

# K P N O O P E R A T I O N S

From the KPNO Director—

## WIYN Telescope Comes Closer to Full Potential

*Richard Green*

The WIYN SAC and Board assembled for their semi-annual meetings at Indiana University on October 22<sup>nd</sup> and 23<sup>rd</sup>. The theme was that the current level of base operations support of the Observatory is now at a successful equilibrium. That success is reflected in performance, reliability, and steady progress on new instrumentation. Continuing attention to the WIYN telescope system has produced a continuing improvement in delivered image quality (DIQ). While the median remains at an impressive 0.8", a DIQ of 0.6" or better is achieved 18% of the time. (For reference, the site-delivered median DIQ is ~0.66"). The 23 Hz oscillation of the secondary mirror support, that could elongate images by as much 0.2", has been completely eliminated by improvements to the damping. Another decrease to the local contribution to image distortion is attributable to improved uniformity of primary mirror temperature, by painstaking sector-by-sector recalibration, and tuning of the thermal control system. Finally, improvements to the focus algorithm and its ultimate automatic implementation will both improve the DIQ and save observational overhead.

Even more impressive is the year's average downtime statistic—only 2.5% of time that could have been used for observation was lost to failure. This represents a full factor

of two reduction from the previous year's value. The main factor is improved robustness in the complex telescope control software. The typical night-to-night figures are actually better yet, since the average was increased by two significant events during the year—a primary mirror support system failure and a required rework of the cable-wrap "maypole" on the azimuth axis.

Meanwhile, progress is being made on new instruments and upgrades. The Mini-Mosaic imager was successfully used in a shared-risk trial in mid-October, and is expected to be fully commissioned and routinely available by January. This imager contains two of the same SITE 2K×4K CCDs as in the NOAO Mosaic Imagers. It will provide larger field of view and better sampling at the imaging port. The WIYN Tip/Tilt Module has made steady progress as well, with most system trades complete and designs moving into the detail stage. Because we had an unfilled Mechanical Engineer position for almost six months, there has been some delay compared to the most optimistic schedule, but we still anticipate full-time use by 2001. In addition, the University of Wisconsin is moving forward with a Cassegrain instrument adapter, which will accommodate Densepak fiber cables without requiring removal of the imager. It should be ready in time to allow imaging while the Instrument Adapter System is off the telescope to be refitted for the WTTM in early 2001.

*continued*

These improvements are the accomplishments of the many individuals invested in the success of WIYN. Charles Corson has assumed the job of Site Engineer and has been able to devote considerable time to the diagnosis and solution of issues such as the primary mirror thermal non-uniformity and focus. Although the dedicated software engineer, Jeff Lewis, left us earlier this year, Bob Marshall, Shelby Gott, and David Mills have stepped up to understand and substantially improve the control system. As always, the Consortium greatly appreciates the effective efforts of David Sawyer, the WIYN Operations Manager, backed up by Tony Abraham and the KPNO Engineering Team.

The origin of the enhanced effort is the decision by the WIYN Board to increase its annual commitment

to the WIYN operations budget. That amount now includes 7.6 FTE of effort, raised from the 6.5 FTE called for in the original agreement, and an additional \$100K for capital items and contract efforts. The direct translation of resources into improved performance has been gratifying to the whole Consortium.

Finally, I note a change in NOAO's representation to the WIYN Consortium. Bob Mathieu of the University of Wisconsin has stepped down as Chair of the SAC to become President of the Board. Abi Saha will replace him as SAC Chair. After more than 10 years of service, Caty Pilachowski has stepped down from her role as Board Secretary, to be replaced by Taft Armandroff. The Board noted its gratitude to Caty with the following resolution:

*The WIYN Board of Directors, on behalf of the entire Consortium, expresses its gratitude and appreciation for the service contributions of Dr. Caty Pilachowski. Caty was one of the original WIYN negotiators, back in the days when all we had to go on was a mirror blank, some travel money, and dreams of a telescope. It was clear early on that Caty brought a hard-nosed perspective to our deliberations. Her tenure as Board member and Secretary from 1989 to 1999 has been an important contribution. With her departure, WIYN truly loses a major part of its institutional memory. Like the minutes of the preceding Board meetings, one of Caty's essential roles on the Board was to remind us of things we needed to remember, whether pleasant or not. Caty was one of WIYN's indispensable people, and she has left upon WIYN the imprint of her own unique blend of quiet delight and seriousness of purpose. Hopefully, the WIYN Consortium has become mature enough now to survive without her. To quote Caty's own words, although she will no longer be present at our meetings, we should think of her "instead, happily doing science with WIYN data." She has not left WIYN, she is using it!*



## NOAO Wide-Field Infrared Imager Project

*Dick Joyce*

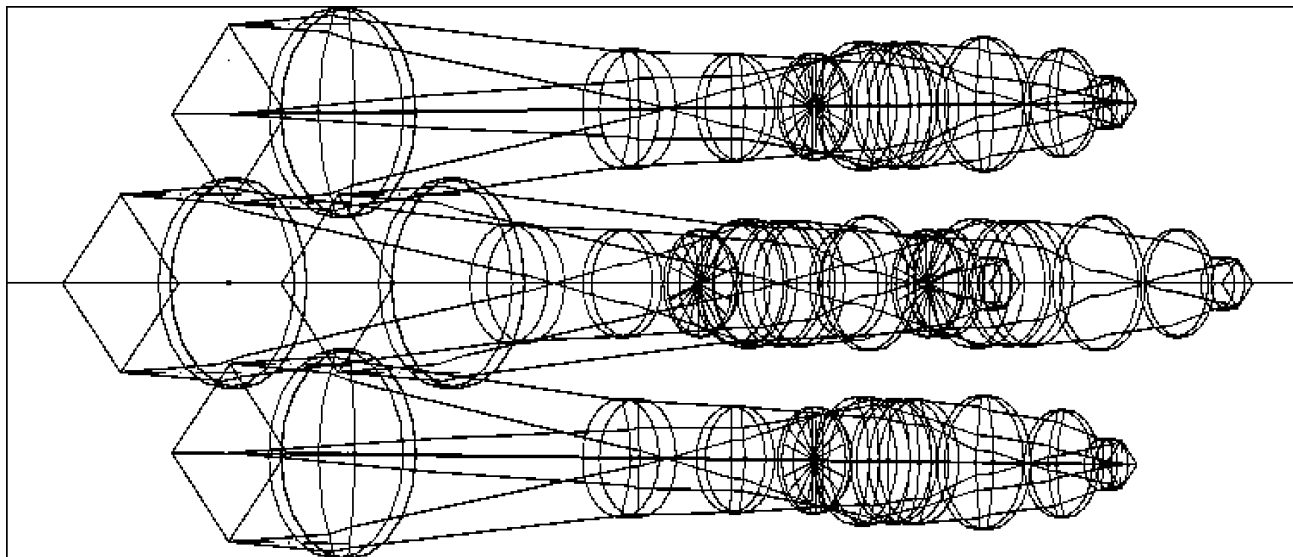


Figure 1. The current conceptual design of the NOAO Extremely Wide-Field IR Imager (NEWFIRM) consists of four identical IR imagers with 15' field of view supported on a central optical bench.

**W**ide-field imaging—both in the optical and infrared—is a long-term, key element in the research capability of Kitt Peak National Observatory. We have initiated a concept study of the next generation IR imager to complement that in the optical provided by 'Mosaic.' Up-to-date information on the NOAO Extremely Wide-Field IR Imager (NEWFIRM) is available on the NEWFIRM web page, which can be reached from the NOAO Home Page, <http://www.noao.edu>.

The development of wide-field imaging has been a consistent component in the KPNO long-range instrumentation plan. The need for wide-field IR imaging capability was highlighted in the USGP Workshop on Supporting Capabilities for Large

Telescopes, in which it was identified as a critical element in a large number of potential scientific programs to complement observations on 8–10 meter class telescopes. This capability is also crucial for limited survey programs to a much greater depth than provided by surveys such as 2MASS and for ground-based support of space missions such as Chandra and SIRTf.

Based on the results of the Supporting Capabilities Workshop and through internal discussions, we have formulated the following baseline specifications for NEWFIRM:

- Equivalent field of view of 30' square on the KPNO 4-m.

*continued*

- Pixel scale in the range 0.3–0.5“.
- Wavelength coverage 0.9–2.4  $\mu\text{m}$ .
- Narrow-band (1 %) imaging capability.
- High throughput.

The first two requirements suggest a 4K $\times$ 4K detector format. IR detectors in this format do not yet exist, nor are they envisioned for the near future. A monolithic all-transmissive instrument of this size would require optical elements that may be unobtainable. Our initial approach is to investigate an open mosaic of four 15' FOV imagers, which keeps the optics to potentially feasible dimensions and avoids the issue of generating a close mosaic of IR arrays.

Our goal is to complete the conceptual study of the baseline configuration during FY 2000. Additional features such as grism spectroscopy, performance at longer wavelengths, and use on the KPNO 2.1-m

telescope will be evaluated as well. Such additions will be weighed against the additional cost and possible compromise of the baseline specifications outlined above. We will post status updates on the WWW as the opto-mechanical study progresses.

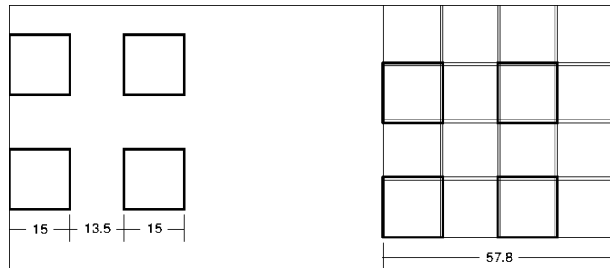


Figure 2. The “open mosaic” concept of NEWFIRM covers an area of 0.93° by taking four telescope positions of four 15' fields in one exposure. Offsetting each telescope position by 14.25' will allow sufficient overlap of the fields, which are separated by 13.5', for registration.

## Hector Rios Wins 1999 Southern Arizona Outstanding Employee Award

*Richard Green, John Scott, John Dunlop, and Sandra Abbey*

**A**t an impressive awards luncheon at the Westward Look Resort on August 9, KPNO's Hector Rios won the Outstanding Employee Award for 1999. The award was given by the Southern Arizona Indian Workforce Development Council, and was supplemented by a scholarship from Pima Community College. *The Arizona*

*Daily Star* subsequently ran a front-page report on Hector and his accomplishments.

The nomination that was submitted for Hector tells the story: When Hector started working for the Observatory, he had little formal training. He was initially hired in 1973 as an entry-level custodian.

*continued*

Over the next few years he worked very hard to increase his skills and knowledge, and was promoted to a lead position in 1978. Hector continued to expand his skills through his own initiative, outside training, and on-the-job training. In 1988 he joined our Mechanical Maintenance group as a Crafts Helper. Here he became involved with the maintenance and improvement projects for the various telescopes and equipment on Kitt Peak. Hector continued to increase his skills in the trades and learned mechanical maintenance, welding, pipe fitting, equipment operations, and so forth. Hector was promoted to a Craftsperson position in 1993 and is now the primary 50-ton overhead crane operator within the 4-meter telescope structure. He is a key member of the mechanical crew and his extensive knowledge of the observatory facility has enhanced the entire crew's abilities.

Hector also serves as a role model for many employees. His pleasant "can-do" attitude enables Hector and his crew to complete varied and challenging projects. He has participated in several

major telescope improvement projects during his career. His crane operation skills have been critical to the removal and reinstallation of the 4-meter primary mirror for periodic maintenance.

Hector has an innate ability to get along with all people and treat everyone with respect. He is extremely intelligent, but very humble and modest about this. Hector has a wonderful sense of humor that is never deprecating and always appreciated by his co-workers and supervisors. (Example: The Director decided that the mechanical crew should wear hardhats during the entire summer shutdown. The next day, Hector appeared at work with a cowboy-hat-shaped hardhat, just to add a little style.) Additionally, Hector has been a cattle rancher on the Tohono O'odham Reservation for most of his life and is a respected member of his District.

We are grateful to Hector for his many years of dedicated service to the Observatory, and congratulate him once again for this well-deserved honor.

---

## Y2K Is Not A Problem at Kitt Peak

*Bob Marshall*

If anyone should care about the century, astronomers should. Accuracy in pointing a telescope requires absolute knowledge of the year. Two digits just don't work; but shortcuts in writing telescope control software—particularly the venerable FORTH system—may have been taken over the years. Our Y2K review is complete and we are ready for the Year 2000 to begin.

Testing for the Y2K problem at Kitt Peak began in July of 1997 with the verification of the WWV-based IRIG-B time signal hardware and software.

Individual telescopes were tested this past spring. During the 1999 Summer Shutdown, a mountain-wide test looked at the telescope and instrument control, all the computers and networks, and the time signal hardware as a system.

No problems were found with the main calculation codes for the Telescope Control Systems, but some changes were needed where date input routines used two digits. We were able to track and guide with no problems with dates set into next year. Most of the instrumentation software did not have a reliance on

*continued*

dates. However, we did have to update FITS keyword routines to handle the Year 2000 changes in the FITS standard that took effect this year. See <http://www.cv.nrao.edu/fits/documents/standards/year2000.txt> for information on the FITS update. Most of the computers required operating system patches for Year 2000 problems. For the mountain networks, a new Cisco router was installed, as the previous one was not certified for Year 2000. The

network router at WIYN needed a new firmware version.

The KPNO telescopes will be closed on 31 December 1999 to allow our staff to celebrate the last year of the millennium, with a T&E night scheduled for 01 January 2000 to ensure that we have correct operation and that visiting astronomers will not have to fly on the first day of the Year 2000.

---

## The 1999 and 2000 REU Programs at Kitt Peak National Observatory

*Buell Jannuzi*

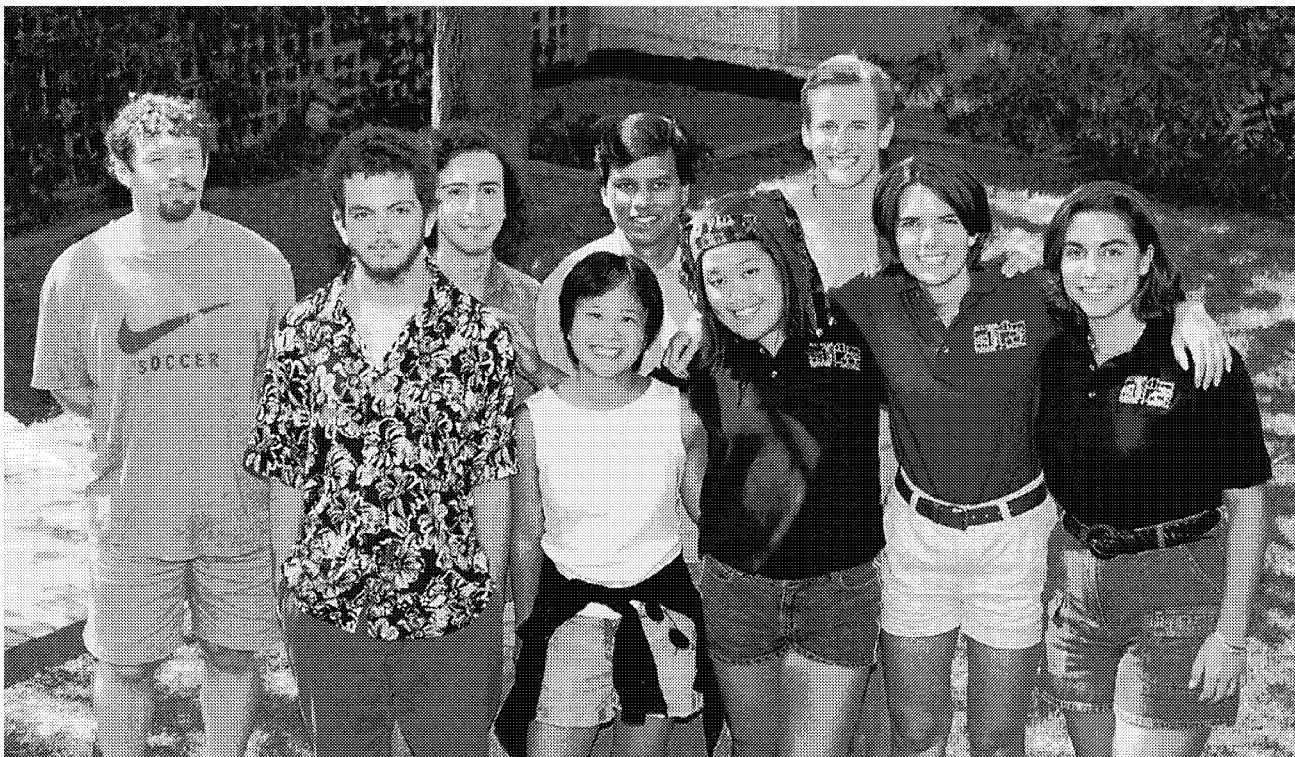


Figure 1. The summer of 1999 saw nine undergraduates come to Tucson as participants in the KPNO REU program. Shown are (left to right), Robert Comstock (Central Washington), Benjamin Jones (Utah), Aaron Einbond (Harvard), Jacqueline Chen (Yale), Proteep Mallik (Oregon), Felicia Tam (Stanford), Nick Mostek (Iowa State), Rachel Parks (North Park), and Cynthia Gomez-Martin (South Florida).

Every summer KPNO is fortunate to have a group of talented college students come to Tucson to participate in astronomical research under the sponsorship of the National Science Foundation's Research Experiences for Undergraduates Program. The program provides an exceptional opportunity for undergraduates considering a career in science to engage in substantive research activities with scientists working in the forefront of contemporary astrophysics. Each REU student is hired as a full-time research assistant to work on specific aspects of major on-going research projects at KPNO. As part of their research activities, REU students gain experience with KPNO's telescopes and develop expertise in astronomical data reduction and analysis.

During the summer of 1999, nine students participated in the KPNO REU program and worked on a wide range of topics. In addition, they participated in a weekly lecture series, several observing runs with telescopes on Kitt Peak, and a "field trip" to visit both NRAO's VLA and NSO's Sacramento Peak Observatory.

At the end of the summer, the students shared their results with the Tucson astronomical community by giving oral presentations describing their research. Most of these students will be attending the January 2000 AAS meeting in Atlanta thanks to the REU program, and we encourage you to stop by their posters and attend their talks. Their end-of-summer presentations and advisors are listed below:

**Jacqueline Chen (Yale University):** "*A Survey for Dwarf Galaxies in the NGC 3109/Antlia Group,*" Taft Armandroff & George Jacoby

**Robert Comstock (Central Washington University):** "*Constraining Observational Interpretation of Cometary Rotational States Using Numerical Simulations,*" Nalin Samarasingha & Beatrice Muller

**Aaron Einbond (Harvard University):** "*Stellar Kinematics of the Outer Spiral Arm of the Galaxy,*" James Rhoads

**Cynthia Gomez-Martin (University of South Florida):** "*Understanding the Evolutionary History of the Draco Dwarf Spheroidal Galaxy,*" Ken Mighell

**Benjamin Jones (University of Utah):** "*Paschen- $\beta$  and H- $\alpha$  Line Emission and Extinction Maps of Four Galaxies,*" Sangeeta Malhotra

**Proteep Mallik (University of Oregon):** "*Reexamining Variables in M3,*" Abi Saha (Mr. Mallik Participated in the REU program activities, but was funded from an alternative source of non-NSF funds.)

**Nick Mostek (Iowa State University):** "*New M31 Globular Clusters and IR Data Reduction,*" Jay Elias

**Rachel Parks (North Park University):** "*Investigation of Optimal Aperture Size for the Next Generation Optical Spectrograph,*" Sam Barden

**Felicia Tam (Stanford University):** "*Radio Sources in the NOAO Deep Wide-Field Survey,*" Arjun Dey and Buell Jannuzi

We expect to be able to have six REU positions available for the summer of 2000.

Participants must be citizens or permanent residents of the United States. The positions are full-time for 10 to 12 weeks between May and September, with a preferred starting date no later than early June. A salary of \$345 per week and funds to cover travel to and from Tucson are provided. Completed applications including applicant information, official transcripts, and letters of recommendation are to be submitted to KPNO no later than 21 January 2000. Additional information and application forms are available from <http://www.noao.edu/kpno/reu>.



## **KPNO Improvement Projects for FY2000**

*Bruce Bohannon, Tony Abraham, and Richard Green*

Improvement projects for Fiscal Year 2000 mark a transition from work at the Mayall 4-m directed at improving the delivered image quality (DIQ) to starting a similar program at the 2.1-m. In looking at the less than 3.5 FTE we now have available for projects after setting aside time for basic operations, maintenance, and response to failures, it is no wonder our ambitions take several years to achieve.

For our on-going program to improve the DIQ at the Mayall 4-m, this year we expect to finish the improved 4-m primary mirror cooling system, complete commissioning of the active control system of the 4-m primary (the 4mAPS), and install a wavefront camera for the Cassegrain focus that will enable wavefronts to be taken on a nightly

basis. At the 2.1-m we plan to upgrade the servo system to eliminate the oscillation in hour angle that causes elongated images. Other work on the DIQ at the 2.1-m has been proposed, but has been given a lower priority so that we might complete the most important work that will show immediate gains.

Other projects initiated this year include replacing our aging electronic guiders with those designed by CTIO, installing a seeing monitor patterned on that developed by ESO, and prototyping a data reduction computer based on PC hardware. We are also upgrading the 4-m aluminizing facility by moving the chamber into a "room" built in the main floor of the Mayall building so that we will have a cleaner environment in which to coat mirrors.

