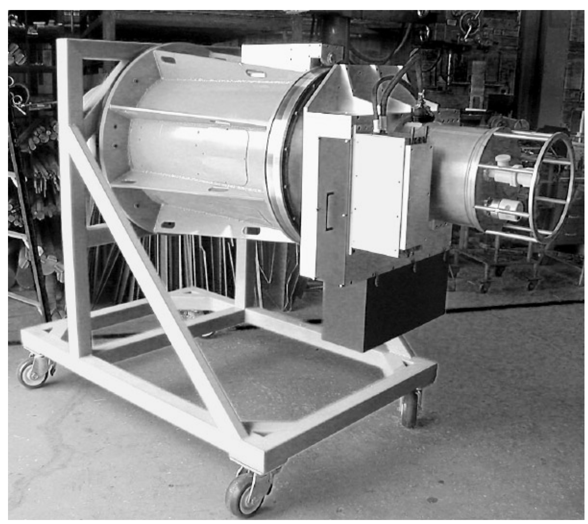
The SOI is a small-field (5.5 arcmin square), high-resolution (0.08 arcsec per pixel) CCD imager designed to exploit the expected very high imaging performance of the SOAR telescope and its Cerro Pachón site. It is also the commissioning instrument for the telescope. The SOI is located at one of three folded Cassegrain foci, and incorporates its own instrument rotator, atmospheric dispersion corrector, focal reducer, and tip-tilt sensor that controls M3, in addition to the usual filter wheels and shutter. Optics and coatings are being chosen carefully to provide excellent throughput over the wavelength range from 310-1,050 nm, which, in combination with a suitable CCD, should allow close reproduction of standard photometric systems.

Progress has been rapid over the past several months, as can be seen from the picture, which shows the first mechanical assembly of the instrument. The dewar, the cylindrical assembly on the right hand side of the picture, is complete and has gone through two cool-down cycles. These tests show that hold time on a single fill of liquid nitrogen, without regulating CCD mount temperature, is around 50 hours, which should comfortably allow the stipulated hold time of 30 hours with a temperature-regulated CCD to be achieved.

The rectangular box partially obscuring the dewar is a SDSU (Leach) CCD Controller. A second Leach controller is on the opposite side of the dewar, and operates the fast guide/tip-tilt CCD. Moving to the left, the large flat assembly is the shutter-filter unit, which interfaces via the instrument rotator to the massive braced support. The linear ADC and the focal reducer optics are inside this support. All optics are in hand. However, the SOLGEL coatings were damaged en-route and need to be re-done.

The two blue-UV optimized 2K × 4K Lincoln Labs CCDs have not yet been delivered, but they are expected within the next few months. In the meantime, the controller data system, a Leach II controller operating in a LabVIEW/Linux environment, has undergone initial tests using a SITe 2K CCD, and will progress to an engineering-grade Lincoln Labs CCD in the SOI dewar. Support of various operating modes such as binning and regions-of-interest will be added.

Over the next few months, work moves from construction to integration and testing, optimization of the data system and user interface, and installation of the science-grade CCDs.



The SOAR Optical Imager sits on its handling cart in the CTIO Instrument Shop.

ISPI Nears First Light, Proposals Solicited for 2002B

Ron Probst & Nicole van der Bliek

The new CTIO infrared camera called ISPI, a 4-meter facility instrument, is on schedule for first light at the end of May and first science observations in July. This schedule follows the delay caused when an ISPI camera lens was transferred to its optical twin, FLAMINGOS, to preserve scheduled science with that instrument at Gemini South, as reported in the September 2001 *Newsletter.*

Initial vacuum and cryogenic tests of the dewar have been successful. We expect to finish the opto-mechanical integration in April after receipt of the replacement lens. From recent conversations with the array vendor, we are optimistic that ISPI will have a fully science qualified array prior to the beginning of Semester 2002B.

ISPI provides 1-2.4 micron imaging with an 11 × 11 arcmin field of view and 0.3 arcsec per pixel sampling. It will have broadband J H Ks filters at first light; a narrow band filter complement is planned, but none have been procured as yet. We would be pleased to work with prospective users who wish to provide narrow band filters for their programs.

We do not yet have on-telescope performance measurements. Predicted ISPI performance numbers were provided in the September *Newsletter* and can be used to estimate integration time.

Alternatively, the Exposure Time Calculator provided in the NOAO observing proposal pages (www.noao.edu/gateway/ccdtime) can be used. Select CTIO instrument "4-m IR imager, f/8" and set the seeing parameter to 1.5 arcsec. (Recent 4-meter median seeing has been substantially better than this. The calculator is set up for CIRIM, not ISPI, so the seeing parameter is being used as a fudge factor to compensate for the pixel size difference).

For further information regarding ISPI, see the project Web pages at *www.ctio.noao.edu/instruments/ir_instruments/ispi*. For updates near the proposal due date, contact one of us at *probst@noao.edu* or *nvdbliek@noao.edu*.

Hydra-CTIO Performance Improves

Knut Olsen & Nick Suntzeff

Hydra-CTIO provides the Blanco 4-meter telescope with a powerful and flexible multi-object optical spectrograph. Built by Sam Barden of NOAO Tucson, who upgraded his own Hydra-WIYN design, Hydra-CTIO features:

- 133 2.0 arcsec-diameter fibers
- Spectral coverage from 3,300-11,000 Å
- Positioning time ~20 minutes per field (~8 sec/fiber)
- 40 arcmin field of view
- Atmospheric dispersion compensation
- Slit plates for higher spectral resolution
- Low- to medium-resolution gratings and single-order echelle mode

In the period following its commissioning in 1998, Hydra-CTIO's observing efficiency was reduced by a number of problems. Over the past year, good progress has been made toward fixing the worst of these, resulting in much improved performance. The Hydra-CTIO web page contains a detailed report of the work that was done. (www.ctio.noao.edu/spectrographs/hydra/hydra.html and, in particular, see *www.ctio.noao.edu/spectrographs/hydra/nov_review2.html*).

Highlights include:

- Mechanical analysis of the fiber gripper assembly led to the discovery that several of the switches controlling the motion of the gripper were not behaving properly. This explained many of the problems reported with the fiber positioner prior to 2001, including crossed or colliding fibers and the occasional inability of the gripper to pick up fibers on the first try. Following careful tuning of the switches, these problems have disappeared completely.

- A 400-millimeter camera with a SITe 2K × 4K CCD was installed in Hydra in June 2001. The two improvements in Hydra due to this new camera are (i) a detector with low noise (~3.5 e-), and (ii) doubled optical resolution. The low noise detector allows spectroscopy of fainter objects, and the higher resolution allows the use of all 133 fibers simultaneously. The 400-millimeter camera installation was delayed due to difficulties with the SITe CCD. Before the installation of the new camera, observers had to use the interim Air Schmidt camera

continued

Hydra-CTIO Performance continued

with a Loral detector, which suffered higher CCD noise and poorer image quality, allowing the use of only half the available fibers and limiting the attainable depth.

- Early users of Hydra-CTIO noticed that the guider did not guide as well as expected. The problem was traced to an uncompensated rotation of the guide camera with respect to the guide fibers. Guided spectra are now measurably better than unguided ones over timescales as short as 10 seconds.

Future users of Hydra-CTIO should watch the Web page for continued updates.

Internet2 Reaches CTIO

Chris Smith & Ron Lambert

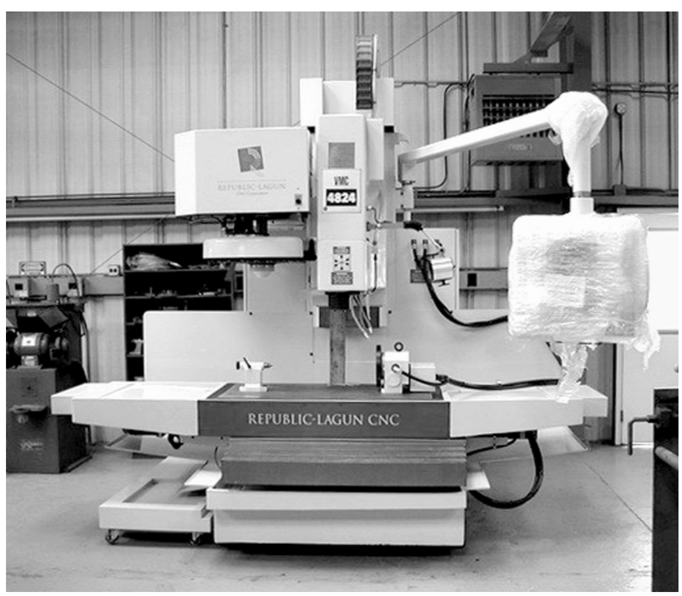
Thanks to NSF funding, awarded jointly to NOAO/CTIO and the Gemini Observatory, all of our facilities in Chile now enjoy high-speed access to Internet2, the new high-speed Internet backbone currently reserved for non-commercial use. The new connection provides 10 Megabytes per second non-stop into an Internet2 connection point in Florida.

This improved access should enable exciting new modes of observing, such as remote observing on SOAR from the partner institutions and on Gemini South from the US Gemini Remote Observing Center (GROC) in Tucson. We also anticipate that this faster link will provide improved access to data produced by NOAO's telescopes in Chile, both for individual observing programs and for NOAO Survey Programs such as SuperMACHO (see article by A. Becker in this *Newsletter*), which will be making data and data products (e.g., announcements of MACHO events) available in real time.

Enhancement To CTIO Instrument Shop Facilities

Alistair Walker, Patricio Schurter

After completing work on optical and infrared imaging instruments for the Blanco and SOAR 4-meter telescopes, the CTIO Engineering and Technical Services (ETS) Instrument Shop will be participating more and more in the NOAO Major Instrumentation Program. To aid this effort, CTIO has purchased a large, computer-controlled milling machine: a Republic Lagun Vertical Milling Center CNC machine, model 4824-S. This impressive device will allow us to produce with high precision the very large pieces of metal typically needed for 8-meter class instruments. The seven-ton machine was delivered and installed in January.



Chilean President Speaks on Dark Skies, Value of Astronomy

Malcolm Smith

The following text is extracted from a transcript and translation of the speech of Chilean President Sr. Ricardo Lagos at the recent dedication of the Gemini South Telescope on 18 January 2002:

"...The astronomical community is represented here by people of various nations, various specialties in a model of cooperative effort, for humanity's benefit. [This] is the result of patient work, that proceeds from theory to observation and vice versa, that is accumulated, interchanged and is made known to all.

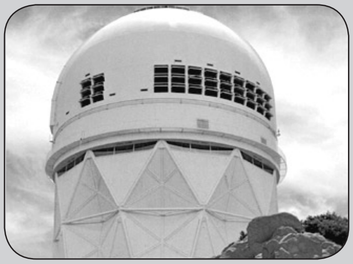
Our small country is proud to belong to this international community. We have wealth to share, this gallery of clear, nearly cloudless skies, as yet barely interfered with by urban lights. Controlling this interference is complex, difficult, we will try our best. Do you realize that sometimes underdevelopment has its advantages? Urban lighting is less when you are dealing with slightly less developed countries. The issue is that in reality many of us would like to have more lighting, but how do we balance more lighting with your capacity to continue observing the sky?

This [sky] is the result of the driest desert in the world, one that is a source of nearly inexhaustible mineral reserves, but is also the reason for the existence of these windows on the Universe. We do not only have clear skies that appeal to astronomers from a range of latitudes. We have also been forming a local astronomical community that is stronger, but which can and must offer more – it is the Chilean comparative advantage, as the economists would say. If we can do science in many areas, let us do it here, where it is our privilege to look at the Universe from this sky..."

Our answer to this challenge is "Ilumine el Suelo, no el Cielo" ("Light the Ground, Not the Sky"). La Serena and Coquimbo between them have thrown US $1M uselessly into the sky during the last decade through electricity wasted on poor lighting. It is, of course, a privilege that the Chilean president included mention of this issue in his speech. The previous president [President Frei] signed into law Supreme Decree #686 in late 1999; this decree applies to lighting in the 2nd, 3rd and 4th regions of Chile, the key zones for existing and future astronomical activity here.

While we can still make movies of the setting Zodiacal light over Cerro Tololo, it is important to start protective work one or two decades before it could otherwise become a serious problem - otherwise it will surely be too late. The sky over Tololo and Pachón is dark - and we intend to keep it that way.

For more on this subject, see the various light-pollution references on the CTIO Web pages and visit the Web site of the International Dark-Sky Association at www.darksky.org. A summary of the international conference on light pollution in La Serena, Chile, on March 5-7 will be provided in the next Newsletter.



K P N O
O p e r a t i o n s

Observing Options for Semester 2002B

Richard Green

Kitt Peak National Observatory continues to offer highly competitive capabilities for your science program, whether it is a survey, a long-term project or a semester-length proposal. The Mosaic CCD camera provides wide-field direct optical imaging at both the Mayall 4-meter prime focus and a one-degree field of view through KPNO access to the WIYN 0.9-meter. Work on objects of more compact scale may be better placed on the 4K × 4K Mini-Mosaic at WIYN or with the 2K × 2K SITe CCD at the 2.1-meter.

FLAMINGOS provides its 2K × 2K HgCdTe detector for direct imaging and long- and multi-slit spectroscopy at the 4-meter and 2.1-meter telescopes. FLAMINGOS will return from Gemini South to Arizona in early November. Its first availability to users depends on whether lab work is needed, its use at the MMT, and the exact ship date from Chile, but in no case should it be later than the beginning of December. It will be available at KPNO until sometime in May the following semester. Because of the limited availability during 2002B, it will be possible to schedule only the highest-rated programs. You should consider carefully whether SQIID, with its simultaneous J, H, and K imaging, provides a useful alternative to FLAMINGOS imaging. Optimistically, FLAMINGOS will be upgraded from an engineering to a science-grade detector before its reappearance for Semester 2002B.

There are several options for optical spectroscopy over a range of dispersions and spatial scales. The excellent red sensitivity and low fringing performance of the Lawrence Berkeley Lab CCDs are available in both MARS (the former Cryocam) and the RC spectrograph. The reliable T2KB remains a choice for RCSP when blue sensitivity or long-term continuity takes precedence. Both the MARS and RCSP LBNL detectors could be upgraded before the start of the semester. Please watch the Web site for the detailed planning of your run.

The echelle spectrograph has been scheduled for several blocks in Semester 2002A, and can be requested with the lower or higher dispersion modes. Added to WIYN Hydra and DensePak is now SparsePak, which is described in an accompanying article. Goldcam remains a popular choice on the 2.1-meter.

It is our intention that instruments for the 4-meter telescopes remain active as long as proposal demand warrants. Thus, there are no planned retirements for the major capabilities listed above. The impact of our more limited support resources is that your success as a proposer may now be contingent on your colleagues' interest in the same capability. We will schedule an instrument (or other specialized offering such as queue observing) only if there are a sufficient number of highly rated proposals to satisfy minimum block-length criteria.

Shared Use of SparsePak on WIYN

Matthew Bershady (University of Wisconsin)

A new fiber array, SparsePak, has been completed and commissioned on the WIYN 3.5 meter telescope. Produced as a PI project, it is now available in "Shared-Use" mode to the general NOAO community.

SparsePak contains a 71 × 72 arcsec, sparsely-packed hexagonal grid of 75 fibers with 4.7-arcsec diameters. These fibers pipe light from the "imaging" Nasmyth focus to the versatile Bench Spectrograph on WIYN. Seven "sky" fibers are placed at ~30 arcsec from two grid sides. The substantial demagnification in the echelle-mode of the Bench Spectrograph yields instrumental spectral resolutions of 8,000-10,000 and as high as 21,000 with SparsePak – comparable to resolutions obtained with smaller fibers. The SparsePak fiber cable itself has more than 90% throughput for $\lambda > 500$ nm, and provides nearly three times the light gathering power over five times the area as DensePak, the pre-existing WIYN fiber array. These attributes make SparsePak well suited for low- to medium-resolution spectroscopy on extended objects down to low surface brightness.

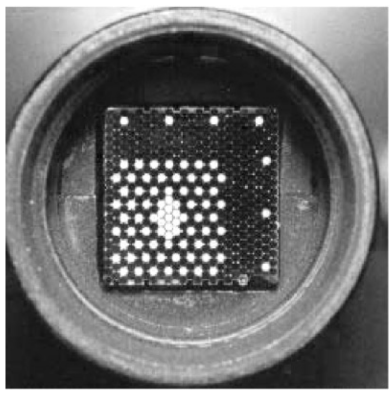
continued

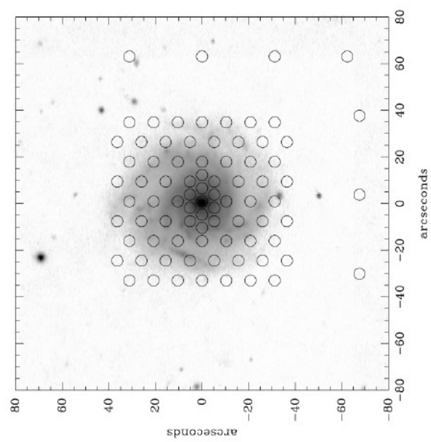
Shared Use of SparsePak continued

Two conference proceedings based on preliminary results can be found on the web (*astro-ph*/0201407 and 0201354; a *PASP*-bound instrument paper is in preparation.) Details on the instrument, commissioning, preliminary results, etc. are available on the Web at *www.astro.wisc.edu/~mab/research/sparsepak/*.

Our instrument team would be delighted to have people use SparsePak as much as possible, as soon as possible. "Shared Use" means it is collaborative. You get access to use SparsePak during your own allocation of observing time, and you get access to the instrument team's expertise. In return, you include the instrument PIs on publications resulting from these observations. If you need to consult in detail with another one of the instrument team, they request that they too be included as an author on resulting SparsePak-related publications.

If you would like to use SparsePak in "Shared-Use" mode, please go to *www.astro.wisc.edu/~mab/research/sparsepak/#su* to find further information, then plan on contacting me at *mab.astro.wisc.edu* to arrange a collaborative proposal.





WIYN Tip-Tilt Module Ready to Begin Commissioning

Chuck Claver

The WIYN Tip-Tilt Module (WTTM) project has evolved from fabrication to assembly and testing during the past semester. The long awaited M3 replacement (for the third curved mirror in the system) was accepted from our vendor in early October 2001. The NOAO optics lab successfully completed post polishing of the M3 diamond-turned aluminum assembly by the end of the month.

A select subset of the optics fabricated for the WTTM was chosen and hand-carried to California, where they were overcoated with an enhanced silver coating. During this time, the final optical system, as built and selected, was rebalanced, which set the final mirror cell dimensions. The cells were hand-delivered to a precision machine shop in Phoenix, where the highly critical surfaces were machined to a tolerance of better than 0.0001 inch.

A fit check of the cells and spare optics was done for the first time just before the holidays, with very good results. The select optics were installed during early January and are producing diffraction-limited images across the entire field of view in the science beam. The completed error sensor has also been installed and is undergoing system checks and integration. Early tests show that the error sensor is able to measure image motions of <0.02 arcsec with an artificial star having a FWHM=0.7 arcsec.

In late January, the project had to recover from the failure of its science-grade CCD. A temporary replacement CCD was identified. The engineering-grade EEV device on loan from Gemini was fitted in a dewar in early February for use with WTTM.

Commissioning at the telescope was scheduled to begin February 26. Stay tuned for on-sky performance results.

An Opportunity for Instrumentation Partnerships with KPNO

Richard Green

KPNO is seeking partners in the development of new astronomical instrumentation for use on the Mayall 4-meter telescope. The goals of such partnerships are to provide forefront observing facilities for Kitt Peak and to cultivate the instrumentation capabilities of the partner's department or lab. These capabilities include design and production of the cryogenic optical and mechanical systems, electronics, and control and analysis software.

Partners will participate by the provision of a combination of funds and technical resources, in exchange for a guaranteed allocation of observing time.

The first partnering opportunity will be participation in the detailed design and production of NEWFIRM, the NOAO Extremely Wide-Field Infrared Imager. The concept is an instrument for the Cassegrain focus of the 4-meter telescope, covering a 27 arcmin × 27 arcmin field of view with 0.4 arcsec/pixel sampling, with a 4K × 4K mosaic of near-infrared detectors.

A conceptual design review for NEWFIRM was held in October 2001. Current work, including some simplification of the opto-mechanical concept, is proceeding toward a Preliminary Design Review. Materials from the CoDR can be found at *www.noao.edu/ets/newfirm/CODR.htm*. The capability for wide-field infrared surveying is being produced as an end-to-end system, and includes the development of a data pipeline and possibly data mining tools.

We are soliciting proposals for partnerships to extend over a three-year period. Proposals are expected to be approximately 10 pages long. An external review committee will evaluate competitive proposals based on the following criteria:

1) *Strength and relevance of the proposed technical and financial contribution to development of the instrument suite for KPNO*
2) *Quality and significance of the proposed observational programs*
3) *Impact on the development of partner instrumentation capabilities*
4) *Benefit to the national community in terms of a total contribution exceeding the minimum value of the total telescope nights requested*
5) *Value of the partnership for education and training*
6) *Prospects for a successful collaborative effort.*

Discussions about potential project roles are encouraged prior to submission of the proposal. The instrument PI is Ron Probst (*rprobst@noao.edu*). Questions about designing the data pipeline and data mining tools should be directed to Dick Shaw (*rshaw@noao.edu*). I will be happy to address issues about guaranteed time, the partnership agreement, and prospects beyond NEWFIRM (*rgreen@noao.edu*).

Telescope time can be made available starting in the semester following completion of a partnership agreement. A later start is also possible if desired. Such time would be distributed uniformly through the semester and by lunar phase, unless a preference for a concentration of lower-demand time is expressed.

The minimum resource contribution per year for any single partner is $200,000, for which a maximum of 10% of the ~330 nights scheduled for science would be offered in return. The maximum return of 4-meter time to all partners will not exceed 25% of the available nights. Even though instrument development is directed toward the 4-meter, some number of nights on the 2.1-meter telescope may be negotiated in place of 4-meter nights at a rate of 4:1. Continuing opportunities for partnering in instrument development or facilities upgrades are anticipated, which create the option for renewal.

Letters of intent to submit a proposal should be sent to Richard Green by 15 May 2002. The letter should contain a brief description of the areas of expertise to be proposed for in-kind contribution, so that individuals with the appropriate experience may be chosen for the review.

Five paper copies of the proposal are due at NOAO-Tucson on 1 July 2002.

The Tougher Firewall

Steve Grandi, Nigel Sharp & John Glaspey

In our never-ending battle to keep the Internet wolves at bay, we are tightening security on our firewall. As of 11 February 2002, you can no longer telnet into NOAO-Tucson or KPNO machines. Please use SSH instead!

At some as-yet-undecided date in March 2002, we will cut off X11 and VNC connections through our firewall to NOAO-Tucson or KPNO machines. Please use ssh tunneling for VNC and X11 connections.

Questions about all aspects of external network connections to and from Kitt Peak mountain computers may be directed to *mtn_net@noao.edu* (which goes to all the authors above).

National Solar Observatory

From the NSO Director's Office

Steve Keil

NSO continues to move ahead rapidly in the implementation of its Long Range Plan. During 2002, we anticipate the completion and fielding of SOLIS and the completion of the transition to GONG++. The program to develop the 4-meter Advanced Technology Solar Telescope (ATST) is starting to pick up momentum. Core science and engineering teams are coming together and we are beginning to explore some of the tougher design issues. Site survey instruments have been shipped to Big Bear Solar Observatory and Haleakala, and the tower and instruments for La Palma are being readied. Two additional sites to test, San Pedro Mártir on the Baja Peninsula and Panguich Lake in Utah, were identified. The ATST science working group will meet on March 16 to review and endorse the science requirement document.

The NSO Users' Committee met in December and a "short" version of the committee report is included in this *Newsletter*; the full text of the report is available at *www.sunspot.noao.edu/INFO/users-comm/users-committee-info.html*. One of the primary issues discussed by the committee was observational modes.

Many hours of good seeing are lost at the Dunn Solar Telescope (DST) due to each PI generally having to change the observing setup, most of which have become quite involved, particularly for those taking advantage of the adaptive optics. A typical setup uses several simultaneous light paths to various imaging and spectroscopic instruments, must synchronize several CCD cameras, and often involves complex spectral and spatial scanning.

The Users' Committee discussed observing modes in which the instrumental configuration is frozen for some extended period. NSO would then allot time to those proposals that could be accommodated with the fixed setup. This would reduce our flexibility to accommodate visiting observer schedules as we now do, but should enhance the available observing time on the DST by 20-25% and reduce the amount of time lost to trial and error revision, or mistakes in setting up. It would also mean that PIs would spend less time at the telescope. In some cases, NSO could collect and ship the data to a PI without the PI having to travel to NSO. We would like your inputs regarding this proposed change and how it might affect your use of the telescope. Please e-mail or call me (*skeil@nso.edu*; 505/434-7039) if you have comments or concerns.

There are several meetings and workshops this year that will be of specific interest to NSO users. The first is an NSO workshop at Sunspot during the week of March 11 on "Current Theoretical Models and Future High-Resolution Solar Observations: Preparing for ATST." Workshop details can be found at *www.sunspot.noao.edu/INFO/MISC/WORKSHOPS/*. A meeting of the ATST science working group to update science requirements and establish the working version of the science requirements document will immediately follow this workshop.

In conjunction with the AAS/SPD meeting this June in Albuquerque, there will be a topical session on June 5 on "Understanding Solar Magnetism—the Advanced Technology Solar Telescope." On August 22-23 there will be a SPIE conference on "Innovative Telescopes and Instrumentation for Solar Astrophysics," as part of the SPIE symposium in Waikoloa, Hawaii on "Astronomical Telescopes and Instrumentation." So, if you are looking for information and interaction on the ATST, we hope to see you at one or more of these meetings.

NSO is working to strengthen its ties with university programs and to create more opportunities for students to do solar research and graduate theses. The collaborative adaptive optics program between the New Jersey Institute of Technology (NJIT) and NSO has led the way, and currently two NJIT students are doing solar research at NSO/Sac Peak. Arrangements are being made with two other universities for students to do their thesis based on data collected at NSO in collaboration with NSO staff scientists. We are open to exploring options for graduate students at other universities to conduct some or all of their research using NSO facilities. NSO can provide support for students to work at the observatory during the summer or other times of the year. NSO staff are also willing to serve on thesis committees and to help supervise thesis research. Please do not hesitate to contact us with interesting proposals.

2001 NSO Users' Committee Report

Tom Ayres (University of Colorado)

The NSO Users' Committee met in Tucson on 7 December 2001. As with last year, the committee was deeply impressed by the progress of the NSO in carrying out its top priority projects:

(1) The Advanced Technology Solar Telescope (ATST) is of great interest to users because it represents the next generation of solar facilities. Crucial subsidiary efforts like adaptive optics (AO) and infrared cameras will find use in current instruments long before ATST is commissioned. At the same time, ATST development draws staff away from current support for instruments and observers. The ATST design effort is moving forward swiftly to present a construction proposal to NSF by the middle of the decade. The facility would be built in the 2007–2009 time frame, with operations commencing in 2009, and relocation/consolidation of NSO a year later. Deployment of advanced site testing equipment has begun, with final site selection slated for 2003. The AO program, a cornerstone of the ATST, is refining its current system to be more robust, stable, and user friendly; and, investigating extensions to higher order (for the 4-meter ATST) and larger fields of view.

(2) The Solar Optical Long-term Investigations of the Sun (SOLIS) facility is in final construction, and will be deployed to the Kitt Peak Vacuum Telescope (KPVT) in Fall 2002. An "interim" camera for the Vector Spectromagnetograph (VSM) replaces the original problematic detector. Key user concerns are ensuring adequate cross-calibration with existing KPVT synoptic data and minimizing synoptic "downtime" during SOLIS installation. Widely publicizing the cross-over/calibration period would allow other ground-based magnetographs to participate in the process. Discussions are underway with potential partners for a multi-site network of the key SOLIS VSM.

(3) The Global Oscillation Network Group (GONG) saw final installation of new 1K × 1K cameras. The second phase of the upgrade — an advanced data handling and analysis system — is moving forward with an initial computer hardware purchase. Users will benefit from the increased resolution and spatial fidelity of the Dopplergrams, and "continuous" line-of-sight magnetograms (one every five minutes). General community science support remains an issue in the absence of a dedicated grant program (outside of the network group itself).

In other areas of interest to users: The administrative separation between NSO and NOAO appears to be going well, although "recompetition" for the overall management of NOAO/NSO is still not settled [as of this writing]. The Virtual Solar Observatory (VSO) effort at NSO is limping along in the absence of major external funding; it nevertheless is vital to current research work, as well as educational and public outreach efforts. The Sac Peak unit of the three-station RISE/PSPT network was put out of commission by a lightning strike last summer. In view of the small user base, the committee felt that the value of the Sac Peak station to the network should be demonstrated before precious resources are expended to repair the unit.

A tip-tilt correction for the McMath-Pierce is expected to be tested in April 2002, with significant implications for future observing programs. An engineering-grade dewar for the new Aladdin 1- to 5-micron array at Kitt Peak is being investigated. At the same time, an upgrade of the FTS could take it off-line for six months. The Evans coronal facility at Sac Peak is suffering from low observational support, and continued operation is dependent on Air Force funding.

Finally, an extensive discussion of telescope operation modes highlighted NSO's declining ability to accommodate support-intensive visitor programs, as personnel are diverted to high-priority projects like ATST and AO, with little or no addition to the scientific staff. We recommend that requests for excessive observing support be scrutinized carefully by the Telescope Allocation Committee, and approved only if the request is especially meritorious, consistent with available resources. As a key part of the ATST operations design, NSO could take cues from some nighttime astronomy successes: remote observing; queue scheduling; standardized instrument configurations; and, easily swappable instrument stations to minimize the impacts of different setups.

In summary, we commend NSO for developing a keen vision of the future; for continuing to build the foundations for realizing that vision; and, as resources permit, for supporting current aspirations of a diverse community of solar observers, instrument builders, space weather forecasters, and atmospheric chemists.

The current NSO Users' Committee members are: T. Ayres, Chair (University of Colorado) T. Berger (Lockheed Martin, Palo Alto), G. Ginet (AFRL/VSBS), P. Goode (NJIT/BBSO), E. Hildner (NOAA/SEC), D. Jennings (NASA/GSFC), P. Judge (HAO/NCAR), K.D. Leka (Colorado Research Associates), D. Rabin (NASA/GSFC), E. Seykora (East Carolina University), D. Weedman (NSF, *ex officio*).

A more extensive version of this report is available at *www.sunspot.noao.edu/INFO/users-comm/users-committee-info.html*.

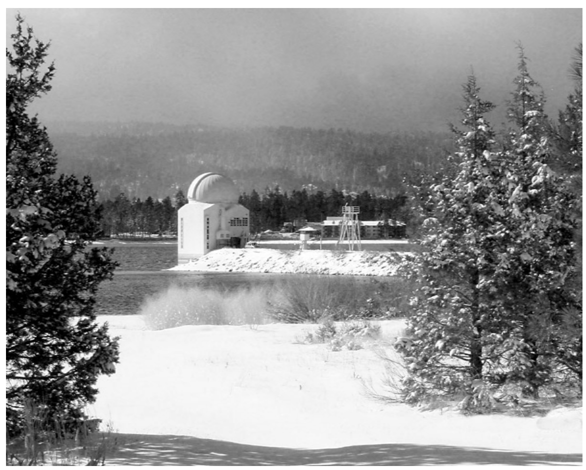
The ATST Site Survey

Frank Hill

The site survey for the Advanced Technology Solar Telescope (ATST) has been making substantial progress toward the selection of a location for the telescope.

In December, the Site Survey Working Group selected the last two candidate locations that will be tested — San Pedro Mártir in northern Baja California, Mexico, and Panguitch Lake in southern Utah. Four sites were previously selected (Haleakala, HI; Big Bear, CA; La Palma, Canary Islands, Spain; and Sacramento Peak, NM).

The six sites under consideration represent a variety of topographic classes: ocean island mountains, coastal and continental high-elevation lakes, continental mountains, and a mountain peninsula. This wide range of topography should help us understand the conditions that affect daytime seeing. The Site Survey Working Group (Jacques Beckers, Peter Brandt, Manolo Collados-Vera, Carsten Denker, Jeff Kuhn, and Kim Streander) did an admirable job of sifting through a large amount of information on approximately 75 sites to select the last two candidates. The group considered elevation, lake characteristics, weather statistics, high-altitude winds, contrails, and the feasibility of construction.



Mark Warner and Frank Hill visited Panguitch Lake and discussed the possibility of an ATST with several local groups, including faculty at Southern Utah University, the US Forest Service, county officials and local residents. All groups were enthusiastic about the possibility, and the site looks good in terms of location and sky clarity. Of course, the quality of the daytime seeing remains to be determined. We have received permission to proceed at San Pedro Mártir from the director of the Observatorio Astronómico Nacional of the Universidad Nacional Autónoma de México, and will schedule a visit there in the near future.

As reported in the December 2001 Newsletter, the test stand at Sacramento Peak is now installed thanks to Robert Rentschler, Scott Gregory, and Larry Wilkins. Steve Hegwer and John Briggs have installed the instrumentation, and data are being taken regularly by Briggs and validated by Richard Radick. The test stand at Big Bear is now in place (see photo); the test stand foundation is being constructed at Haleakala, and the permit process is underway at La Palma. We also plan to conduct a short-term test at Mauna Kea with a scintillometer array.

On the instrumentation side, considerable progress has been made on the scintillometer array and S-DIMM calibrations. Thanks to the untiring efforts of Radick, Briggs, Hewger, Fletcher, and Wilkins, a number of electronic and optical gremlins in the system have been exorcised (with suitable chants and incantations). In particular, the results of simultaneously running systems at three heights at Sac Peak indicate that the scintillometer array can provide information about the height dependence of the seeing near the ground. The analysis procedure to extract this information is complex and is still being developed by Beckers and Radick.

In addition, Radick and Briggs have measured the image scale of the S-DIMM using stellar separations. The measured value agrees to better than 1% with the design value, a testament to Jacques Beckers' design and the skill of the Sac Peak shop in constructing the system. Finally, Haosheng Lin at the University of Hawaii has been awarded a contract to develop and fabricate the sky brightness monitor and water vapor meter for the survey. These devices should be available this spring.

Data collection was slated to begin at Big Bear around mid-February, followed by Haleakala in mid-March, and La Palma in late April. The development of the reduction system for the statistical analysis of the data is underway using the Sac Peak data as a test bed. The time frame for the site recommendation is currently September 2003.

SOLIS

Jack Harvey

Assembly and testing of the SOLIS instruments continues.

The Vector Spectromagnetograph (VSM) is presently located in a basement lab where it awaits delivery of two cameras from Rockwell. These cameras were expected by mid-February. Four detectors were fabricated, and two of them appear to meet our specifications. The remaining electronic and mechanical parts of the cameras are nearing completion.

Analysis of tests of the assembled modulator package for making vector magnetograms showed inadequate performance, so the package was disassembled to locate the problem. We found that the retardation of the liquid crystal elements was 0.44 waves rather than 0.50 waves, as shown by other devices we used. Thanks to an optimization program written by C. Keller, it was possible to rotate some fixed retarders in the package to compensate for the difference, and performance now meets expectations.

After a comparison among four candidates, the High Altitude Observatory Rough Estimate code by Paul Seagraves was selected to provide quick-look reductions of the vector magnetograms. Tests indicate that this will provide first-look data within five minutes after the completion of a full-disk observation.

The Full Disk Patrol (FDP) housing is in another basement lab where it is being fitted with optics cells, mechanical mechanisms and electronic components.

A solar image was passed through the 1083- nm filter to a simple RS-170 CCD camera and it produced excellent full-disk helium images at 30 frames per second.

Assembly of the tunable 380-680 nm narrow-band filter is continuing. This Lyot-type filter requires an achromatic element in each stage to provide a widened field of view. Traditionally this is done by using achromatic half-wave plates, which are difficult to construct and expensive. We found that achromatic polarization rotator is an easier solution that performs better. An elegant design by Koester was implemented using three polymer retarders, with good results.

The Integrated Sunlight Spectrometer (ISS) is producing integrated sunlight spectra in the same basement lab that houses the VSM. Testing of flat fielding algorithms continues and has revealed a larger-than-expected temperature sensitivity.

As the ambient temperature changes, the position of the spectrum on the CCD moves enough to affect the flat fielding process. This motion will be much reduced in the final installation because the spectrograph will be housed in a temperature- and humidity- controlled environment. In its present open laboratory location, the temperature sensitivity of the spectrograph is a troublesome nuisance, and attempts to reduce the temperature swings in the lab are underway.

The Mount Control System (MCS) software now operates all three telescope axes in both rate and position modes. The system can acquire and track objects for pointing calibrations. The MCS can also blend signals for the guide, pointing map, and handpaddle into the track rate.

The detector controllers for the ISS and extinction monitor are completed, and the controller for the FDP is nearly completed. Completion of the VSM detector controller was expected to begin in February upon arrival of the Rockwell cameras.

Schedules to operate each of the instruments can be created, modified, and executed. Diagnostics to monitor the progress of the schedules have also been finished.

NSO Proposal Submission Deadline for Summer (July-September) 2002 Quarter:
15 May 2002
Observing Time Request Forms are available at *www.nso.noao.edu*

McMath-Pierce Adaptive Optics: Universal Tracker is Working

Christoph Keller & Claude Plymate

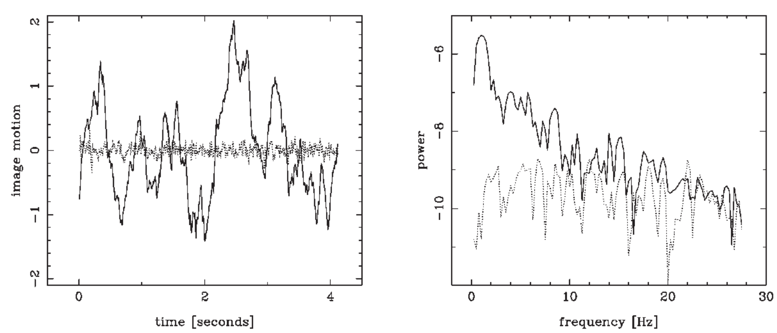
An adaptive optics system is currently being developed for the 1.5-meter McMath-Pierce main telescope. A low-cost approach using off-the-shelf components will provide diffraction-limited images in the thermal infrared under most seeing conditions. Earlier Newsletter articles focused on the successful tests of a correlating Shack-Hartmann wavefront sensor with several hundred subapertures and slow closed-loop operation with a Hartmann wavefront sensor in the laboratory. In the meantime, the tip-tilt correction has been implemented, and initial tests have been performed at the telescope.

Since the deformable mirror provides only limited correction of wavefront tilts (or image motion), there is a separate tip-tilt mirror. The fast CCD camera, and the tip-tilt mirror without the adaptive mirror and the wavefront sensor, will also be made available for observations where tip-tilt correction is sufficient. This configuration, the so-called Universal Tracker, has now been tested at the McMath-Pierce main telescope.

The tracker can operate in various modes, depending on the target that it is tracking. The simplest mode is limb tracking, where image motion in only one axis is corrected. For sunspots, the digital analog of a quad-cell has been implemented. The figure shows the initial performance of the system that corrects motions up to about 12 Hz. It is important to note that, apart from noise in the image motion measurement, there is very little power left in the closed-loop mode. Future improvements in the speed of the image acquisition software will increase this crossover frequency to about 100 Hz.

By early March, the Universal Tracker will also work as a correlation tracker. The system will then be available for scientific observations by the general user community on a shared- risk and limited-support basis. The full adaptive optics system is expected to become operational at the telescope by 2003.

This figure shows the performance of the Universal Tracker in the digital quad-cell mode, tracking a sunspot under bad seeing conditions. The graph to the left shows the performance in one axis in open-loop (solid line) and closed-loop (dashed line) modes, respectively, while the right graph shows the corresponding temporal power spectra.



New NSO IR Camera System

Matt Penn, Doug Rabin (NASA/GSFC) & Jeremy Wagner

A new camera system built around a 1024 × 1024 InSb Aladdin array is under development. The camera electronics and control software are currently being developed by Mauna Kea Infrared, based on a new version of the Red Star controller. A dewar for testing and initial science observations will be made available by NASA's Goddard Space Flight Center. Delivery and testing of the camera system are expected in late 2002 or early 2003.

The camera will augment the current NSO program of near-infrared spectropolarimetry and spectroscopy in the 1- to 5-micron range. It is expected to be used at both the McMath-Pierce and Dunn solar telescope facilities, and shared-risk use of the camera will likely begin in the second quarter of 2003.

G O N G
Global Oscillation Network Group

GONG

John Leibacher

With the end of the monsoon season, we were able to put the final touches to the GONG+ upgrade at Udaipur, and take part in the Udaipur Solar Observatory's 25th Silver Jubilee (Figure 1) at the same time, thanks to a lot of help above and beyond the call of duty from Sudhir Gupta, Pooja Vajpayjee, and Chaman Lal Tak, as well as the entire network operations team here in Tucson, who provided around-the-clock support.

The Mauna Loa site has had a number of problems that necessitated the changing of the light feet turret, and data was lost at the Tenerife site due to an electronics problem. Despite the less-than-hoped-for duty cycle during the first quarter of operation, the community is already getting a lot out of the new and improved GONG+ data. Perry Rose and Ed Rhodes (University of Southern California), working with Johan Reiter (Munich), are digging into the high-ℓ frequencies (Figure 2); Rick Bogart (Stanford University) and Deborah Haber (University of Colorado) are prodding the surface with ring diagrams (Figure 3); and, Doug Braun (NorthWest Research Associates) is imaging the backside of the Sun (Figure 4). We are also moving forward with comparisons of GONG+ and MDI.

Figure 1
Professor U.R. Rao, former Chair of the Indian Space Research Organization, opens the Udaipur Solar Observatory Silver Jubilee with the lighting of the lamp, in the presence of P.V. Venkatakrishnan [Director, USO], John Leibacher, [GONG Project Director, NSO], G.R. Agarwal [Director, PRL], A. Bhatnagar [former Director, USO], and A. Ambastha [USO].

GONG suffered the departure of an important member of the family, and enjoyed some new arrivals. Lana Britanik had been planning on moving to Albuquerque for quite some time, but she stayed with the project until the deployment was complete and the real-time instrument control was handed off. Thanks for everything, Lana, and best wishes for your new ventures! Chirag Shroff joined GONG to take on the real-time software challenge, and Thierry Corbard will be supporting the GONG++ Local Helioseismology Pipeline development.

Network Operations and the GONG+ Deployment
We continued to gain experience with the new system during the fourth quarter of 2001. An opportunity for improvement presented itself in bringing the Udaipur site on line, after considerable effort troubleshooting problems that lingered after the GONG+ installation. With the usual monsoon weather, relatively few real solar observing opportunities were lost. The implementation of an enhanced camera power supply and signal filtering in the timing system corrected much of the trouble, and has allowed the acquisition of good data. The occasional glitches that remain are being addressed.

It was discovered that the instrument at El Teide was running with the data acquisition system (DAS) operating anomalously. The DAS boards were not stacking the images properly and resulting images could not be used. Rebooting the data computer fixes the problem. However, the system slips back into this improper mode on occasion. Because the problem can be easily identified and recovered from, we intend to monitor the system and track down the source.

The Learmonth system began suffering timing re-syncs at the rate of about one per day. These events typically interrupted data acquisition until the system was rebooted. When looking into the nature of the re-syncs, it was noticed that they had characteristics similar to re-syncs that had occurred last spring at CTIO. In fact, some of them appeared at the same sidereal time as those from CTIO, which is a very curious circumstance indeed. We believe this may have something to do with the GPS satellite constellation and/or the GPS receivers that we employ. It's just one more of those "little mysteries" of a worldwide network that we are getting more experience in coping with.

About the middle of December, the Mauna Loa instrument failed with what appeared to be a problem with the amplifier that drives the half-waveplate rotator. The problem could not be solved remotely, and a two-person team was dispatched to the site just prior to the end of the year. They discovered that the problem in the waveplate system resulted from an electrical short in the turret where seals had allowed water to enter. The turret was shipped to Tucson for an overhaul. A second team followed a week later and installed the spare turret; they then performed a full preventative maintenance check of the system while on site.

Data Management and Analysis
During the past quarter, the DMAC produced month-long (36-day) velocity, time series, and power spectra for GONG Classic month 61 (ending 10 May 2001) with a fill factor of 0.66 and tables of mode

continued

GONG continued

frequencies, which were computed from the power spectra using the three-month-long time series centered at GONG months 58 and 59. The mode frequencies from the time series centered at GONG month 60 will be produced early next quarter.

The project began a campaign to re-pick the mode frequencies from the Classic GONG data set after the application of multiple optimized tapers, which has been demonstrated to give substantially better results, to the three-month-long time series. This campaign has produced mode frequency sets for GONG months 27, 29, and 48-60.

In addition, the project began a third mode frequency campaign to extract mode frequencies from multi-tapered year-long (10 GONG months) time series. Testing and determination of the processing parameters for this campaign has been completed.

The low fill factor in GONG month 61 results from the upgrade of several of the observing sites to GONG+. Images from GONG+ sites are not included in month 61.

The Classic GONG month 62 images and the GONG+ month 62 images were processed separately to month-long time series and ℓ-ν spectra. In addition, the GONG+ month 63 images were processed to month-long time series and ℓ-ν spectra. These results are being evaluated before being archived and made available for distribution.

During the early weeks of the past quarter, a major computer hardware upgrade was completed that included replacing most of the project's aging workstations. A new SunFire 4800 eight-CPU server with two Terrabytes of disk space and a DLT tape library is now in service. This machine is being used to reprocess GONG Classic data as we implement the automated GONG++ processing pipeline. Steve Wampler and Bret Goodrich are carrying out the design specifications. The pipeline will support the development and production of GONG++ applications and data products.

Data Algorithm Developments (and some science)
Cliff Toner continues to work on several of the basic processing algorithms that are vital to the scientific productivity of GONG. Recently, Cliff has fired up his image-merging code, and he is generating a multi-day time series of merged GONG+ images from the network. He has also improved the algorithm that cleans up the spikes in the time series.

Simon Kras, Rudi Komm, and Rachel Howe are busy going through a multi-taper analysis of all of the GONG Classic time series. Simon is pushing the data through the multi-taper and peak finding steps while Rudi and Rachel check the results, obtain the splittings, and invert the frequencies to infer the solar interior dynamics. The processing of the multi-tapered data provides significantly more (~20%) good fits than the straight periodogram. The picture of the internal dynamics is thus getting sharper, but it is not changing its fundamental character so far. Rachel is also working on the spherical harmonic leakage matrix computation.

Caroline Barban is implementing a new method of fitting the spectra using four measurements: the power spectrum in velocity (*V*), the power spectrum in total intensity (*I*), the phase difference between *V* and *I*, and the coherence between *V* and *I*. This method has been pioneered by Severino et al. (2001, *Astrophys. J.* 561, p. 444). This very promising technique seems to give reliable fitted parameters in regions of the spectrum where the modes are resolved.

Richard Clark is working on an automated bad-image rejection system. He is finding that the GONG instrument makes a pretty good airplane detector, to the point where we can almost identify the aircraft type and estimate its speed! Of course, the real point is to identify the bad images and remove them from the data stream as early in the processing pipeline as possible.

Jeff Sudol continues to work on the problem of measuring the residual optical distortion in the GONG+ images. This is a challenging problem due to the small magnitude of the effect. Jeff is planning to drill a pattern of target holes in metal plate, take a large number of images as the plate is moved in the field of view, and then fit the apparent separations to map the distortion.

Thierry Corbard recently joined the GONG project to work on the GONG++ data analysis. Thierry is experienced with inversions and the analysis of low-degree data. He is about to greatly expand the number of pixels in his life, as his job is to implement several local helioseismology packages.

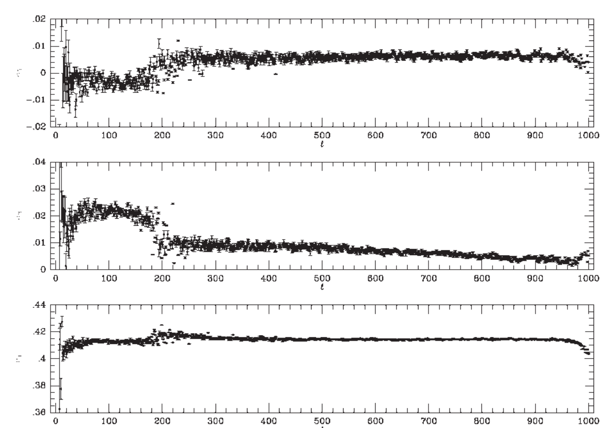


Figure 2:
Odd splitting coefficients generated from a 12-day, 32K point power spectrum computed with full-disk velocity images from three GONG+ sites: Big Bear, Learmonth, and Cerro Tololo. These are *n*-averaged splitting coefficients (in units of μHz), computed using the traditional cross-correlation technique and a wide range of frequencies. Data processed by Perry Rose at USC for Ed Rhodes.

continued

GONG continued

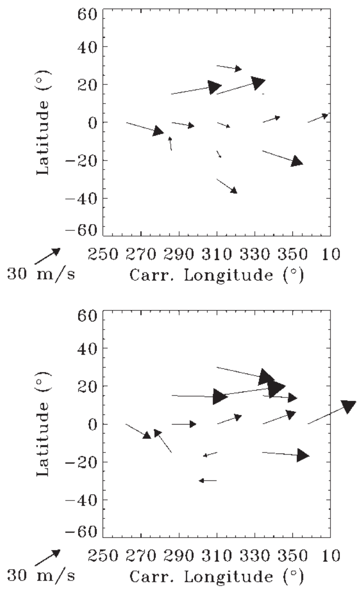


Figure 3:
Deborah Haber [Colorado] and Rick Bogart [Stanford] have produced the first comparison of direction and magnitude of subsurface flows at selected depths inferred from ring diagram analysis of 11 hours of data from MDI (above) and the GONG+ Big Bear instrument (below). Independent analyses were performed for a set of thirteen 15-degree regions centered at the Carrington coordinates of the bases of the arrows representing the flows. These results are from 1-Dimension RLS inversions at a depth of 7.1 Mm. The results have shown excellent agreement in the flow maps at depths below 2 Mm, but discrepancies near the surface. These variations are currently thought to arise from the differing optical distortions in the two instruments, which mostly affect the high-ℓ modes that sample just below the surface.

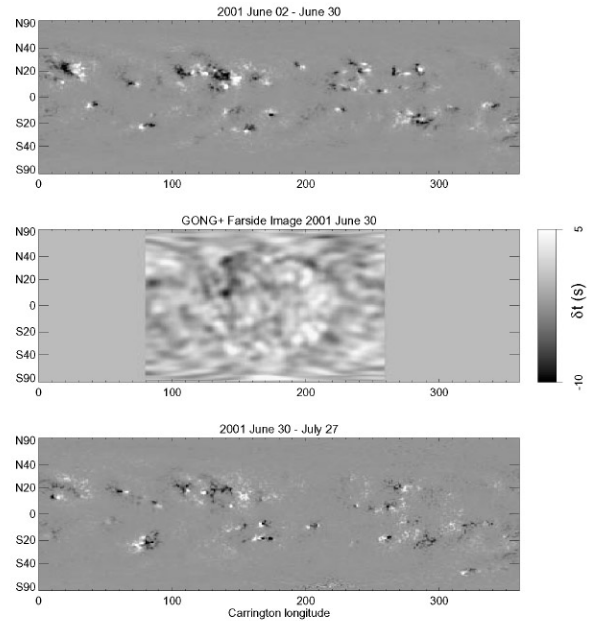


Figure 4:
The first far-side image of the Sun obtained from the GONG+ network. It was computed by Douglas Braun (NorthWest Research Associates) using 19 hours of data on 30 June 2001 and obtained from the GONG+ sites at Cerro Tololo, Big Bear, and Learmonth. The seismic image in the center shows acoustic travel-time perturbations over the entire far hemisphere of the Sun and was obtained using helioseismic holography as described by Braun and Lindsey (2001, *Astrophys. J.* 56, L189). The panels on the top and bottom show synoptic magnetograms for the preceding and following solar rotations. The largest active region in the preceding rotation (at 140 degrees longitude) shows up distinctly while it was on the far side (although with an unusual shape). See *www.colorado-research.com/~dbraun* for more information on far-side imaging and helioseismic holography.

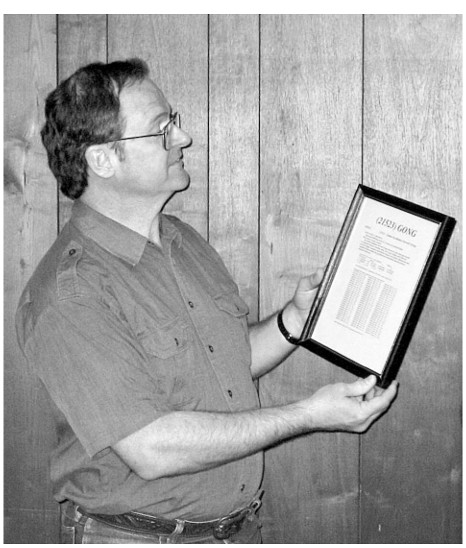


Figure 5:
Minor Body [asteroid] 1998 MW15, discovered on 26 June 1998 by GONG's very own Roy Tucker at his Goodricke-Pigott Observatory, has been assigned the name "(21523) GONG" by the International Astronomical Union's Committee on Minor Object Names…not that we consider ourselves to be a minor object!

Public Affairs & Educational Outreach

New Look For Kitt Peak Visitor Center - Inside and Out

Robert Wilson

If you haven't stopped in the Kitt Peak Visitor Center lately, you might be pleasantly surprised at some of the changes wrought on the outside, and more surprised still at some of the modifications planned for the inside. Some changes have been a long time coming, and others will evolve over time, but the result will be a visitor center worthy of the name and a more effective tool for public outreach.

The most obvious exterior upgrade is the removal of the rock wall that once enclosed the small patio to the south of the visitor center. In its place is a new patio surface with two blue metal benches and three green metal picnic tables. The refurbished patio serves as both a scenic place to relax and enjoy a picnic lunch, and a safer site for participants in our popular public Nightly Observing Program to gather and gaze upward.

Eventually, the patio will be home to a new audio kiosk containing recorded information about the tile mural on the visitor center's exterior. More of these automated kiosks are slated for placement near Kitt Peak's major telescopes, where engraved signs now stand. The kiosks have Plexiglas-covered panels on top, which will hold diagrams of the telescopes discussed in the audio recordings.

Inside the visitor center, at lease one volunteer docent stands ready to greet and assist visitors. Docents are easily identified by the maroon polo shirt with an embroidered logo that all docents are required to wear. NOAO's Public Outreach staff has revamped the docent-training program and stepped up efforts to recruit volunteers. New docents now attend eight weeks of training and all docents are evaluated annually to ensure professionalism and commitment to the program.

At the north end of the inside space sits a newly encased model of a Gemini observatory, which gives visitors a glimpse of the state-of-the-art technology being developed and employed by NOAO and its partners to open the Universe to greater human understanding. A panel on the side of the case displays information about the project and the consortium; a computer to display the CD-ROM virtual tour of Mauna Kea and recent Gemini science images will be added at a later date.

In the darkened northeast corner is the reshaped theater, where videos about astronomy are shown at regular times throughout

continued

Kitt Peak Visitor Center Continued

the day on a wide-screen, high-definition television. New padded benches have been arranged in rows for better viewing comfort.

Visitors who want a first-hand look at the wonders of the night sky have long enjoyed our Nightly Observing and Advanced Observing programs. These will be augmented by new public programs, from an introduction to astronomy as a hobby to instruction on CCD imaging. NOAO Public Outreach also plans to forge relationships with local schools and organizations such as The Girl Scouts to develop programs that will introduce astronomy and science to area youth.

Toward that end, the Visitor Center purchased a new spectroscopy exhibit featuring a hands-on display of six gas-filled tubes and two diffraction gratings. In addition, the Sun-viewing coelostat is scheduled for major repairs, and once back in place, will provide the centerpiece for a display on solar activity. Finally, visitors in September 2002 will experience the power of the Sun through the traveling Space Weather Mini-Exhibit developed by the Space Science Institute and NASA's Goddard Space Flight Center. This temporary rented exhibit will be on display for 12 weeks.

All these changes have one central purpose: to better help visitors explore their Universe through the science of astronomy. The next time you visit Kitt Peak, or even Tucson, come on out to the Kitt Peak Visitor Center. We have a lot to show you.

The newly encased model of a Gemini observatory in the Kitt Peak Visitor Center.

Educational Outreach Update

Suzanne Jacoby & Connie Walker

Teacher Leaders in Research Based Science Education (TLRBSE) is an NSF-funded Teacher Enhancement Program hosted by NOAO. Consistent with national priorities in education, TLRBSE seeks to retain and renew middle and high school teachers of science and mathematics. Within the exciting context of astronomy, TLRBSE integrates the best pedagogical practices of Research Based Science Education with the process of mentoring. TLRBSE consists of a distance learning course, two-week summer institute, and year-round support for participants.

The inaugural TLRBSE distance learning course began in mid-January with participants learning to navigate the WebCT environment and build an online community. Coursework in leadership skills, astronomy content, and inquiry-based pedagogy will unfold over the next 16 weeks. Students receive three hours of graduate credit from the University of Arizona for successful completion of the distance learning course and the summer institute.

Four nights of telescope time have been scheduled concurrently on the NOAO 2.1-meter, WIYN 0-9meter, and RCT 1.3-meter telescopes on Kitt Peak in support of the TLRBSE summer institute in July 2002. Half the group will

continued

Outreach Update Continued

explore nighttime research projects on Kitt Peak while the other half travels to NSO/Sac Peak for solar observations.

Arrangements have been made for a TLRBSE Exhibit and Exhibitor Workshop at the March 2002 National Science Teachers Association (NSTA) meeting in San Diego, CA. Annual meetings of the NSTA typically draw up to 20,000 attendees from across the country and provide a stimulating environment to discuss science education topics.

Astronomer mentors are needed to work with TLRBSE teachers when they return to their home schools after the summer institute. The following 20 middle school and high school teachers from around the country have been selected to participate in the 2002/2003 TLRBSE program. If you have an interest in mentoring a TLRBSE teacher near you, please contact Suzanne Jacoby (*sjacoby@noao.edu*) or Connie Walker (*cwalker@noao.edu*).

Jeff Adkins, *Deer Valley High School*, Antioch, CA
Mary Bishop, *Saugerties High School*, Saugerties, NY
Dorothy Bowman, *Shady Spring Elementary Gifted Center*, Shady Spring, WV
Robert Carroll, *Lexington High School*, Lexington, SC
Andrew Cohen, *Charleston Co. Regional Math/Sci Hub*, Charleston, SC
Nancy Crotty, *G.L. Edwards Middle School*, Conyers, GA
Stanley Gann, *Lakeside High School*, Hot Springs, AR
Eric Goff, *Union Educational Complex*, Mt. Storm, WV
Anthony Maranto, *St. Marks School*, Southboro, MA
Joy Martin, *Columbus Tustin Middle School*, Tustin, CA
Debbie Michael, *East Lincoln High School*, Denver, NC
Rick Norman, *Wall Junior High School*, Wall, TX
Betty Paulsell, *Pioneer Ridge Science Ed Center*, Independence, MO
Robert Quackenbush, *Riverside High School*, Durham, NC
Steve Rapp, *Linwood Holton Governor's School*, Abingdon, VA
Daphne Richmond, *Mountainburg Middle School*, Mountainburg, AR
Jeffery Sayers, *Northview High School*, Brazil, IN
John Schaefers, *Ingomar Middle School*, Pittsburgh, PA
Babs Sepulveda, *Lincoln High School*, Stockton, CA
Penny Welbourn, *Berne Knox Westerlo CS*, Berne, NY

The follow-up workshop for Project ASTRO-Tucson partners was held at David Levy's home-based observatory in Vail, AZ, on February 17. Workshop highlights included sunspot observing techniques, where the Sun sets on the horizon, the phases of the Moon and other wonders of the night sky. Many Tucson Amateur Astronomy Association members and Project ASTRO-Tucson astronomer partners volunteered their time and their telescopes. Instructional hands-on classroom activities showed the 3rd -5th grade teachers how to make constellations in empty film canisters, while 6th-9th grade teachers kinesthetically discovered "The Reasons for Seasons" from the activity book, *The Universe at Your Fingertips*.

Educational resources for nine Project ASTRO activities have been replenished, reorganized, and listed in the ASTROgram newsletter, making them more easily accessible by teachers on a check-out basis. In addition, further improvements were made to NOAO Educational Outreach web pages.

NOAO Educational Outreach has extended Project ASTRO to a bilingual charter school in Nogales, AZ, and soon to Sierra Vista through the Huachuca Astronomy Club and the University of Arizona South. NOAO Project ASTRO astronomers have visited various local schools including the Arizona School for the Deaf and Blind. Plans are being made for our annual participation in Camp ACCESS, a summer program for handicapped challenged children, as well as in SARSEF, the Southern Arizona Regional Science and Engineering Fair. Educational Outreach went international in sending one of its products, a portable solar telescope, to a school in Costa Rica for a solar eclipse.

A New Kind of Journal

Sidney C. Wolff (NOAO) & Andrew Fraknoi (Foothill College and Astronomical Society of the Pacific)

We are pleased to announce the founding of a new – and new kind of – journal for people engaged in astronomy and space science education. The Astronomy Education Review (AER) will be an on-line journal and archival Web site, publishing:

- Peer-reviewed papers on astronomy education research (and discussions of how to apply that research to classroom situations)
- Short reports on innovative techniques, approaches, activities, and materials
- Annotated lists of useful resources (print, audio-visual, and electronic)
- Brief announcements of opportunities (funding, cooperation, meetings, employment, etc.)
- Editorials, opinion pieces, critical reviews, and discussion.

More information about the journal can be found on the Web at *aer.noao.edu*.

The first issue, currently under development, will include a major article by Gina Brissenden, Timothy Slater, and Robert Mathieu on “The Role of Assessment in the Development of the College Introductory Astronomy Course: A ‘How-To’ Guide for Instructors.” It describes various methods for doing assessment and relates the methods of assessment to student learning.

We will also publish a survey of introductory astronomy textbooks by David Bruning to help you in making your selection for next semester. We have received a number of other articles, book reviews, and news items, and will be posting them as soon as they are refereed (for research articles) or reviewed by one of the editors.

At a time when there is increased emphasis on education and outreach in astronomy and space science, our field very much needs a way to encourage and archive communication among those actively involved in this valuable work.

Since neither the existing research journals nor the popular astronomy magazines serve this role, a new publication is clearly needed. The creation of this journal has been endorsed by both the American Astronomical Society and the Astronomical Society of the Pacific.

We welcome suggestions about the project and contributions to any of the sections of the journal. Please send your input to the editors at *aer@noao.edu*.

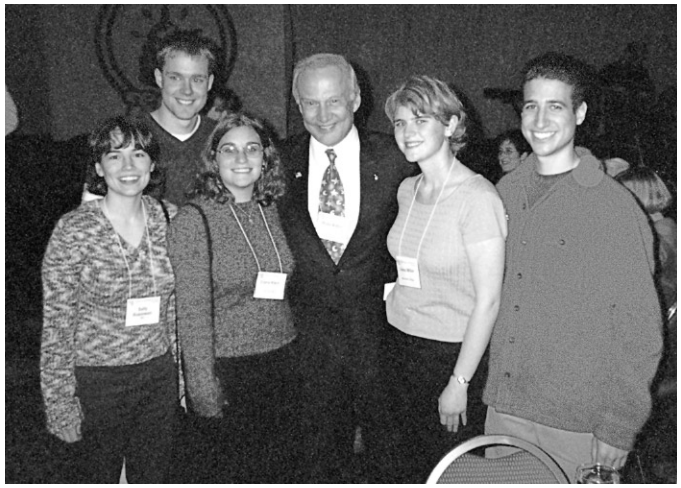
In Brief

NOAO public affairs had a **strong presence at the January 2002 meeting of the American Astronomical Society** in Washington, DC. Astronomy news based on adaptive optics-related discoveries from Gemini North was the centerpiece of the main press briefing on the first day of the meeting, which included compelling presentations by Ray Jayawardhana of the University of California-Berkeley and Michael Liu of the University of Hawaii. This briefing produced widespread media coverage, including page A3 of the *Washington Post* and two later stories in the *New York Times*. [See related story in Science Highlights, pg. 5.] Two staff members from the NOAO Educational Outreach group attended the meeting, and both Project ASTRO and TLRBSE programs were featured as poster presentations. Colorful new exhibit posters highlighted engineering progress on the Large Synoptic Survey Telescope and the US Gemini Program.

The Kitt Peak Visitor Center hosted a double-sized group (35 people) for its Nightly Observing Program on the night of the **Leonids meteor shower**. A Project ASTRO classroom that gathered to watch the Leonids was covered by local Tucson KGUN-9 ABC-TV news.

NOAO Public Affairs produced a **new two-page fact sheet on the economic impact of NOAO and NSO** on Tucson and Arizona, which received its first use in a series of handout packets given to Capitol Hill staff in Washington. Contact Public Affairs Manager Doug Isbell to obtain a copy (*disbell@noao.edu*).

The **2002 Research Experiences for Undergraduates (REU) program at CTIO** is in full swing, with four US students and three Chilean students in the parallel Program of Investigation in Astronomy (PIA), plus one US student who is studying for a year in La Serena as an exchange student. For more details, see *www.ctio.noao.edu/REU/ctioreu_2002/REU2002.html*.



Students from the KPNO Research Experiences for Undergraduates (REU) program class of 2001 were thrilled to meet Apollo 11 astronaut Buzz Aldrin at the banquet during the January 2002 meeting of the American Astronomical Society in Washington, DC.

From left to right, the photo shows Sara Robinson, Daniel Wik, Elana Klein, Dr. Aldrin, Melissa Miller, and Matthew Grabelsky.

Notable Quotes

Is This the World's Best Joke?
British researchers say they've identified the world's funniest joke.

The Laughlab, at www.laughlab.co.uk, was created by Richard Wiseman of the University of Hertfordshire in England for what he calls the most comprehensive study ever on the psychology of humor.

Since it was launched in September [2001], the site has collected more than 10,000 jokes and ratings from 100,000 people in 70 countries. The following joke received the highest rating from 47% of people who participated:

Sherlock Holmes and Dr. Watson are going camping. They pitch their tent under the stars and go to sleep. Sometime in the middle of the night, Holmes wakes Watson up: "Watson, look up at the stars, and tell me what you deduce."

Watson says, "I see millions of stars and even if a few of those have planets, it's quite likely there are some planets like Earth, and if there are a few planets like Earth out there, there might also be life." Holmes replied: "Watson, you idiot, somebody stole our tent."

-- Washington Post, December 31, 2001