# NOAO Newsletter - December 1993 - Number 36

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## NOAO Highlights!



## Director's Office



## Cerro Tololo Inter-American Observatory



## Kitt Peak National Observatory



## National Solar Observatory



## Global Oscillation Network Group

### US Gemini Program



### Central Computer Services



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*Comments concerning this Newsletter are welcome and will be forwarded to the appropriate editors.*


# Large Scale Structure from Brightest Cluster Galaxies (1Dec93)


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Large Scale Structure from Brightest Cluster...(1Dec93)
Galaxies
(from NOAO Highlights!, NOAO Newsletter No. 36, 1 December 1993)

We measure how our local group of galaxies is drifting through space from radial velocities and distances of distant clusters of galaxies in several directions. Such studies have suggested the existence of a "Great Attractor," a concentration of mass thought to lie in the direction of the Hydra-Centaurus supercluster, whose gravity causes a bulk flow of material toward itself. Bulk flows of galaxies are expected as a natural consequence of the large scale structure of the Universe. The amplitude of the flows as a function of spatial scale offers information on the power spectrum of the mass distribution in the Universe, and thus can potentially discriminate between the various theories of formation for both large scale structure and galaxies themselves. For many years bulk flow associated with the Great Attractor defined the largest structural scale known in the Universe.

[Figure not included]

More recently astronomers have begun to examine larger volumes of space to search for structure on even larger spatial scales. Work using the KPNO 4-m and 2.1-m telescopes and the CTIO 1.5-m telescope by T.R. Lauer (NOAO) and M. Postman (STScI) suggests that bulk flows continue over distance scales nearly three times larger than the previously known limit of 6000 km s-1. They used photometry of brightest cluster galaxies (such as the one in A3526, shown on the cover) to derive distances for 119 clusters of galaxies and to measure the space velocity of the Local Group with respect to an inertial frame comprising all Abell galaxy clusters within 15,000 km s-1 redshift. The goal of the Lauer-Postman survey was to see if the motion of the Local Group measured with respect to the Abell clusters was consistent with that inferred from the dipole anisotropy of the cosmic microwave background. This is thus a direct test to see if the large-scale bulk flows of galaxies seen by other investigators on smaller scales finally damp out at much larger distances. Surprisingly, Lauer and Postman find that the Local Group motion inferred from the Abell cluster sample strongly differs from that inferred from the dipole of the cosmic microwave background. An obvious interpretation is that the entire volume probed by the clusters is itself streaming with a velocity of nearly 700 km s-1. In short, Lauer and Postman did not detect the flow convergence scale, and conclude that bulk flows of galaxies continue to much larger scale than previously expected. The result of the Lauer-Postman survey is intriguing as it implies more power on larger scales than is predicted by any theoretical model, and thus offers a powerful probe into the formation of the largest structures in the Universe.

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# Flows and Structures in Star Forming Regions (1Dec93)

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Flows and Structures in Star Forming Regions (1Dec93)
(from NOAO Highlights!, NOAO Newsletter No. 36, 1 December 1993)

Much of recent work in the field of star formation has concentrated on examining the mechanisms of interaction between newly formed stars and the molecular cloud from which they formed. Structures are indeed present in the molecular cloud once stars form, but the state of the cloud, whether homogeneous, highly structured, or somewhere in between, prior to the start of star formation is uncertain. Once star formation begins, mechanisms such as shocks, infall, winds and mass outflow, and the radiation of the star itself interact with the molecular cloud, both producing structure and changing the thermal state of the medium. Regions of bi-polar flow and lenticular structures such as disks can be identified near newly formed stars of solar mass or larger. Changes in the thermal state of material near newly forming stars also modify or eliminate the cooling mechanism needed for star formation itself. In a cool molecular cloud, far infrared emission from molecules, neutral atoms, and possibly grains can remove the heat generated by the star formation process. When the molecules and grains are destroyed and the atoms ionized, these initial cooling mechanisms are reduced or eliminated, but others must arise to allow the process of star formation to continue.

The interaction between newly formed stars and the surrounding medium can have a profound effect on the process of star formation itself. How is the process of star formation regulated? Does the interaction trigger or inhibit formation of stars in different mass ranges? The regions of photo-dissociation near newly forming stars may provide such mechanisms, and a clear understanding of the physics of photo-dissociative regions is critical to understanding star formation. In external galaxies, particularly starburst galaxies, photo-dissociative regions may dominate, or be the only regions accessible to observation. The interpretation of such observations must depend on a clear understanding of photo-dissociative regions in the Milky Way.

[Figure not included]

A clearer understanding of the interaction between newly forming stars and the interstellar medium is beginning to come from observations of bright, nearby regions of active star formation such as M17 (the Horseshoe Nebula, shown at 3.3 fm in the picture) and M42 (the Orion Nebula). Infrared images obtained by I. Gatley and M. Merrill (NOAO) with new, large format array detectors and instruments such as COB and SQIID help to reveal the structural and thermal state in the material from which stars are forming. Diagnostic features available with this instrumentation include Brackett series hydrogen recombination emission strengths to map the distribution of, and extinction to, the ionized gas; molecular hydrogen emission line ratios to map the distribution and excitation of the molecular gas; and images at 3.3 fm at the emission band normally attributed to poly-aromatic hydrocarbons to trace the dust emission. Together these features trace the dense ionization fronts in the nebulosity surrounding young stars, revealing the structure and state of the gas and dust. The excitation mechanism of the molecular gas, whether UV fluorescence or mechanical shock from stellar winds, can also be determined from these diagnostics. Of further concern is the effect of patchy extinction on the on the line ratios used to deredden unresolved star forming regions in external galaxies.

A series of related high resolution spectroscopic studies have been carried out by C.R. O'Dell (Rice U.) and his collaborators (H.O. Castanada (Inst. Astrofisica de Canarias), D. Meyer (Northwestern U.), and M.R. Jones, Z. Wen, and D.K. Walters (Rice U.)). Coude Feed spectra across the face of the Orion nebula have revealed the presence of multiple emitting layers. When these are combined with 21 cm radio data, maps of the interstellar extinction, and new absorption line spectra of the associated bright stars, a detailed three dimensional picture of the region emerges. The nebula is revealed to be a thin layer imposed near the front of the Orion Molecular Cloud. A thin layer of neutral material from the molecular cloud also lies in front of the entire region.

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# A Spectroscopic Indicator of Type Ia Supernova Luminosities (1Dec93)

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A Spectroscopic Indicator of Type Ia Supernova...(1Dec93)
Luminosities
(from NOAO Highlights!, NOAO Newsletter No. 36, 1 December 1993)

Due to their extreme luminosities at maximum light, type Ia supernovae (SNe Ia) have long been considered among the most attractive cosmological standard candles. Although nearly all work to date has been devoted to attempts to use these objects to determine the local rate of expansion of the universe (Ho), SNe Ia also provide one of the few direct techniques for measuring the deceleration parameter qo. However, in a recent study of nine well-observed events based largely on data obtained at CTIO, M. Phillips (CTIO) found clear evidence for a significant intrinsic dispersion in SNe Ia absolute magnitudes amounting to ~0.8 mag in B, ~0.7 mag in V, and ~0.5 mag in I. Such a range in peak luminosity could introduce a substantial Malmquist bias into searches for distant (z &gt = 0.3) SNe Ia which, if uncorrected, could lead to an erroneous value of qo.

Phillips suggested two possible solutions to this problem. For reasons not yet clearly understood but perhaps hinting of opacity differences or a range of ejected masses, the absolute magnitudes of SNe Ia at maximum light appear to correlate strongly with the initial decline rate of the B light curve, with the slope of the correlation being steepest in B and growing progressively flatter in V and I. Hence, by measuring the decline rate during the first 2-3 weeks following maximum, it should be possible to associate an appropriate absolute magnitude with any particular event.  Alternatively, Phillips suggested that measurements be restricted to the I or near- infrared (JHK) bands where the slope of the peak luminosity-decline rate correlation is relatively flat. However, both of these solutions are difficult to apply to distant SNe Ia.  Measuring an accurate initial decline rate requires catching the supernova at or before maximum, and then sampling the light curve frequently during the first 15-20 days following maximum~a difficult feat for relatively nearby SNe Ia, much less for faint distant ones.  Observing in the near-infrared will also be a challenge since the contrast between the supernova and its host galaxy is much less than it is at blue wavelengths. Since it will be necessary to obtain spectroscopic confirmation of distant SNe Ia candidates in order to distinguish them from other types of luminous supernovae, a more practical solution to the Malmquist bias problem would be to find an accurate spectroscopic indicator of peak luminosity.

[Figure not included]

In his original study, Phillips called attention to certain features of the optical spectra of SNe Ia which appeared to correlate with decline rate---and, hence, with absolute magnitude.  Using spectroscopic and photometric observations obtained in the course of the Calan/Tololo Supernova Survey, M. Phillips, M. Hamuy (CTIO), N.  Suntzeff (CTIO), and J. Maza (U. of Chile) have now confirmed that the most promising of these spectroscopic indicators, the intensity ratio of the Si II l5979 and l6355 absorption features, does indeed correlate tightly with initial decline rate and with absolute magnitude. If a spectrum can be obtained within approximately +-5 days of B maximum, this study indicates that a measurement of the Si II l5979/l6355 intensity ratio can predict the absolute magnitude of the event to a precision of &lt =0.3 mag. Further observations of nearby SNe Ia at well-determined distances are required to confirm these results, but it appears that SNe Ia may yet provide a reliable means of determining the deceleration rate of the expanding universe.

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# Time-Distance Helioseismology (1Dec93)

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Time-Distance Helioseismology (1Dec93)
(from NOAO Highlights!, NOAO Newsletter No. 36, 1 December 1993)

The application of seismology to the study of the solar interior has advanced almost solely by the prediction and measurement of the Sun's frequencies of free oscillation. Direct measurement of the travel times and distances of individual acoustic waves---the predominant approach in terrestrial seismology---would appear to be more difficult in view of the number, and stochastic nature, of solar seismic sources. T. Duvall (NASA/Goddard Space Flight Ctr.), S. Jefferies (Bartol), J. Harvey (NSO/T) and M. Pomerantz (Bartol) have shown that it is possible to extract time-distance information from temporal cross correlations of the intensity fluctuations on the solar surface. The basic concept is simple: at the surface, an upward propagating wave from the interior is reflected back downwards by the very steep density gradient at the surface. As the wave travels into the interior it is refracted due to the rapid increase of temperature with depth. The wave travel time is the time taken between successive surface reflections. Consider two locations at which waves traveling along subsurface curved ray paths reach the solar surface. The resulting signal as observed at these two locations is strongly correlated at a time difference corresponding to the travel time along the path. By measuring this time difference as a function of the distance of separation of the two surface locations, it is possible to develop a plot of the travel time versus the distance separation, a plot familiar from terrestrial seismology. In the initial work, the new technique was used to show that acoustic waves with frequencies greater than the acoustic cutoff frequency are not significantly reflected by the solar atmosphere, with their reflection coefficient being less than 2%. This approach opens the way for seismic studies of local solar phenomena, such as subsurface inhomogeneities near sunspots, and should help to refine global models of the internal velocity stratification in the Sun.

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# WIYN Nears Completion! (1Dec93)

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WIYN Nears Completion! (1Dec93)
(from NOAO Highlights!, NOAO Newsletter No. 36, 1 December 1993)

Installation of the 3.5 WIYN telescope continues on Kitt Peak. The telescope mount is in place and work continues on the control system and optics. The primary mirror will travel to the mountain in January and the delicate task of installing optics will begin. This effort is expected to take two months followed by the final integration of the control system.

In the current schedule, commissioning starts in April once all telescope systems are in place. The first tasks are tuning of the drives and the adjustment and evaluation of the optics and their supports.  Preparations for this phase are well underway. A site manager, David Sawyer has been hired and the operations staff is being identified.

During the last quarter, the WIYN primary mirror group prepared the mirror cell and support systems for mating of the mirror to the cell in preparation for testing prior to delivery of the mirror to the observatory in January. After some delays, all parts of the new axial support mechanisms were delivered and the units assembled.  The 66 axial units and the modified 24 lateral supports were mounted to the

cell and connected with stainless steel tubing to form the hydraulically connected lateral support system and the 3 axial support zones.

In addition, the control electronics were updated and additional diagnostic software written. New LVDT units which sense the mirror position in the cell were fabricated and mounted near the outer edge of the mirror to provide better access and greater sensitivity. Portions of the cell were repainted, and other cleanup work was done to ready the system for testing which is expected to begin in mid-October.

Contraves is polishing the 1.2-m secondary mirror for WIYN. The surface quality is steadily converging on its final figure. The mirror is being tested interferometrically over its full aperture using NOAO's 100" test sphere and a null lens. The polishing is behind schedule and a concerted effort is underway to complete the mirror in time for a February installation in the telescope. In the meantime, the secondary mirror cell is being fabricated at NOAO and is expected to be finished prior to delivery of the mirror.

Kodak completed the tertiary mirror to WIYN's specifications. It is now back at NOAO waiting for completion of its cell. The tertiary mirror rotator and tilt assembly that allows the telescope beam to be directed to any one of three instrument ports was delivered to NOAO in September. It was mounted on the primary mirror cell, checked for fit, and is currently being readied for final installation in the telescope.

[Figure not included]

Two 0.5-m diameter fused silica blanks were ordered for the 1 degree wide-field corrector. The first blank was received in September and the second blank is expected in early November. The lenses for the corrector are being polished by Rayleigh Optical in Tucson.

The detailed design of the Instrument Adapter ("guider box") is progressing with fabrication to start next quarter. Orders are being placed for long lead-time items including guide cameras and a CCD for the wavefront sensor.

Last quarter's activities at the Observatory centered around cabling and preparations for the control system. Cable drapes and wind-ups were installed on the telescope and additional conduits and trays were provided in the enclosure. Work also continued on building systems.

The control system status displays and network hardware were installed by the University of Wisconsin Controls Group. The remainder of the controls will be delivered through the rest of 1993. Using the software being supplied by UW, the telescope will be operated with commands entered from the keyboard. A graphical interface will be developed during the coming year.

Matt Johns, Caty Pilachowski, Richard Wolff

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# USNO and NOAO Develop a 1024 x 1024 InSb Device (1Dec93)

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USNO and NOAO Develop a 1024 x 1024 InSb Device (1Dec93)
(from NOAO Highlights!, NOAO Newsletter No. 36, 1 December 1993)

Indium Antimonide detector technology has progressed very rapidly in the past few years. In 1987 the 58 x 62 arrays were introduced at NOAO, revolutionizing the IR program. This year the instruments have been upgraded to 256 x 256 InSb. And now we are excited to report that a collaboration is underway between USNO and NOAO to develop a low background 1024 x 1024 Focal Plane Array, called Aladdin. The Preliminary Design Review on the readout design was held with SBRC in October, and the layout and simulations have begun. One of the more difficult problems was getting the device pin count down to 124 pins. The package is a special design and is 1.65 inches square. The

performance requirements are shown in the table below and are substantially unchanged from what was reported at the U. of California, Los Angeles meeting on "Astrophysics with IR Arrays" last July. The logic control will be by CMOS shift register and the unit cell will be in PMOS. Both NMOS and PMOS output drivers will be provided and a decision as to which one to use in the hybrids will be made after bare readout testing. A number of features have been incorporated in this design to reduce the clocking feedthrough to the detector node. This has been a problem with the existing 256 x 256 InSb FPA, and it has a drastic effect on full well capacity. The architecture is four completely electrically-independent quadrants (hence the large lead count) but the detector pitch will be continuous so that no loss of fill factor will be experienced at the quadrant seams.

[Figure not included]

This figure shows the impact of the increasing format size for imaging the Galactic center, the three panels illustrating a single frame at 58 x 62, 256 x 256, and 1024 x 1024 pixels respectively.

We are in the process of setting up a notice and information access on one of the NOAO machines that interested parties can "FTP" the latest news. For the moment you can e-mail the author for updates. This development is for the astronomical community at large as well as the USNO and NOAO. A production effort is planned as soon as the development is proved feasible and some idea of the yield and cost can be determined. I am collecting names of interested parties and institutions for use in establishing a production consortium. If you are interested, please contact me via e-mail and I will keep you posted.

Aladdin Characteristics

| | |
|---|---|
| Number of Pixels | 1024 (H) x 1024 (V) : 1,048,576 elements |
| Pixel Size | 27 um square |
| Effective Fill Factor | 100% |
| Readout Type | CMOS Control Logic using a PMOS SFD |
| Number of Outputs | 32 |
| IR Detector | Thinned InSb |
| Wavelength Range | 0.8 - 5 um |
| Operating Temperature | 35K |
| Dark Current | < 0.1 e-/sec |
| Noise | < 30 e- rms |
| Full Well Capacity | > 2 um 105 e- |
| Readout Speed | 20 frames/sec |
| Quantum Efficiency | > 80% 0.8 to 5 um |
| Defective Pixels | < 1.0% No Bad Rows or Columns |

A. M. Fowler I: afowler@noao.edu

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# Alain Porter (1958-1993) (1Dec93)

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Alain Porter (1958-1993) (1Dec93)
(from the Director's Office, NOAO Newsletter No. 36, 1 December 1993)

We mourn the loss of our friend and colleague, Alain Porter, who passed away during the night of 10 October. Alain had made significant contributions to research on supernovae, galaxy clusters, and the evolution of quasar energy distributions. His meticulous care as an observer made all his datasets of substantial value. It is clear, however, that his intellectual enthusiasm was most strong when directed toward the understanding of supernovae and the relationship of light curves and spectra to the physical evolution of the envelopes and energy sources.

Alain graduated from Harvard magna cum laude in 1980, receiving a Master's degree along with his B.A. His involvement with the Center for Astrophysics High Energy Division and interest in the X-ray properties of galaxy clusters continued throughout his career. He received his Ph.D. from the California Institute of Technology in 1988 for his thesis with J.B. Oke on Isophotometry of Brightest Elliptical Galaxies in Rich Clusters. Alain was one of the early users of the CCD on the Burrell Schmidt telescope on Kitt Peak, to extend his thesis work to cDs with envelopes of very large angular size. He came to KPNO as a postdoc in 1988 to work with Pat Osmer and Richard Green on the spectral energy distributions of high-redshift quasars. He remained at KPNO after the completion of his postdoctoral appointment to pursue research with ROSAT, IUE and EUVE related to both quasar energy sources and the X-ray luminosity function of clusters of galaxies.

Alain Porter has left us two legacies. We have the publications and conference proceedings, which represent only a fraction of the ambitious projects that he had undertaken.  More importantly, we have the example of his tremendous dedication and joy in the pursuit of astronomical knowledge. His ongoing battle with cancer sapped energy and created increasing physical discomfort. He nevertheless maintained a full work week and a heavy observing schedule as long as possible, to the extent that some of his students and colleagues were unaware of any current medical problem. When the everyday aspects of working and observing became a growing physical challenge, the productive use of time and successful completion of responsibilities became acts of quiet heroism. Alain's commitment to our field kept him focused on the promise of the future; his years in Tucson made our lives richer by his presence and by his example.

Richard F. Green

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# NSF Provides Travel Support for Observing at Major Foreign Optical Telescopes (1Dec93)

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NSF Provides Travel Support for Observing at...(1Dec93)
Major Foreign Optical Telescopes
(from the Director's Office, NOAO Newsletter No. 36, 1 December 1993)

For several years the National Science Foundation has provided funding, administered by NOAO, to support travel to large or unique foreign optical telescopes. The telescopes normally covered by this policy include:

Anglo-Australian Telescope (Australia)
Canada-France-Hawaii Telescope (Hawaii)
European Southern Observatory (Chile)
La Palma Observatory (Spain)
Las Campanas 2.5-m Telescope (Chile)
Special Astrophysical Observatory 6-m (Russia)
United Kingdom Infrared Telescope (Hawaii)

The proposal for foreign telescope time should be initiated by the PI who must be a US-based astronomer.  Generally, the foreign observatory should not require a local collaborator as a condition for telescope time, and the presence of the US-based PI should be essential for the successful pursuit of the research program. Reimbursement under this program is not available to staff employed at national observatories.Reimbursement covers round-trip airfare only. Subsistence and incidental expenses are not covered. Normally only one trip per fiscal year per investigator can be supported (our fiscal year begins 1 October).

To apply, send a letter requesting support and explaining why your presence is essential, together with a copy of your proposal and a copy of the letter or observing schedule that indicates you have been granted observing time on one of the above telescopes to:

Caty Pilachowski
National Optical Astronomy Observatories
PO Box 26732
Tucson, AZ 85726-6732

Applications should be received at least one month before travel
commences. Travel must be on a US carrier if available.

Caty Pilachowski

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# Acknowledgement Reminder (1Dec93)

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Acknowledgement Reminder (1Dec93)
(from the Director's Office, NOAO Newsletter No. 36, 1 December 1993)

Publications resulting from use of any of the NOAO facilities should
acknowledge the observatories. When referencing Cerro Tololo
Inter-American Observatory, Kitt Peak National Observatory, or National
Solar Observatory, please add a footnote on the title page that reads
as follows:

"Visiting Astronomer, (appropriate facility), National Optical
Astronomy Observatories, which is operated by the Association of
Universities for Research in Astronomy, Inc.  (AURA) undercooperative
agreement with the National Science Foundation."

Also, Burrell Schmidt telescope users are reminded that a special
acknowledgement is needed on papers resulting from these observations.
In addition to the above mentioned footnote, the following is also
required:

"Observations made with the Burrell Schmidt telescope of the Warner and
Swasey Observatory, Case Western Reserve University."

Jane Marsalla

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# News from AURA: Outstanding Science and Service (1Dec93)

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News from AURA: Outstanding Science and Service (1Dec93)
(from the Director's Office, NOAO Newsletter No. 36, 1 December 1993)

And the winners are. . .

AURA is pleased to announce the NOAO recipients of its 1993 annual
awards for outstanding science and service to the astronomy community.
Tod Lauer (Kitt Peak) received AURA's Science Award for his research
into the large-scale structure of the universe. In particular, and in
collaboration with Marc Postman of STScI (who has also received the
AURA outstanding science award at STScI), Tod has measured the velocity
of the Local Group with respect to an inertial frame defined by the 119
Abell and ACO clusters contained within 15,000 km s-1.  This is the

deepest volume- limited radial velocity survey yet conducted. Distances to the clusters are determined by an analysis of the radial brightness profiles ofthe brightest cluster members.

Ramona Elrod received AURA's Service Award for her outstanding performance as Administrative Assistant at the National Solar Observatory at Sacramento Peak (NSO/SP), reflected in her diligence, enthusiasm, and high level of professionalism. She carries out a variety of responsibilities for NSO. In particular, Ramona organizes many meetings and workshops, handling all visitors' needs and making their experiences at NSO/SP productive as well as enjoyable.

Congratulations!

Goetz Oertel, Lorraine Reams

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# NOAO Preprint Series (1Dec93)

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NOAO Preprint Series (1Dec93)
(from the Director's Office, NOAO Newsletter No. 36, 1 December 1993)

The following preprints were submitted during the period 1 August 1993 to 31 October 1993. Please direct all requests for copies of preprints to the NOAO author marked with an asterisk.

533 *Smith, R.C., "High-Resolution Spectroscopy of Balmer-Dominated Shocks in the Large Magellanic Cloud"

534 *Morrison, H.L., Harding, P., "The Galactic Bulge and Halo"

535 Hillenbrand, L.A., *Massey, P., Strom, S.E., Merrill, K.M., "NGC 6611: A Cluster Caught in the Act"

536 Warren, S.J., Hewett, P.C., *Osmer, P.S., "A Wide-Field Multicolor Survey for High-Redshift Quasars, z &gt = 2.2. III. The Luminosity Function"

537 *November, L.J., "Design of Precise Ultraviolet Imaging Polarimeters That Rely on In Situ Calibration"

538 *Lauer, T.R., Postman, M., "The Motion of the Local Group with Respect to the 15,000 km s-1 Abell Cluster Inertial Frame"

539 *Howard, R.F., "A Possible Coriolis-Force Contribution to the Tilt-Angle Rotation of Sunspot Groups"

540 *Suntzeff, N.B., Mateo, M., Terndrup, D.M., Olszewski, E.W., Geisler, D., Weller, W., "Spectroscopy of Giants in the Sextans Dwarf Spheroidal Galaxy"

541 Goodrich, R.W., *Veilleux, S., Hill, G.J., "Infrared Spectroscopy of Seyfert 2s: A Look Through the Obscuring Torus?"

542 *Koutchmy, S., Belmahdi, M., Coulter, R.L., Demoulin, P., Gaizauskas, V., MacQueen, R.M., Monnet, G., Mouette, J., Noens, J.C., November, L.J., Noyes, R.W., Sime, D.G., Smartt, R.N., Sovka, J., Vial, J.C., Zimmermann, J.P., Zirker, J.B., "CFHT Eclipse Observation of the Very Fine-Scale Solar Corona"

543 *Fowler, A.M., Gatley, I., Vrba, F.J., Ables, H.D., Hoffman, A., Woolaway, J., "Performance of the Current 256 x 256 SBRC InSb Array and Status of the Next Generation 1024 x 1024 InSb Array"

544 *Howard, R.F., "Active Regions of the Sun"

545 *Forbes, F.F., "Large Telescope Alignment Using Wavefront Curvature Sensing"

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# Non-NOAO Preprints (1Dec93)

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Non-NOAO Preprints (1Dec93)
(from the Director's Office, NOAO Newsletter No. 36, 1 December 1993)

Preprints that were not included in the NOAO preprint series but are available from staff members are listed below in alphabetical order by first author. Please direct all requests for copies of these preprints to the NOAO author marked with an asterisk.

Ciardullo, R., *Jacoby, G.H., Tonry, J.L., "A Comparison of the Planetary Nebula Luminosity Function and Surface Brightness Fluctuation Distance Scales"

*Eggen, O.J., "Evolved GK Stars Near the Sun. II. The Young Disk Population"

Fleming, T.A., *Green, R.F., et al., "Three New BL Lacertae Objects in the Palomar-Green Survey"

*Howard, R.F., "Polarity Separation in Active Regions"

Kastner, J.H., *Gatley, I., Merrill, K.M., Probst, R., Weintraub, D.A., "The Bipolar Symmetry of Ring-Like Planetary Nebulae: Molecular Hydrogen Emission from Halos"

*Kennedy, J.R., and the GONG Team, "GONG, a Global Network of Automated Solar Telescopes"

*Komm, R.W., "Meridional Flow and Rotation of Active Regions"

*Komm, R.W., "Wavelet Analysis of Active Regions"

Leinert, C., Zinnecker, H., Weitzel, N., Christou, J, *Ridgway, S.T., Jameson, R., Haas, M., Lenzen, R., " A Systematic Search for Young Binaries in Taurus"

*Radick, R.R., "Photometric Variations of Solar-Type Stars"

*Restaino, S.R., Conley, R.W., Loos, G.C., Radick, R.R. "Image Deconvolution From Pupil Masking Experiment"

*Restaino, S.R., Radick, R.R., Loos, G.C., "First Experimental Results From Pupil Masking on a Solar Telescope"

*Restaino, S.R., Radick, R.R., Loos, G.C., Conley, R.W., "A Validation of Interferometric Imaging From a Pupil Masking Experiment on a Solar Telescope"

**Sharp, N.A., "A Local Whole-Sky Redshift Sample"

*Smartt, R.N., Coulter, R.L., Kuhn, J.R., November, L.J., Koutchmy, S., and the CFHT Team, "White-Light and Infrared Coronal Observations During the 11 July, 1991 Total Solar Eclipse"

*Smartt, R.N., Koutchmy, S., "Recent Developments in Coronagraph Instrumentation"

**Valdes, F., "Psfmeasure/Starfocus: IRAF PSF Measuring Tasks"

**Valdes, F., "Psfmeasure/Starfocus: PSF Measuring Algorithms"

*Veilleux, S., "Luminous Infrared Galaxies: AGN or Starbursts?"

Zhang, Q., Soon, W.H., Baliunas, S.L., Lockwood, G.W., Skiff, B.A., *Radick, R.R., "Brightness Variations of the Sun in Past Centuries"

** Available in the preprints directory on pandora.

Ann Barringer, John Cornett, Elaine MacAuliffe,
Jane Marsalla, Shirley Phipps, Cathy Van Atta

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# Preprint FTP Archive (1Dec93)

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Preprint FTP Archive (1Dec93)
(from the Director's Office, NOAO Newsletter No. 36, 1 December 1993)

ftp pandora.tuc.noao.edu (or 140.252.1.24), cd preprints

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# CTIO Instrumentation (1Dec93)

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CTIO Instrumentation (1Dec93)
(from CTIO, NOAO Newsletter No. 36, 1 December 1993)

We continued to make steady progress with the implementation of ArCon CCD controllers and in the general upgrading of the 4-m prime focus. The use of our Tektronix 2048 x 2048 CCD with ArCons, and the general visitor use of the Large Format Prime Focus CCD (LF PF CCD) camera, are described by Alistair Walker in a separate article.

Another related project which has achieved important milestones is the 4-m Prime Focus Atmospheric Dispersion Compensating (PFADC) corrector. This is effectively a four-element Wynne-type corrector with dispersion-correcting prisms incorporated. It was designed by Richard Bingham (U. College, London). It is now in routine use (with the ADC prisms in their neutral position) with the LF PF CCD and Argus, and clearly delivers subarcsec (0.5 arcsec or better) images which are better than any ever obtained with our other prime-focus correctors. The control system for the ADC prism positions will not be ready for about three more months.

There was also considerable progress with the series of projects related to upgrading the f/7.8 secondary at the 4-m, but the refiguring of the mirror itself has fallen distressingly far behind schedule. The problem is that the optics company that measured the mirror's figure for us took three months instead of the contracted one month. We thought we had built an ample safety margin into our observing schedule, but we had not allowed for such a gross over-run. The result is that we have had to cancel the scheduled f/7.8 runs in early December (we will have to use prime focus and f/30 IR instruments instead). We very earnestly apologize to the observers who lost their time.

However, the final measurements (which we believe to be of high quality) show that just the high frequency errors on the mirror's surface contributed 0.6-0.7 arcsec to the 80% encircled image diameter, so it was clearly necessary to obtain these measurements in order to properly correct the mirror's figure using Kodak's ion polishing technique. We will also be removing a similar contribution to the image size due to spherical aberration, and so we continue to hope for a very significant improvement in the image quality at this focus.  The mirror is now at Kodak for the ion polishing step, but will then need to be

remeasured before we bring it back to Chile.

Other projects brought to a successful conclusion during this period were a general refurbishment of the ASCAP single-channel photometers, and the construction of an improved focus system for the CCD system at the Schmidt telescope (see accompanying article).

Jack Baldwin

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# CCD NEWS (1Dec93)

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CCD NEWS (1Dec93)
(from CTIO, NOAO Newsletter No. 36, 1 December 1993)

ArCon and the Tek 2048

The Tek 2048 CCD is now operating with an ArCon controller, reading out through two amplifiers. After some teething troubles (we thank the first few observers for their forbearance) the CCD is now working well. At a pixel time of 7 us, the gain is 3.2 e-/adu, the read noise 4.0 e- rms, and the read time is 75 seconds. This setting matches the dynamic range of the CCD (220000 e- full well) and is invariably the setting-of-choice for direct imaging. For use at low S/N, for example with the Echelle long camera, a 20 us pixel time yields a gain of 1.1 e-/adu, read noise of 2.8 e- rms, and a read out time of 127 seconds. The most notable improvement over the old VEB-controller implementation, apart from the shorter read times, is the lack of fixed pattern noise and much lower read noise at short pixel times.

4-m Prime Focus Imaging

The Tektronix 2048 was used with the Large Format PF CCD and, for the first time, with the new ADC corrector, for most of the 4-m prime focus runs 7-20 September. The CCD was controlled by ArCon, and the instrument was operated with the new STD-bus controller. Unlike the hybrid arrangement reported in Newsletter No. 35, p. 15, all control of instrument and CCD are integrated under the one user interface, which is easy to use and operationally very similar to the KPNO "ICE" interface. The optical performance with the new corrector is of great interest, since it is designed to give 0.25 arcsec images over most of a one degree diameter field. The ADC corrector is optically slower than our older correctors (f/2.89, 18.0 arcsec/pixel) so the Tek 2048 has pixel size 0.44 arcsec and field size 15 arcmin square. There is slight curvature of field; this may well all be due to the CCD itself since it is known not to be flat. If the CCD is focused so that best focus is approximately midway from center to corner, then FWHM at the center and corners will be about 0.06 arcsec larger than for the focus star. The actual FWHMs observed were somewhat of a disappointment, with best images around 1.1-1.2 arcsec FWHM. However, we anticipate that the seeing and optics improvement program presently underway should, in the near future, allow the full capabilities of the new corrector to be realized.

Schmidt (CCD) Focus Mount

The new focus mount for the CCD on the Schmidt telescope has been mechanically completed, and placed into service. This work was funded by the University of Michigan in a program to upgrade the CCD capabilities of this telescope. Although the focus is still adjusted manually, it is very much easier to do than before and projects using several filters are now viable. The motor controller for the focus mount should be finished in a few months time, whereupon the focus will be able to be controlled from the ArCon user interface.

Alistair Walker

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# IR News (1Dec93)

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IR News (1Dec93)
(from CTIO, NOAO Newsletter No. 36, 1 December 1993)

CTIO Projects

Both the IRS Upgrade and the HgCdTe Imager projects are on schedule for commissioning toward the end of next semester. We therefore expect to be able to offer them second semester 1994 - but be sure to check the March Newsletter for an update before writing your proposals!

OSIRIS News

Observations with OSIRIS have gone well, with the biggest difficulty by far being acquisition of guide stars for spectroscopic work. The restricted guider field at f/30 means that at high latitudes or in dark clouds, there is often no star available from the HST Guide Star Catalog. If you have OSIRIS time on the 4-m, unless you are confident that such stars will be available, we urge you to come prepared. Ideally you should have a list of guide stars, and if not, the minimum is a good finding chart of known scale.

We will send out more information to observers granted time next semester; anyone currently assigned time should contact one of the undersigned with questions.

Jay Elias, Richard Elston, Darren DePoy (OSU)

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# Solar Eclipse Visitors (1Dec93)

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Solar Eclipse Visitors (1Dec93)
(from CTIO, NOAO Newsletter No. 36, 1 December 1993)

We have been receiving many requests to visit Cerro Tololo during the time of the 3 November 1994 solar eclipse. This eclipse will be total in the North of Chile and partial in La Serena. Exceptionally, the Director has allowed visits to the Observatory on Saturdays and Sundays the weekends before and after the eclipse. (Normally we only have them on Saturdays.) There will be two guided tours a day, one from 9:00 am to 12:00 pm and the other commencing at 01:00 pm and ending at 04:00 pm. Since we do not have large reception areas, we can only host a maximum of 50 people at a time. We would be grateful if you would advise anyone you might know who is thinking of visiting Cerro Tololo, that our facilities are open to the public only if arranged in advance. We grant space on a first-come first-serve basis; roughly 40% of the space has been reserved as of October 1993. Thanks!

Elaine Mac-Auliffe

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# Traveling to La Serena (1Dec93)

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Traveling to La Serena (1Dec93)
(from CTIO, NOAO Newsletter No. 36, 1 December 1993)

On a few occasions observers traveling by air from Santiago to La Serena have had trouble with the Chilean airline, National, in that they have not honored reservations made in Santiago. We want to encourage passengers to travel by bus or use Ladeco, which allows them to make arrangements and confirmations through their own travel agency. In exceptional cases, when international connections require a passenger to take a National flight, we will purchase the ticket for him/her and it will be charged to his/her CTIO bill. This cost must be reimbursed at the end of the run. Consequently the traveler requesting the ticket must bring enough funds to cover the fare and other expenses that might be incurred.

Elaine Mac-Auliffe

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# Telescope Time Request Procedures (1Dec93)

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Telescope Time Request Procedures (1Dec93)
(from CTIO, NOAO Newsletter No. 36, 1 December 1993)

This is a reminder (again!) that we do not accept FAXed proposals for telescope time. They are often nearly illegible, especially figures. Also, we are still not in a position to receive figures electronically.  If you have a proposal with figures, it must be sent by mail or courier service. Also, we remind you that courier services such as Federal Express or DHL do not deliver directly to La Serena; for fastest delivery we recommend that you send such materials to our Santiago office, at

AURA Inc.
Mariategui 2438
Providencia
Santiago, Chile
Tel. 204-7394

You should allow three working days for delivery to La Serena from the US.

The instructions in the TeX proposal template file state that e-mailed telescope time requests should be sent five days before the regular proposal deadline. We have not enforced this deadline, nor will we do so next semester, but we remind you that the September 30 and March 31 deadlines are for receipt of the proposal at CTIO in usable form. We are not responsible for lost e-mail or problems with your TeX files. If you send in your telescope time request a few days early it will give you time to correct problems that may arise.

In this regard, please do not send us anything other than the plain TeX form supplied (that is, the edited version of the ASCII file); in particular Postscript, dvi, or LaTeX files are not acceptable and will be rejected out of hand. Almost all the proposals come in during the last week of the month, and it is simply not practical to handle special formats. (That assumes we can even guess what they are: it is a little hard to figure out an encoded binary file that arrives with no explanation.)

Finally, we are trying to work out a way to automate acknowledgement of

proposal receipt. Our previous attempt ran into problems with bad
addresses, and we had to go back to manual acknowledgements.  Check the
March Newsletter for an announcement.

Jay Elias, Elaine Mac-Auliffe, Ximena Herreros

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# CTIO FTP Archives (1Dec93)

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CTIO FTP Archives (1Dec93)
(from CTIO, NOAO Newsletter No. 36, 1 December 1993)

ftp ctio1.ctio.noao.edu (or 139.229.1), cd ctio

```
argus     Directory containing Argus information.
bench_echelle  Directory contining 1.5-m BME information.
cat4m     File containing CTIO 4-m prime focus plate catalog.
ctioforms Directory containing TeX template for CTIO e-mail proposals [3].
filters   Directory containing CTIO filter library [34].
manuals   Directory containing CTIO instrument manuals [32].
standards Directory containing standard star fluxes from Hamuy et al.,
          1992, PASP, 104, 533, and Hamuy et al., 1994 (in preparation) [29].
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[] NOAO Newsletter issues containing latest information on this entry.

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# Observing Request Statistics February-July 1994 (1Dec93)

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Observing Request Statistics February-July 1994 (1Dec93)
(from CTIO, NOAO Newsletter No. 36, 1 December 1993)

The total number of requests for telescope time received this semester
 216, which is the largest number ever. Demand is up mainly on the
4-m, due to the return of the f/8 secondary (we hope!) and to the
availability of the new PFCCD and corrector. Demand on the other
telescopes is more or less stable. On the 1.5-m, demand for
spectroscopy is down and imaging is up. This does not seem to be due to
particular instrumental developments. The requests for time on the
Schmidt were for CCD only; although we had expected heavy demand for
the CCD we did not expect the plate requests to be zero.

4-meter Telescope: 167 nights available

| Requests | | Nights Requested | | | | |
|---|---|---|---|---|---|---|
| Dark | Bright | Dark | Bright | Instrument | Nights | % |
| 0 | 2 | 0 | 7 | ASCAP | 7 | 1.7 |
| 12 | 12 | 41 | 39 | Argus | 80 | 19.8 |
| 0 | 1 | 0 | 1 | CF/CCD | 102 | 25.2 |
| 3 | 12 | 11 | 45 | Ech/CCD | 56 | 13.9 |
| 0 | 1 | 0 | 3 | IR/Phot | 3 | 0.7 |
| 16 | 1 | 47 | 2 | PF/CCD | 49 | 12.1 |
| 4 | 3 | 16 | 9 | RF-P | 25 | 6.2 |
| 2 | 3 | 8 | 14 | Visitor | 22 | 5.4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 15 | 0 | 59 | OSIRIS | 59 | 14.6 |
| 64 | 56 | 213 | 191 | | 404 | 100% |

| | Now | Last Semester | Semester Before Last |
|---|---|---|---|
| No. of requests | 120 | 107 | 108 |
| No. of nights requested | 404 | 355 | 362 |
| Oversubscription | 2.42 | 2.23 | 2.18 |
| Average request | 3.37 | 3.32 | 3.35 |

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1.5-m Telescope: 170 nights available

| Requests | | Nights Requested | | | | |
|---|---|---|---|---|---|---|
| Dark | Bright | Dark | Bright | Instruments | Nights | % |
| 3 | 2 | 16 | 15 | SCAP | 31 | 9.1 |
| 13 | 3 | 79 | 7 | CF/CCD | 86 | 25.3 |
| 7 | 5 | 28 | 27 | CS/CCD | 55 | 16.2 |
| 0 | 9 | 0 | 46 | Ech/CCD | 46 | 13.5 |
| 0 | 1 | 0 | 9 | IR/IRS | 9 | 2.6 |
| 1 | 2 | 6 | 7 | IR/Phot | 13 | 3.8 |
| 2 | 16 | 0 | 76 | OSIRIS | 76 | 7.1 |
| 26 | 41 | 138 | 202 | | 340 | 100% |

| | Now | Last Semester | Semester Before Last |
|---|---|---|---|
| No. of requests | 67 | 69 | 68 |
| No. of nights requested | 340 | 301 | 366 |
| Oversubscription | 2.00 | 1.80 | 2.09 |
| Average request | 5.07 | 4.36 | 5.38 |

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1-m Telescope: 173 nights available

| Requests | | Nights Requested | | | | |
|---|---|---|---|---|---|---|
| Dark | Bright | Dark | Bright | Instruments | Nights | % |
| 7 | 8 | 59 | 114 | ASCAP | 173 | 91.5 |
| 2 | 2 | 9 | 7 | CS/2DF | 16 | 8.5 |
| 9 | 10 | 68 | 121 | | 189 | 100% |

| | Now | Last Semester | Semester Before Last |
|---|---|---|---|
| No. of requests | 19 | 13 | 19 |
| No. of nights requested | 189 | 101 | 164 |
| Oversubscription | 1.09 | 0.57 | 0.92 |
| Average request | 9.95 | 7.77 | 8.63 |

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0.9-m Telescope: 168 nights available

| Requests | | Nights Requested | | | | |
|---|---|---|---|---|---|---|
| Dark | Bright | Dark | Bright | Instruments | Nights | % |
| 27 | 9 | 166 | 54 | CF/CCD | 220 | 100% |

| | Now | Last Semester | Semester Before Last |
|---|---|---|---|
| No. of requests | 36 | 36 | 41 |
| No. of nights requested | 220 | 207 | 258 |
| Oversubscription | 1.31 | 1.21 | 1.54 |
| Average request | 6.11 | 5.75 | 6.29 |

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Schmidt Telescope: 108 nights available

| | | | |
|---|---|---|---|
| CF/CCD | 16 req. for 133 nights | 100% | |

| | Now | Last Semester | Semester Before Last |
|---|---|---|---|
| No. of requests | 16 | 18 | 10 |
| No. of nights requested | 133 | 104 | 89 |
| Oversubscription | 1.23 | 0.96 | 0.83 |
| Average request | 8.31 | 5.78 | 8.90 |

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0.6-m Telescope: 181 nights available

| | | | | | |
|---|---|---|---|---|---|
| ASCAP | 2 req. for 32 nights | 69.6 | No. of requests | | 3 |
| Visitor | 1 req. for 14 nights | 30.4 | No. of nights requested | | 46 |
| 3 | 46 | 100% | Oversubscription | | 0.25 |
| | | | Average request | | 15.33 |

Jay Elias

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# Town Meeting at the AAS (1Dec93)

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Town Meeting at the AAS (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

The Staff and Directors of the Kitt Peak National Observatory and the National Optical Astronomy Observatories invite the community we serve to attend a Town Meeting on Wednesday, 12 January 1994, from 12:30-2:00 at the 183rd meeting of the American Astronomical Society in Washington, DC. During the past year, KPNO has initiated several new or experimental programs to serve better the needs of the astronomical community. These include new modes of observing with our queue scheduling experiment, data archiving via our "save the bits" experiment, and a renewed commitment to improving the quality of images at Kitt Peak telescopes. At the Town Meeting, we would like to discuss aspects of these new programs, as well as the direction of our instrumentation effort and the broader concern of the role of KPNO in US astronomy, and to listen to the views of both users and non-users of our facilities on these various issues. The Town Meeting is open to all, and we urge all who attend the AAS meeting to share their thoughts and concerns with us.

Caty Pilachowski, Todd Boroson, George Jacoby

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# Astronomers Respond to KPNO Questionnaire (1Dec93)

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Astronomers Respond to KPNO Questionnaire (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

KPNO has recently distributed a questionnaire to help us evaluate both how we are doing and how we can best meet the needs of the astronomical community. The questionnaire was distributed by e-mail to over 500 astronomers who had applied to use our facilities in the past five years (as this was the only e-mail list readily available to us); we hope for a wider distribution as each recipient passes the questionnaire on to friends and colleagues. After completing the questionnaire, respondents should e-mail it back to an e-mail drop (kpno-quest@aas.org) at the Executive Office of the American Astronomical Society to assure anonymity. The e-mail header will be removed before the questionnaire is forwarded back to NOAO. We very much appreciated the assistance of Chris Biemesderfer, Peter Boyce, and the AAS with our questionnaire.

If you have not already obtained a copy, and would like to respond to the questionnaire, it can be obtained via anonymous ftp from orion.tuc.noao.edu in the kpno/question subdirectory. If you have no electronic access and would like to obtain a paper copy to fill out, please contact Pat Patterson at (602) 325-9397.

To date (late October) over 100 responses have been received. The results of the questionnaire will be discussed with the Users Committee in early December, presented at the KPNO Town Meeting at the winter AAS meeting in Washington D.C., and summarized in the next Newsletter issue. Thanks to all who have taken the time to respond to the KPNO

questionnaire.

George Jacoby, Caty Pilachowski, Todd Boroson

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# Observations of the Jupiter/Comet Shoemaker-Levy 9 Encounter (1Dec93)

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Observations of the Jupiter/Comet...(1Dec93)
Shoemaker-Levy 9 Encounter
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

During the period 20-24 July 1994, fragments of the comet Shoemaker-Levy 9 are expected to impact the planet Jupiter. A significant amount of interest has been expressed in using KPNO telescopes to observe this encounter, and the Observatory plans to make the usual complement of telescopes and instruments available during that period (i.e., the 4-m will be available, despite the summer shutdown work planned there). In addition, the 2.1-m, 1.3-m, and Coude Feed may be available for several days before and after these dates if there is a strong scientific demand.

Proposals to use KPNO facilities will be reviewed by a specially convened TAC composed of planetary and solar system astronomers. If you wish to propose for observations during this period,please use the standard KPNO observing form, but be sure to mark "Jupiter Encounter" on the front page near the scientific category section. The deadline for receipt of proposals for this special program is 31 January 1994. Please send your proposals to the KPNO Observing Support Office. Any proposals for observing the encounter that were previously submitted will be reviewed as part of this special process.

Proposals to observe this event are also being accepted by the National Solar Observatory, which has adopted the same proposal deadline. Review and scheduling of KPNO proposals will be coordinated with NSO.

George Jacoby, Dave De Young, Mike Belton

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# Summer Projects at Kitt Peak (1Dec93)

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Summer Projects at Kitt Peak (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

The summer months were extremely busy ones at Kitt Peak. While the observers took a break from the poor observing weather, our mountain, engineering, and scientific staff have been hard at work getting ready for the new observing semester, just getting back into full-swing at the time of this writing. While most of the following activities are described in more detail in accompanying articles, they are summarized here to show the broad range of activity involved in supporting and maintaining Kitt Peak.

The major project during this summer's shutdown was the first year of a multi-year program to renovate the 4-m telescope. A new telescope control system was installed, including new drive servos and encoders, new telescope and instrument control software, and a new graphical user interface. The 4-m has reopened on schedule, and observers are taking advantage of the improved operations. We also implemented our "save-the- bits" program, and are now routinely archiving all CCD data images obtained on Kitt Peak.  Computers in all Kitt Peak domes were also upgraded. During the summer we also carried out the observing phase for our first queue scheduling experiment, obtaining data for approved programs on the 2.1-m with GoldCam spectrograph on the Coude Feed spectrograph, and on the 0.9-m with a wide-field imager, with the capable help of our mountain observing technicians.

The project to modify the Hydra fiber positioner for the WIYN telescope proceeded with fabrication work on the focal surface assembly, the focal plate access hinge, and new red fiber cable. Hardware for the new HARCON CCD controllers was also completed, and the implementation of the new controllers is awaiting completion of the software. Significant progress was made on the design of the dewar, filter assembly, and guiding mechanism for mosaic imager, and a preliminary design review was held. Testing and evaluation of the Loral mini-mosaic and 1K x 3K chips continued, and a new detector was installed in GoldCam. Finally, the new 0.9-m image corrector was installed, tested, and put into use.

Our infrared effort focused on upgrading infrared instruments on the mountain to run under the new WildFIRE IR array controller. IRIM and SQIID are complete; CRSP should be complete by November and COB by next semester. The contract with SBRC and the Naval Observatory to develop a 1024 x 1024 InSb array was signed recently, and work has begun. The first test devices are expected next year.

Caty Pilachowski

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# Kitt Peak and Graduate Students: More Than Just Peanut Butter (1Dec93)

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Kitt Peak and Graduate Students: More Than...(1Dec93)
Just Peanut Butter
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

Visiting graduate students often spend a few days in Tucson reducing data before returning home. They grind away in isolation in the basement, eating peanut butter sandwiches and being effectively invisible.

We believe that Kitt Peak has more to offer graduate students than just a spot in the dungeon chained to a computer: in addition to first-class computer facilities, we also have a scientific staff who may be able to provide some insight into the astrophysical problem you are addressing. In addition, our scientific and support staffs have technical expertise that may help you get the most out of your data.

We are therefore encouraging graduate students who are interested in staying for an extended visit (we have in mind visits of order one month) to contact any the of Kitt Peak scientific staff members who might be appropriate to act as "sponsors" for the visit. Kitt Peak would provide office space and may be able to otherwise facilitate the visit, depending upon circumstances. Don't be shy! And all nearby convenience stores do stock peanut butter.

Ron Probst, Phil Massey, Caty Pilachowski

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# Queue Scheduling - A Progress Report (1Dec93)

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Queue Scheduling - A Progress Report (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

One of the new observing modes with which we have been experimenting is queue scheduling. During the summer, we "queue scheduled" observations for a number of proposers on three of our small telescopes. This project was quite successful for us, and we were able to explore a lot of operational issues. The program was also successful from the proposers' point of view. We obtained observations for 23 of the 35 projects submitted that had high grades. We were able to complete about one-half of the former.

One of the things that we discovered is that you have to have a large enough pool of observations and observational requirements in order to make effective use of all the telescope time. For instance, almost all the proposals for observations on the 0.9-m required photometric skies. As it turned out, there was almost no photometric time during the nights we were observing on the 0.9-m, and so, after completing the few programs which did not require photometric conditions, there was not much left to do.

We had a positive experience with the electronic proposal form, which was done with a LaTeX template, assembled by Chris Biemesderfer. In fact, this is so clearly an improvement to the process of applying for telescope time, we are now developing a similar form for the regular proposals.  All additional correspondence with the proposers was handled by e-mail--and some finding charts for spectroscopic observations were sent as FITS files by anonymous ftp.

One of the most difficult decisions we had to make was how far to take the data reduction.  We saw that there were subtleties in the data taking which might be important to the data reduction. Thus, it was desirable to carry out the reduction to the point where we would not have to explain the details of the data taking to the recipient of the data. In fact, it would have been nice to send proposers completely reduced data. In practice, this turned out to be impossible, and, at least for GoldCam and the 0.9-m direct data, we sent partially reduced data. The raw data was also made available, of course.

During the current fall semester, we are running a small queue program on the 0.9-m telescope. We have scheduled five highly ranked proposals during two periods in October and November. We had hoped for a more ambitious program, but we found many people who had submitted successful proposals were reluctant to have their observations queue scheduled. We believe that the efficiency of the telescopes can really be improved by scheduling in this way, and so we are exploring various options which would make the queue program more attractive. Among the possible changes we are exploring are 1) allowing proposals to stay in the queue from semester to semester or year to year until the observations are successfully obtained, 2) scheduling regular blocks of "queue" time which would be filled by proposals which could be submitted every quarter or even more frequently, and 3) setting up an "eavesdropping" mode--in which the proposer would be informed when his or her observations were being made and could participate electronically. We are investigating the reactions of potential users to these options through our questionnaire and the town meeting at the January AAS meeting.

Who actually does the queue observing? We have drawn on both the downtown and mountain staffs for this project; participants have included Taft Armandroff, Todd Boroson, Ed Carder, Jim DeVeny, Di Harmer, Jen Hedden, Kurt Loken, Phil Massey, Alex McDonald, Caty Pilachowski, Mike Pierce, Ata Sarajedini, Bill Schoening, Dave Silva, Dave Summers, Bridget Watts, Daryl Willmarth, and Mike Wise.

Todd Boroson, David De Young,
Taft Armandroff, Caty Pilachowski

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# Coordinates for Kitt Peak (1Dec93)

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Coordinates for Kitt Peak (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

The days of hunting around using the acquisition TV for a barely-visible object are mercifully behind us. Thanks to improved encoders, more sophisticated pointing software, and regular pointing maps, the typical Kitt Peak telescope has RMS pointing errors of a few arcseconds around the sky. Thus we strongly encourage observers to come to the mountain equally well prepared, particularly for spectroscopic applications. (The object you want to observe should be the one that lands directly in the middle of the slit!)

As outlined in previous newsletters, we have a number of ways to help you achieve this. The NOAO/Tucson facilities include a two-axis Grant machine and glass and film copies of the POSS and ESO sky surveys (along with software to make use of this material); local IRAF software that allows precise positions to be extracted from CCD frames using the HST guide-star catalog as a reference; and we have negotiated with STScI to provide digitized images of the sky survey plates that come complete with their own astrometric calibration. The latter had been provided only for Hydra users, but thanks to a recent renegotiation we are now able to provide scans to all observers with time on Kitt Peak or CTIO telescopes.

These STScI extractions can be obtained from the two surveys that were used to generate the HST Guide Star Catalog: the southern SRC J survey and the Palomar "quick V survey." In addition, extractions can also be obtained from the original POSS E plates. Proper-motion may be a significant consideration in the latter, however.

Requests for these extractions should be sent to Tod Lauer at NOAO (e-mail to tlauer@noao.edu) specifying the field center coordinates and equinox, the field size (limited to 1 degree per side), and the choice of plate material. At this time we are glad to accept requests from observers awarded time in the upcoming Spring 1994 semester with a deadline of 15 January. The requested images should be available via anonymous ftp by 1 February.

Phil Massey, Tod Lauer, Taft Armandroff

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# Telescope Scientists (1Dec93)

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Telescope Scientists (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

Each telescope on Kitt Peak has associated with it a staff astronomer who serves as the "telescope scientist" for that particular facility. What is the role of a telescope scientist? Our primary responsibility is to see that our telescopes can be used as efficiently as possible for science: we represent the customer, the astronomer. Part of this is setting scientific priorities for our telescopes; some of this is

proposing improvements to the telescopes that will enhance the science through-put; some of this is just making sure that visitors know the tricks of using our telescopes well.

In practice, how do we do this?  Probably each of us has our own answer to this. On a daily basis we are likely to review what happened at our telescopes the previous night by reading the on-line "service" log and the Astronomer-In-Residence report.  Weekly we sit down along with the support scientists, instrument scientists, engineers, and mountain representatives and discuss what happened on the mountain this week. Sometimes common themes will emerge that underscore the need for certain improvements:  the knowledge that the 2.1-m, 1.3-m, and 0.9-m telescopes all have  focus drifts that depend primarily on temperature, say, suggests that thermistors mounted in the telescope tubes would be a Good Idea. Most of us receive copies of the run evaluation forms you fill out after your observing run, unless you specifically request that it be kept confidential. Maybe you've raised an issue that we are unaware of, and we will e-mail you for more details, or maybe we have a partial answer for you. When major engineering is required at one of the telescopes, it is the telescope scientist's responsibility to assign scientific priorities.

This month many of you will be receiving "fat packages" indicating that we were able to schedule your observing proposal; in it you will find a list of "Facilities and Staff Contacts." This list includes the telescope scientists, instrument scientists, and support personnel for each telescope and instrument. If your telescope quits tracking at 11 pm, call for a Technical Assistant on the radio. But if you have questions over issues of flat-fielding, or instrument performance (perhaps you've noticed that your CCD camera is no longer sufficiently light-tight to permit darks to be done during the day), or have any sort of question regarding the efficient collection of high-quality photons, give one of the people on the list a call (although don't feel required to wait until 11 pm). Your staff contact, or the person that came up and got you going, is an excellent place to start, but feel free to make use of any of the staff contacts listed, including the telescope scientist. If we can't help you, we can at least direct you to someone who can.

The current list of telescope scientists is as follows:

4-m: Phil Massey
2.1-m: Tod Lauer
1.3-m: Dick Joyce
0.9-m: George Jacoby
Coude Feed: Sam Barden
Burrell Schmidt: Tom Kinman

Phil Massey

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# The 4-m: Past, Present, and Future (1Dec93)

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The 4-m: Past, Present, and Future (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

During the past year Kitt Peak has embarked on its largest, riskiest, and perhaps most heroic effort in years: a major renovation of the 4-m telescope.  This follows the six-month closure of the 2.1-m during the fall 1989 semester for similar work; fortunately, what was learned as a result of that upgrade gave us both insight and courage to make a major upgrade of the Kitt Peak flagship.  Before reporting on the present status and future plans, it may be useful to place this renovation in historical context.

In the late 1960s AURA was involved in the design and construction of two, nearly- identical, large telescopes, one to be located in the northern hemisphere, and one in the south. (Sound familiar?) In the January-March 1972 Quarterly Report, the project manager for the Kitt

Peak "150-inch telescope," David Crawford, summarized the history as follows: In March 1961 the AURA Board of Directors asked the KPNO staff to begin a design study for a large optical telescope. The telescope was to have a prime focus field of view that must be "large," the focal ratios at prime and Cass should be about f/2.8 and f/9, and the telescope should be as versatile as possible without compromising efficiency. The telescope was to have a minimum lifetime of 50 years, and was to be designed for high reliability. First-light was announced the following year, 27 February 1973.

Twenty years later (and nearly thirty years after some of the system was designed) we are continuing to fulfill the promise of a highly versatile, efficient, and reliable telescope of large aperture--the largest telescope in the northern hemisphere available to anyone in the astronomical community based purely (or as pure as we can make it) on the basis of scientific merit. The 4-m currently supports a complement of ten major instruments, many of them state-of-the-art: Hydra, the multi-object fiber positioner; the R-C and Echelle spectrographs operated with large-format CCDs; the prime-focus, large-format CCD camera with its scanning table for imaging objects at a tiny fraction of the night-time sky level; the high-throughput, low-dispersion Cryogenic Camera; four IR instruments based upon the explosion in IR arrays: (the IR Cryogenic Spectrometer, the Cryogenic Optical Bench, the Simultaneous Quad Infrared Imaging Device, and the IR Imager); as well as the Fourier Transform Spectrometer (FTS).

As those of you who applied for 4-m time this semester are only too aware, there was roughly five weeks less observing time available than is normally the case, due to a prolonged shutdown that extended to 5 October. This shutdown was scheduled in order to complete the first year of a three-year project to replace the old electronics and software with modern systems. The motivation for this major renovation is two-fold: (1) improve the reliability of operation by using systems that are easier to maintain and diagnose, and (2) improve observing efficiency (faster slews, more accurate tracking and pointing). In addition, major efforts are taking place during this same time period to improve the dome-seeing. (See the article in this Newsletter on image quality improvements.)

This summer saw the replacement of the servo system (the electronics via which the telescope motors run), the encoders, and the computer system that operates the telescope. There was the usual crop of last minute problems, but thanks to everyone's hard work and cooperation, the 4-m re-opened exactly as planned. On 5 October the first visiting observer, Hans Rix, was obtaining data just like any other night on the 4-m, except for the large number of slightly nervous people standing by "just in case." In the subsequent weeks there has been almost no time lost due to the new systems, and we are in the process of completing "Phase I" of the renovation. Efforts are in progress to track down the remaining nagging problems, the most serious of which is a problem with the incremental encoders on the dec axis that is the primary culprit in limiting the absolute pointing accuracy (all-sky) to 10-15 arcsec. (This is nevertheless as good as we had previously achieved in practice with the 4-m.) By the time you read this we hope to have this problem solved, as well as other items rectified.

Despite the incremental encoder problem, our tests have shown that the 4-m now offsets better than I would have ever believed to be possible: a number of open-loop (unguided) offsets up to 30 arcmin in length were done at various rotator angles and declinations and in each case the new object was centered on the slit to within the accuracy of the relative coordinates (0.2 arcsec). Tracking also appears to be much improved over the old system. Software control of the leaky guider now permits guiding from the slit-viewing TVs on the Echelle and R-C Spectrographs, reducing setup times for many programs.

During 1994 the upgrade to the telescope control system will continue in order to include support for the atmospheric dispersion corrector (Risley prisms), provide computer verification that everything is "set" and ready to observe (read-back of mirror cover positions and instrument configuration), improved searching algorithms of coordinate data bases ("What Landolt standards of a specified color are currently available between an airmass of 1.5 and 1.8?"), and the like.

However, the major work planned for the coming year is upgrading the instrument motor controllers. The reliability of these has decreased with time to the point that we are seldom surprised if there is at least some failure during an instrument block. Replacing the motor drivers is a daunting challenge: there are 45 motors that control the 4-m instruments and guiders. This is not a project that will bring about "new science" (such as, say, putting a tip-tilt fast guider in the PF CCD imager), but it does permit good science to continue to be done with a minimum of down-time. In addition, replacing the motor

controllers and I/O control multiplexer will allow us to do away with CAMAC, reducing heat-sources in and around the telescope.

In addition, major steps are underway to improve the thermal environment: the oil cooling system is in place and will be switched on later this semester.  We also plan to improve the ventilation of the dome, following CTIO's lead. MDM, located just down the road from the 4-m, often obtains subarcsec seeing, and we hope to be achieving this in the near future as well.

While there were literally dozens of people involved in the success of the 4-m project, the following must be singled out for special note. The project scientist for the renovation was George Jacoby; Bruce Bohannan was the project manager. Tony Abraham managed the Kitt Peak engineering effort. D'Anne Thompson was Project Engineer for the software effort, and Scott Bulau was the Project Engineer for the new servo hardware. Bob Marshall managed the mountain programming group that worked with D'Anne: Kim Gillies, Shelby Gott, Lee Groves, and Jeff Lewis. Larry Daggert managed the ETS resources. Engineers and technicians who contributed in a major way to this project included Khairy Abdel-Gawad, Tom Bajerski, Ed Bell, Bob Bode, Kurt Cramer, Allen Gerzoff, John Hoey, Patti Jackson, Rene Muhlberg, Kevin Price, Tom Roussey, Dave Stultz, and Vern Russell. Bill Ditsler made a major upgrade to the acquisition and guiding TV systems. Jim DeVeny, Bill Schoening, and Daryl Willmarth were instrumental in the check-out phase, with staff astronomers Taft Armandroff, George Jacoby, and Phil Massey participating in the final moments.

In addition to new servo hardware, there is also new stereo hardware: observers may want to bring their favorite CDs and cassette tapes with them.

Phil Massey

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# Planning for Early WIYN Science Operations (1Dec93)

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Planning for Early WIYN Science Operations (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

With the imminent completion of the WIYN telescope, we have begun planning for science observations. We expect the telescope and its two facility instruments, the Imager and Multi-Object Spectrograph (aka Hydra), to be ready for initial science operations shortly after 1 January 1995. NOAO will received 40% of the observing time on the WIYN telescope. We plan to operate WIYN in a shared-risk, queue mode, as explained below, for six to nine months before normal operations commence 1 September 1995.  Following the shared-risk period, we will continue to operate WIYN in a queue scheduled mode, but will be able to accommodate some on-site observers with dedicated nights as well.

What are shared-risk, queued observations? NOAO will provide trained observers at the telescope to run the instruments and take observations. "Shared-risk" means that we will do our best to complete approved programs and to provide science grade data but cannot guarantee that those goals will be accomplished. WIYN is a very complex machine: we hope it will not have "teething" problems but want to allow latitude during the early operations phase to respond to any problems that do arise. Queued observations give us maximum flexibility during the final WIYN shakedown, minimize WIYN user inconvenience during the earliest stages of WIYN science operations (users won't lose time to equipment failure), and maximize the likelihood that the most scientifically meritorious programs will acquire data even in the face of WIYN startup problems.

As well as achieving our technical goal of a well-operating facility during the shared-risk phase, we will also use this period to develop and test new operations procedures for WIYN, from science proposal submission through scientific and technical evaluation to time

allocation and construction of the actual observing queue. As part of that process, we must learn what WIYN observations are appropriate for queue observing and which are not. For example, most current KPNO optical imaging programs could be queue scheduled; however, is the same true for Hydra programs?

We hope also to implement several observing procedures which optimize WIYN observing efficiency and scientific output during "queue mode" observations. Effective flexible observing protocols, which facilitate selecting observing programs in real-time that are well-matched to current observing conditions (e.g. seeing quality, transparency, photometricity), are needed. We have been experimenting with such protocols at other telescopes as described elsewhere in this Newsletter. However, for WIYN, we also need to develop procedures for interweaving Imager and MOS observations depending on observing conditions. In addition, a real-time "hitchhiker" (or "eavesdropping") scheme to allow remote investigators to interact with on-site WIYN observers will be tested and implemented. The ability to evaluate data quality efficiently in real-time and then use that information to adjust the observing program must be made available. A scheme for timely dissemination of completed queue observations must be developed.

All these tasks can and will be simulated prior to actual science operations; however, to understand what works and what doesn't work requires taking actual science data. By accepting proposals for a shared risk period, we will obtain the program pool needed to fine-tune WIYN science operations with the understanding that these programs will be completed on a "best effort" basis. The advantage for proposers is they may get early data from a potentially excellent facility.

NOAO anticipates that 30 September 1994 (i.e. the usual fall NOAO observing proposal deadline) will be the deadline for accepting the first WIYN shared risk science program proposals. During the shared risk period, we may attempt to schedule WIYN quarterly. If we do, we would accept further WIYN proposals on 31 December 1994 and 31 March 1995. Proposals will be ranked based on scientific merit by external peer review. Approved programs would then be scheduled by an internal NOAO committee which will have some liberty to construct the queue to meet our technical objectives.

Further details about proposal submission, "first light" Imager and MOS capabilities, time allocation and scheduling procedures, and observing procedures will be presented in the next Newsletter.

Any comments or questions about WIYN science operations can be send to me (dsilva@noao.edu).

Dave Silva

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# Staying Focused at the 2.1-m (1Dec93)

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Staying Focused at the 2.1-m (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

Users of the 2.1-m f/7.5 CCD imager have often reported focus drifts and/or jumps during the night. Is it the focus readout that drifts while the secondary stays put? Does the secondary drift while the readout correctly reflects its position?

During the course of a five-night run I was blessed with subarcsec seeing (0.8 arcsec) on each and every single night and was therefore able to investigate the focus behavior in some detail. These findings are consistent with investigations made by Fred Forbes with his wave-front sensor camera. I find three effects:

1) There is a focus shift with temperature that is 40 microns (40 "units" on the display) per degree F, at least over the range of 52-72

F. (The "depth-of-field" of the focus is about 25 microns.) This is in the sense that as the temperature drops during the night you want to increase the focus value.

2) There is a focus shift with zenith distance that appears to be independent of azimuth; it amounts to about 130 microns per unit airmass. This is in the sense that as you go to higher airmass you want to decrease the focus value.

3) There is also a "wild card" factor. If you run a series of consecutive focus sequences at zenith you will usually get the same value. But occasionally (10-20% of the time) you will get somethingsubstantially different: perhaps 200 to 300 microns off. Thus, something acts as if it is sticking between the focus encoder and the secondary. (If you then repeat the focus sequence you will get the original value.) I believe this is the origin of the "focus jump" reports, for if one were to run a focus frame, set the focus to the seemingly correct value, and then take an exposure, there is a finite probability that the images will be substantially out of focus on that frame. At this point the poor observer will refocus and either find the same focus value as before (if the focus motion "stuck" on the program frame) or a substantially different focus (if the focus "stuck" on the original focus frame). Reports will then drift downtown that the focus "jumped."

Users are warned to be on the alert for these three effects.  At the moment the only way of reading the temperature is checking the analog device ("thermometer") directly outside the control room door.

The following approximation will serve as a rough guide to the focus through the BVR filters:

24200 - 41.5 * T(dF) - 130 * (airmass - 1.0)

The focus through the "U" filter differs from the above by +150 microns.

Phil Massey

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# Nicer, Tinier Images at the 0.9-m: Image Corrector Installed (1Dec93)

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Nicer, Tinier Images at the 0.9-m:...(1Dec93)
Image Corrector Installed
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

The field accessible with Tektronix 2048 x 2048 CCD at the 0.9-m f/7.5 focus is an impressive 23 arcmin on a side.  The Mini-Mosaic, currently under development, will have an even larger field with the added bonus of smaller pixels to sample better the observed point spread function (PSF). However, it has been known for some years that the images at this focus degrade far from the optical axis, becoming enlongated blobs in the corners of our Tek 2048 chip. As the f/7.5 is a Richey-Chretien design, we have been fighting two effects: (1) the focal plane is curved, but the chip is flat, leading to position-dependent "best" focus; and (2) the images are highly astigmatic.

In order to deal with both of these problems, a simple, two-element corrector was designed and has now been installed and fully tested. Although the corrector is easily removed from the beam, we expect that most, if not all, observers will benefit from the use of this corrector, and will want to use it.

[Figures not included]

We are pleased with the performance of the corrector.  The PSF variability has been greatly reduced, particularly in the corners of the chip. This is illustrated in the attached figure which shows images in the center and corner of the chip with and without the corrector. As an extra bonus, the images used for guiding by the off-axis TV are

greatly improved. Some residual PSF variability remains, but due to the non-symmetric nature of the variability, we do not believe the corrector is responsible.  Our leading contender for the origin of this problem is the support of the f/7.5 secondary.  We plan further investigation and hope to cure this problem this year. The PSF behavior with the corrector is straightforwardly modeled using DAOPHOT II, which was not true for images taken in good seeing without the corrector.

The scattered light performance of the corrector appears to be good. We have observed fields containing bright stars with and without the corrector, and no scattered light problems are apparent. Surface photometry of galaxies has also been performed with the corrector in and out of the beam, and identical results were found.

The one and only drawback we have found to the corrector is that the corrector U throughput is only 65% relative to the uncorrected throughput. The relative throughputs at other wavelengths are much better: 87% at B, 94% at V, 98% at R, and 94% at I. We nevertheless believe that most observers will still gain even at U from the use of the corrector if attempting stellar photometry in anything but the center of the chip, as more light will be concentrated in fewer pixels.  Even for non-stellar sources, the photometric accuracy at U will be improved through finite-sized apertures.

The corrector is not designed to be used with the f/13.5 secondary and will be removed from the beam when that secondary is used. It may also prove desirable to remove the corrector for f/7.5 projects which make use of only the central part of the field (particularly at U), and where paranoia over scattered light outweighs PSF constancy considerations.

We are very grateful to the many staff members who have contributed to the implementation of the corrector, particularly Liang Ming, Jorge Simmons, Tony Abraham, and Skip Andree.

Taft Armandroff, Phil Massey,
Dave Silva, Ata Sarajedini

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# Updates on GoldCam and CryoCam (1Dec93)

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Updates on GoldCam and CryoCam (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

We have undergone some minor changes with the detectors in GoldCam and CryoCam. These are improvements to the CCDs previously in place, not new chips.

In CryoCam, the detector is a thinned Ford 800 x 1200 CCD with 15 micron pixels (the same size as the old TI 800 x 800). We have recently lowered the read noise to 14 electrons by careful adjustment of the clock voltages. The chip has been coated with an AR coating which peaks at 6000 . This choice of coating has the dual effect of reducing the fringing in the far red and lowering the QE shortwards of 4000 A . We decided to give up the near UV response because the optics in CryoCam are not optimized for the blue anyway (the collimator is a crown-flint doublet). The advantage in the red is dramatic. We have reduced the fringing at 9000 A from about 25% amplitude peak-to-peak on a chip with no coating or a blue- optimized coating to less than 5% amplitude peak-to-peak. This facilitates sky subtraction and accurate fluxing of faint objects. The chip is flat, of course, which also aids sky subtraction. We certainly expect to put a similar device with lower noise into CryoCam when we receive one.

As reported in the last Newsletter, we recently replaced the mediocre Ford 3K x 1K CCD in GoldCam with one of much better performance. Users of the old chip suffered from a large number of traps in the imaging area which compromised regions of the spectrum and necessitated a preflash, increasing the effective noise. The new chip solves these two

problems. It has no traps above pixel 600, below which the focus starts to seriously deteriorate. The read noise is 8.5 electrons, and no preflash is needed. We had also intended to remedy the fringing problem, which was quite severe with the old CCD. Unfortunately, due to a calibration error, the AR coating which was put on the new CCD was too thin, and both the spectral response and the fringing were quite similar to the old CCD. We have just recoated the chip with a coating which should move the peak response somewhat further to the red and reduce the fringing substantially. At the time of writing we have been able to estimate from lab measurements that we have reduced the fringing by about a factor of 3.  A determination of the new sensitivity curve will have to await measurements at the telescope, expected during the next few weeks. The one remaining problem is the resolution. Since we have installed the first Ford 3K x 1K CCD in GoldCam, we have never achieved better focus than about 2.5 pixels. We have now changed the chip, the coating, and the field flattening lens, each of which we thought might be responsible. None of these changes have had any effect. We will continue to work on this problem.

Todd Boroson, Rich Reed, Di Harmer

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# "Save the Bits" Can Save the Night! (1Dec93)

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"Save the Bits" Can Save the Night! (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

Since the beginning of the current observing semester, KPNO has been saving all CCD images generated on our telescopes.  (This project is known locally as "save the bits"). IR data will soon be included in this program. Raw images are shipped automatically over the ethernet to the Administration Building, where they are cached onto a disk and then written to Exabyte tape.

Our fledgling data archive already proved its worth when we were able to restore a night's data accidentally destroyed through a processing error by an observer. Such accidents may be more common that we would all like to admit, and we want to encourage all observers who lose data, for whatever reason, to ask if we can restore it.  Chances are, we can! A night's data is too precious to lose.

We do stress, however, that observers should not rely on "save the bits" for routine data backup. The project is still in the experimental stage, and we cannot guarantee to be able to restore data under all circumstances. Normal tape backup procedures should still be followed by observers.

Caty Pilachowski, Rob Seaman

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# A Strategy for Improving Image Quality on Kitt Peak (1Dec93)

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A Strategy for Improving Image Quality on Kitt Peak (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

As part of our annual exercise of planning improvements to telescopes, instruments, and software on Kitt Peak, we have formulated a strategy aimed at achieving the very best seeing possible at our telescopes. The quality of an image is due to a combination of telescope and instrument optics, atmospheric turbulence and wind shake, and thermal effects within the dome.  Recent optical tests of our telescopes suggest that the mirrors are capable of subarcsec images, and yet these are seen only very rarely. Evidence from the Hiltner 2.4-m telescope of MDM observatory on the southwest ridge suggests that the site seeing is frequently that good.

One area where efforts to improve image quality may well be fruitful is in the thermal environments of the domes. We have, for some time, been trying to remove heat sources and improve ventilation within all of our domes. We would like to make this a priority for the next few years and determine if the existing telescopes can be retrofited with seeing improvements which will allow them to perform at the site seeing limit.

Because the improvement projects at the 4-m are costly, difficult, and lengthy, we must plan to devote a major fraction of our efforts to that telescope. The payoffs there are largest too. We are finishing up an oil cooling system for the oil-pad bearings. We are beginning an engineering study which is preliminary to cutting ventilation holes in the dome next summer. We expect to begin a study this year to learn how we might cool the primary mirror to maintain it at the ambient temperature.

At the same time, we would like to make improvements at a telescope where we can see substantial progress in a short time, and so we have decided to try this approach at the 0.9-m.  During the coming year, we hope to replace the solid tube with a truss, cut fourteen 4 x 4 foot holes in the dome and install louvered panels, and move all the heat-producing electronics off the observing floor. We will begin thinking about how to cool the mirror here as well. The hope is that after one year and a relatively small investment of resources we will routinely see subarcsec images at this telescope. With the experience gained at the 4-m and the 0.9-m we plan to then move on to the other telescopes.

We believe that improving the image quality is very important, both because of the gains in efficiency to be realized from our existing telescopes and because of the way that our instrumentation programs must evolve. In both the IR and the optical, the excitement of the Gemini telescopes comes from the superb image quality expected.  Our future instrumentation should take advantage of tip- tilt correction or higher order adaptive optics and should optimally sample the seeing. Now that IR detectors have come on the scene with enough pixels to achieve both good spatial resolution and reasonable field size, we should not be limited by poor telescope images.  Similarly, optical spectroscopy stands to gain significantly by using narrower slits. Our program of image improvement is the logical next step in remaining competitive with newer facilities.

Todd Boroson

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# KPNO Filters: Finding What's There and How to Borrow Them (1Dec93)

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KPNO Filters: Finding What's There and How...(1Dec93)
to Borrow Them
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

Filter Data Bases

A text file containing data on all the filters in the KPNO collection can be obtained via anonymous ftp as described in detail in the September 1993 NOAO Newsletter. (Use "ftp orion.tuc.noao.edu," log on

as "anonymous" with your name@machine as the password, "cd
kpno/filters."

The original data base (filters.db) lists the full complement of KPNO
filters. The length of this data set may occasionally prove to be a
burden when trying to seek out a specific filter only to learn that the
desired filter is of the wrong size. We have now broken down the data
base into smaller sets based upon the filter size. Odd size filters and
1 by 1 inch filters are listed in 1inch+.db. The 2 x 2 inch filters are
given in 2inch.db and 4 ~ 4 inch filters in 4inch.db.

The subdirectory "plots" contain transmission data for many of these
filters, and will eventually contain the complete set.

Borrowing Filters

There is a steady level of requests from the outside community to
borrow filters from KPNO. We would like to remind everyone of the
policy for these loans.

Many filters are frequently used on the mountain by visiting
astronomers. These filters are on a restricted list and cannot be lent
out. Filters scheduled for observations in the queue observing program
will also fall into this restricted category since the actual time of
use of a specific filter is difficult to predict.

Filter loan requests can be made by sending George Jacoby a letter or
e-mail message. That message should include the following:

List of the desired filters (by KPNO number)

A scientific justification for the request

Where the filters should be delivered

Where they will be used

The date the filters are needed

The date the filters will be returned

A FAX telephone number where the Loan Agreement form can be sent

The loan period should not be longer than a few weeks as long term
loans will not be permitted. Students wishing to borrow filters are
required to have their project advisor sign the letter. Borrowers may
be asked to pay shipping costs, especially if Federal Express is
required.

Following approval, the standard NOAO Loan Agreement will be Faxed for
signature. This agreement includes the estimated monetary value of the
filter for which the borrower will be responsible. The signed agreement
should be mailed or faxed back to KPNO prior to release of the filter
for shipment. Upon return of the undamaged filter, the Loan Agreement
will be terminated.

Sam Barden, Jim De Veny, Ed Carder

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# Who's Who Among the Kitt Peak Post-docs (1Dec93)

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Who's Who Among the Kitt Peak Post-docs (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

KPNO has a lively post-doctoral research program as evidenced by the
accompanying photograph of the post-doctoral fellows resident at KPNO
for the 1993-1994 academic year. Each year KPNO is typically able to
offer one or two post-doctoral appointments supported directly by NOAO
funds. We are also pleased to be able to host Hubble fellows as well as

a number of other researchers supported by external grants.  This fall we are pleased to welcome NOAO post-doc Stephane Courteau to the program.  Courteau arrived in October from Cornell University, where he held an NSERC post-doctoral fellowship. With the start of a new year we thought that this would be a good time to summarize the research activities of all of our post-docs.

[Figure not included]

These are the post-doctoral fellows resident at KPNO for the 1993-1994 academic year. Moving left to right, they are Sylvain Veilleux, Heather Morrison, Beatrice Muller, Stephane Courteau, Edward Ajhar, Ata Sarajedini, Nalin Samarasinha, Michael Pierce, and Michael Wise. (Michael Corbin not pictured.)

Edward Ajhar is supported by the HST Wide Field/Planetary Camera team through KPNO staff member Tod Lauer. Ajhar is presently studying the cores of giant elliptical galaxies from HST WFPC images. Ajhar with other collaborators is using surface brightness fluctuation distances to early-type galaxies to determine the nearby large-scale flow, as well as developing surface brightness fluctuations as a probe of stellar populations. Ajhar also studies globular cluster systems of elliptical galaxies to understand the origin of both systems.

Michael Corbin is supported by the HST Archive program. He is working with KPNO staff member Todd Boroson on a project of combining HST FOS and IUE spectra of low-redshift QSOs with ground-based optical spectra. The goal is to compare ultraviolet and optical emission lines in a sample of QSOs which cover a wide range in luminosity and radio properties. These comparisons should provide the basis for detailed models of the objects' emission line regions.  In collaboration with others at Steward Observatory, Corbin is also undertaking a program of narrow-band imaging of high-redshift QSOs discovered in the Large Bright Quasar Survey.

NOAO post-doctoral fellow Stephane Courteau works on mapping the distribution of matter in the universe. In his thesis at Lick Observatory, he showed that our extragalactic neighborhood extending out to ~75 Mpc moves in bulk at ~350 km/s in the direction of, but extending beyond, the southern Great Attractor, in reasonable agreement with predictions from mixed dark matter models. His work also involves mass modeling and the analysis of dust extinction in disk galaxies, as well as observational tests for the evolution of galaxies at large look-back time.

Hubble fellow Heather Morrison works on the structure of the Milky Way and other galaxies, with particular emphasis on galaxy formation and evolution, using the oldest stellar populations as tracers of the early history of galaxies. Her current research includes collaborative investigations into the relationship between the galactic bulge and halo and a study of thick disks in other galaxies using ultra-deep CCD surface photometry.

Beatrice Muller is supported by the Galileo imaging team through KPNO staff member Mike Belton, and is presently working on the high resolution images of Ida obtained by Galileo. Muller also works on physical properties of cometary nuclei, Near-Earth-asteroids, and the link between comets and asteroids.

NOAO post-doctoral fellow Michael Pierce works on determining extragalactic distances and the Hubble Constant. The approach taken by Pierce and his collaborators emphasizes the intercomparison and testing of various techniques as a means of establishing the level of confidence in the extragalactic distance scale. His recent work has concentrated on the Tully-Fisher method and those involving supernovae. Pierce is also using high resolution imaging techniques to investigate the role of mergers in galaxies at high red-shift.

NASA planetary science post-doctoral fellow Nalin Samarasinha works on modeling inhomogeneities in cometary comae (such as jets) to understand their chemical composition and origin. His work on cometary rotational states includes understanding temporal evolution of rotational states under sublimation-induced torques as well as the inter-relationship between the rotation and the orbital dynamics.

NOAO post-doctoral fellow Ata Sarajedini is conducting research on stellar populations of the Galactic halo and disk. He has worked on the age range among the Galactic globular and open clusters, and is currently investigating blue straggler stars in open and globular clusters. He is also trying to improve the methods by which basic cluster properties like metal abundance and reddening are determined.

Hubble fellow Sylvain Veilleux works on the structure, dynamics, and

origin of active galactic nuclei (AGN). His current research includes exploring the effects of the AGN on the host galaxy and the transport of material within the body of the host galaxy down to the accretion disk scale.  Veilleux and his collaborators are also studying luminous infrared galaxies in an attempt to determine the origin of nuclear activity in galaxies and searching for evolutionary links between active and starburst galaxies.

NOAO post-doctoral fellow Michael Wise is conducting theoretical studies of the intracluster medium in clusters of galaxies and the interstellar medium in early-type galaxies.  He is presently developing detailed models for the X-ray spectra of these objects in an effort to determine the ultimate fate of the large amounts cooling gas implied by X-ray observations. In support of this program, Wise is using ROSAT X-ray imaging and ASCA X-ray spectroscopy data to study the environments in these objects.  Wise is also pursuing optical investigations on polarized light in clusters and the effects of dust on broad-band, optical color gradients in elliptical galaxies.

Tod Lauer

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# A Look Behind the Scenes: How to Become a Kitt Post-doc (1Dec93)

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A Look Behind the Scenes: How to Become a Kitt...(1Dec93)
Peak Post-doc
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

Kitt Peak National Observatory is pleased to support astronomers at the start of their careers through our post-doc program. Each year we carefully sort through the hundred or so applications received for our NOAO/KPNO fellowship positions.  Unfortunately, in many cases, poorly prepared applications interfere with our ability to see the true scientists the applications are supposed to represent. Many of the difficulties in presenting a well thought out application are things we see quite commonly, so this year in advance of the 15 December deadline for applications we would like to offer a few tips.

With so many applications to review, the Post-doc Committee tries to converge quickly on the dozen or so applications that we will examine more thoroughly.  The parts of the application we review most closely are the cover letter, the applicant's description of ongoing and future research, the record of research accomplished to date, and the letters of recommendation.

In most cases, we are not likely to have direct knowledge of you, so a good word from your senior colleagues is crucial to assessing your current progress and prospects for benefiting from an NOAO post-doc position.  Surprisingly, however, a substantial fraction of applicants do not ensure that we receive the nominal three letters. We try to make do with what's on hand, but if a key letter (such as from the applicant's thesis adviser, say) is missing, the application is not as strong as it could be. We normally begin to review all applications immediately after the deadline, and we unfortunately have neither the time nor the resources to track down missing letters. We urge you to make sure that all of your letters are received by us prior to 15 December.

We look closely at what you have to say about yourself. Your cover letter is usually the first introduction we have to you. The cover letter should include a brief statement of your scientific accomplishments, your research goals during a post-doctoral appointment, your reasons for wanting a position at KPNO, and the reasons why you should be our top candidate for a position. The research essay should be brief and to the point; most reviewers are not in your field, and have a stack of other applications to read. We don't have time to digest preprints, reprints, or any other documents beyond your essay. What we do want to see is a clear description of what you are doing, and what you hope to do at KPNO. We are also looking for are

those who understand the context of their own research within the larger arena of astronomical research.

As for your future plans, we look for programs that both are interesting and have a realistic chance of success over the duration of the post-doc appointment. We hope our post- docs will contribute to the scientific environment at NOAO, and it's natural to favor those who will fit in well with the kinds of research that we do.  But our program is diverse and our current set of post-docs have a broad range of interests.  We look for post-docs who can benefit from and contribute to the scientific environment and resources offered by KPNO--and we think your own success here is likely to be tied to how well you can make good use of what we have to offer.

Good Luck!

Tod Lauer, Caty Pilachowski

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# Contents of the KPNO Anonymous FTP Area (1Dec93)

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Contents of the KPNO Anonymous FTP Area (1Dec93)
(from KPNO, NOAO Newsletter No. 36, 1 December 1993)

ftp orion.tuc.noao.edu (or 140.252.1.22), cd kpno

| | |
|---|---|
| README | Describes the contents of this directory. |
| filters | Directory containing the KPNO optical filter libraries [35,36] and other filter information |
| filters/plots | Directory containing filter transmission data arranged by KP filter number [35] |
| henearhres | Tabulated list of wavelengths from "A CCD Atlas of Comparison Spectra: He-Ne-Ar, 3300  - 11,100 ," Daryl Willmarth, April 1993 (will appear in IRAF V2.10.3 in the linelists directory) [35] |
| hydra | Directory containing hydra information [29,30,32,33] |
| kpnoforms | Directory containing TeX template for KPNO Observing Time Request [34] |
| manuals | Directory containing instrument manuals for KPNO [35] |
| platelogs | Directory containing photographic plate catalog for KPNO 4-m PF camera [35] |
| question | Directory for KPNO user questionaire [36] |
| sqiid | Directory containing scripts for the reduction of sqiid data |

[] NOAO Newsletter issues containing information on this entry.

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# Greetings! (1Dec93)

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Greetings! (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

On 1 October, the Directorship of the National Solar Observatory passed from John Leibacher to me. I expect to spend the next few months familiarizing myself with the broad mosaic of activities at the Sacramento Peak, Tucson/Kitt Peak, and GONG branches of NSO. It is exciting to be back working in the field of research in which I started my career in astronomy. Research at NSO spans a broad range of topics, ranging from the study of the solar interior by helioseismology to the influence of solar activity on the earth's environment. It includes the development of sophisticated technologies and methodologies to achieve its goals. Its mission includes both astronomical and solar-terrestrial research; both service to the US community through a visiting astronomer program and long-term programs, and in-house research. As the US national observatory for solar research, it should aim at the excellence and leadership needed to maintain our pre-eminent position in this field of astrophysics and to satisfy the nation's needs in understanding the sun's role in determining the global environment. I am fortunate to find an observatory which has profited from the excellent leadership of my predecessor. To achieve its mission, NSO's primary sponsorship by NSF, through AURA, is complemented by the participation by many other agencies including the US Air Force, NASA and the NOAA Space Environmental Laboratory, providing for a complex but synergistic program. I look forward to meeting the challenges of maintaining and improving the excellence of the observatory even in these times of budgetary constraints.

Jacques Beckers

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# Scientific Staff Changes (1Dec93)

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Scientific Staff Changes (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

After more than thirty years with the solar research program at Kitt Peak, Bill Livingston retired on 30 September. Bill's career as a solar physicist has been a full one including many major contributions in observational astronomy. As an Emeritus Astronomer, we anticipate that he will continue his very active participation in NSO.

Bob Howard moves to a half-time position. Bob maintained a high level of scientific productivity throughout the years, so we expect to hear much of him even at the 50% level.

Thank you Bill and Bob for your many contributions to the Observatory. We look forward to more of the same!

We will see a number of young astronomers joining us. These include Doug Braun and Yu Hong Fan (Hawaii), Andrew Jones (Netherlands), Christoph Keller (Zurich), Sydney D'Silva (India), and Ye Ming Gu (U. of Arizona). Welcome!

Jacques Beckers, John Leibacher

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# Change of Location of Sacramento Peak Coronal Maps (1Dec93)

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Change of Location of Sacramento Peak Coronal Maps (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

Daily pseudo-full-disk NSO/SP coronal maps in Fe XIV and Ca XV will soon no longer be available by anonymous ftp to robur.tuc.noao.edu. They will continue to be available by anonymous ftp to ftp.sunspot.noao.edu (146.5.2.1), cd pub/corona.maps. For further information see previous articles in the NOAO Newsletter No. 30, p. 29; No. 31, pp. 28-29; and No. 32, pp. 39-40; or contact raltrock@noao.edu or NOAO::raltrock.

Dick Altrock

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# Infrared-Array Measurements of Carbon Monoxide Near 4.7 um (1Dec93)

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Infrared-Array Measurements of Carbon Monoxide...(1Dec93)
Near 4.7 um
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

In the June issue of the Newsletter, Bill Livingston and Keith Pierce announced the availability of a large infrared-optimized grating in the McMath-Pierce vertical spectrograph and illustrated the new capability with spectral scans of carbon monoxide lines near 4.67 um. Recently, the first bi-dimensional CO spectra were obtained using this grating, NSO's Amber 256 x 256 InSb array, and the image-scanning hardware developed for the Near Infrared Magnetograph (NIM). The array captures a spectral range of about 3 cm-1 near 2140 cm-1, enough to record several vibration-rotation lines with different excitation energies. CO is a sensitive thermometer of the solar temperature-minimum region. Ayres has hypothesized that the temperature-minimum region is thermally bifurcated, with magnetic heating and CO cooling playing key roles. CO lines also show prominent five-minute oscillations, as demonstrated at the McMath two decades ago by Noyes and Hall. Ayres (CASA), Noyes, Uitenbroek, and Avrett (CfA), Solanki (ETH), and Livingston and Rabin (NSO) will be analyzing various aspects of spatially-resolved CO data.

Owing to thermal background, the region of the CO fundamental bands should be observed using cold, narrowband (dl &lt 1000 A) filters. Observers interested in a particular spectral region are encouraged to contact us so that we can determine whether a suitable filter is available or can be obtained at reasonable cost.

Doug Rabin, Bill Livingston, Dave Jaksha

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# Good Ole George (1Dec93)

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Good Ole George (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

George Simon was honored on 20 August 1993 for his thirty years at Sacramento Peak with a surprise dinner and "roast" put on by the staff at Sac Peak.

Dick Altrock

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# NSO Observing Proposals (1Dec93)

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NSO Observing Proposals (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

Current deadlines for submitting observing proposals to the National Solar Observatory are (1) 15 January 1994 for NSO/KP and NSO/SP solar observations in the second quarter of 1994 and (2) 31 March 1994 for the fall semester (August-January) of 1994 for the NSO/KP Solar-Stellar Spectrograph observing.  Forms, information, and a Users' Manual may be obtained from the Telescope Allocation Committee at NSO/SP, P.O. Box 62, Sunspot, NM 88349, for the Sacramento Peak facilities (sp@sunspot.noao.edu) and at NSO/KP, P.O. Box 26732, Tucson, AZ 85726, for the Kitt Peak facilities (nso@noao.edu). A TeX or UNIX roff version can be e-mailed at your request or obtained by anonymous ftp from ftp.sunspot.noao.edu.

Dick Altrock

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# Sac Peak Summer Workshop XIV (1Dec93)

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Sac Peak Summer Workshop XIV (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

Karatholuvu Balasubramaniam and George Simon organized and directed a five-day international workshop, the week of 30 August at NSO/SP, entitled "Solar Active Region Evolution ~ Comparing Models with Observations." The workshop was jointly sponsored and funded by AFOSR, NSF and NASA, with proceedings to be published as a 600 page volume by theAstronomical Society of the Pacific. New results on solar observations, theory, and instrumentation were exchanged by approximately 80 scientists from four US government agencies, 13 countries, 21 universities, 26 research institutes, and five corporations.

Karantholuvu Balasubramaniam, George Simon

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# He 10830 A Video Filtergraph/Magnetograph (1Dec93)

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He 10830 A Video Filtergraph/Magnetograph (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

A new instrument for high spatial and temporal resolution imaging of solar active regions and flares in the 10830 A line of He I is being developed under the Memorandum of Agreement between AURA and NASA/GSFC for use at the NSO/Kitt Peak Vacuum Telescope. The He 10830 A Video Filtergraph/Magnetograph will be able to run simultaneously with the spectromagnetograph and will provide a unique view of solar structure and activity since the line is formed entirely in the high chromosphere but also responds to EUV radiation from overlying, higher temperature regions of the atmosphere. The instrument is based on a five-element Lyot filter which provides differential dual bandpass response and polarization modulation. With the help of NASA/GSFC, detailed design and assembly drawings were completed in the past year, and the instrument was fabricated in the NOAO shop. The data system and its associated software are in place. Assembly, electrical cabling, and final software development are in progress, and the instrument should be installed at the KPVT late in 1993 or early in 1994.

Jack Harvey, Harry Jones

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# NSO/SP FTP Archives (1Dec93)

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NSO/SP FTP Archives (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

ftp ftp.sunspot.noao.edu (or 146.5.2.1), cd pub/corona.maps

```
fexiv     Directory containing daily pseudo-full-disk maps of the Fe XIV
          solar corona [30], [32]
caxv      Directory containing daily pseudo-full-disk maps of the Ca XV
          solar corona [30], [32]
idl       Directory containing IDL procedures for displaying the maps
          [30], [32]
```

ftp ftp.sunspot.noao.edu (or 146.5.2.1), cd pub/corona.maps

```
CORONALERT          current Sac Peak CORONALERT [34]
CORONALERT.SAVE     Sac Peak CORONALERTs archive [34]
```

ftp ftp.sunspot.noao.edu (or 146.5.2.1), cd pub

```
obs_sched    Directory containing observing schedules for NSO/SP facilities
observing_templates     Directory containing NSO observing request forms
```

[] NOAO Newsletter issues containing latest information on this entry.

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# NSO Telescope/Instrument Combinations (1Dec93)

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NSO Telescope/Instrument Combinations (1Dec93)
(from NSO, NOAO Newsletter No. 36, 1 December 1993)

Vacuum Tower Telescope (SP):
- Echelle Spectrograph
- Universal Spectrograph
- Horizontal Spectrograph
- Universal Birefringent Filter
- Fabry-Perot Interferometer Filter System
- Advanced Stokes Polarimeter
- Slit-Jaw Camera System
- Correlation Tracker
- Branch Feed Camera System
- Horizontal and Vertical Optical Benches for visitor equipment
- Optical Test Room

Evans Solar Facility (SP):
- 40-cm Coronagraphs (2)
- 30-cm Coelostat
- 40-cm Telescope
- Littrow Spectrograph
- Universal Spectrograph
- Spectroheliograph
- Coronal Photometer
- Dual Camera System

Hilltop Dome Facility (SP):
- Ha Flare Monitor
- White-Light Telescope
- 20-cm Full-Limb Coronagraph
- White-Light Flare-Patrol Telescope (Mk II)
- Sunspot Telescope
- Fabry-Perot Etalon Vector Magnetograph
- Mirror-Objective Coronagraph (5 cm)
- Mirror-Objective Coronagraph (15 cm)

McMath-Pierce Solar Telescope Facility (KP):
- 160-cm Main Unobstructed Telescope
- 76-cm East Auxiliary Telescope
- 76-cm West Auxiliary Telescope
- Vertical Spectrograph: IR and visible gratings
- Infrared Imager
- Image Stabilizers
- 1-m Fourier Transform Spectrometer
- Stellar Spectrograph System
- 3 Semi-Permanent Observing Stations for visitor equipment

Vacuum Telescope (KP):
- Spectromagnetograph
- High-l Helioseismograph

Razdow (KP):
- Ha patrol instrument

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# The Global Oscillation Network Group (1Dec93)

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The Global Oscillation Network Group (1Dec93)
(from GONG, NOAO Newsletter No. 36, 1 December 1993)

The Global Oscillation Network Group (GONG) Project is a community-based activity to develop and operate a six-site helioseismic observing network for at least three years, to do the basic data reduction and provide the data and software tools to the community, and to coordinate analysis of the rich data set that should result. The Project is currently looking forward to an operational network and data management and analysis center in 1994. GONG data will be available to any qualified investigator whose proposal has been accepted, however active membership in a GONG Scientific Team will allow early access to the data and the collaborative scientific analysis that the Teams have already initiated. The GONG Newsletter provides status reports on all aspects of the Project and related helioseismic science.

Activities involving development of the GONG instrument continue to wind down as production of the field instruments accelerates. Most recent instrument development work has focused on using the prototype for solar observations and to test production software and hardware. A very nice development was the receipt of narrow band prefilters (4.5 A) using an ion-assisted deposition technique for use in the field instruments. The filters are quite impressive. Peak transmission is up to 75% and scatter is very low. Most impressive is the small temperature variation of the peak wavelength. It is much less than standard thin film interference filters and bodes well for the long term stability of the filters. Other good news is the completion of an order for 20 mirrors for the production light feed systems. These mirrors have tight tolerances on phase shifts of the reflected polarized light which the vendor was able to meet.

The first production 1 A Lyot filter was assembled from the second worst set of crystal optics we have available (the worst set is in the prototype), and it easily meets all of our specifications. The major optics concern now is the Michelson interferometers that are the heart of the GONG instrument. Our new vendor, Interoptics, has contracted to provide the interferometers in two batches, the first five being due in November. Progress has been rapid and it appears that delivery will take place as scheduled.

During the summer observing run, the prototype instrument recorded thirteen consecutive days of calibratable data, 16-28 June. These data have now been reduced to a thirteen-day time series, mode coefficient power spectra, and l-v spectra. Since early July, the prototype instrument has been operated so that electronic and mechanical activities take place during one week while software activities take the next week. Observing periods of three days are included in each two week cycle. This cycle has been very effective and continues at present. Somewhat longer observing periods coincided with the final observing tests of the SOI-MDI instrument. We are now taking data synchronized to the expected light-travel-time-corrected start times of SOHO observations.

The GONG production group is advancing steadily on the production of the six field-station instruments scheduled for deployment next year. Good progress is being made with the production of optical, electronic, and mechanical elements of the instruments, along with improvements and enhancements to the instrument control and monitoring software.

The routing of printed circuit boards and the production of electronic chassis to receive those boards continues to pace the electronics effort. Twenty-two of the thirty boards have been routed and prototyped. As a result, certification of electronic components is now a major aspect of the production effort. We plan to have as much of this work as possible done by outside vendors. The production printed-circuit boards will be forwarded to shops specializing in populating and wave-soldering board components. These houses will also perform many of the quality-assurance inspections necessary to insure a high degree of reliability. We will then mate the cards with pre-certified chassis and perform functional tests ourselves prior to integration into systems.

The instrument shop is still working ten-hour days to keep mechanical production on track. To date, more than 80% of the mechanical parts making up the GONG instruments have been fabricated. Our lead instrument maker has already turned his attention to the fitting and assembling the major instrument elements. The wave-plate rotator and optical-table leg assemblies are already together, and assembly of the calibration boxes is under way.

Greg Ladd joined the DMAC project on 1 August as a data reduction specialist. Previously, Greg was with NSO where he worked with Fourier Transform Spectrometer data for many years.

GONG's anonymous ftp disk storage area has moved from the VAX cluster to a DECstation in the GONG/DMAC building. The network address has changed from robur.tuc.noao.edu (140.252.1.10) to helios.tuc.noao.edu (140.252.8.105). `helios' is the DSDS user machine. A new disk was recently added to `helios' making the move possible. The change provides increased storage capacity, improved data transfer capacity, a more standard ftp interface, improvement in the backup of the disk. However, access to the storage area via NSI-DECnet (previously, SPAN) is no longer available.

The development of the DSDS has proceeded to the point were most functions are available and usable in prototype form. The development system for the DSDS has consisted of DECstations running ULTRIX with the INGRES database. A transition is underway which will move the DSDS to SPARCstations running SOLARIS with the ORACLE database. These changes were prompted by several factors including cost, the desire to move to a more homogeneous workstation environment (i.e., Sun workstations since these are the de facto standard at NOAO), and the need to increase the capacity of the DSDS. Since a major upgrade was inevitable, the DMAC chose to proceed now since deferring may result in a major system transition during the network phase of the project.

The magnetograms, a bird-lover near the prototype instrument, and the usual cloudy afternoons of Tucson summer combined to make the data from the summer observing run a good test case for automatic bad-image detection. Work continues in the areas of quality assurance, peak finding, geometry details, artificial data, and merging. W. Williams, J. Goodrich, and R. Toussaint have been comparing automated and manual methods of Quality Assurance to find bad images in the data stream. Winifred has developed a suite of statistical tests that search for partial images, off-center images, noisy images, images with limb problems, low- intensity images, modulation images with rings, etc... A few days of data have been run through this gauntlet, and the power spectra compared with spectra of the same data that have been culled using manual methods developed by Jean and Roberta who visually inspect time series plots of average velocity, modulation, and intensity. The comparison was done on a relatively good time series of data, and both methods flagged a small set of images. The two sets of images had some overlap, but did not completely correspond. Inspection of the gap-filled power spectra showed very small differences, primarily in the noise at low degree. These results suggest that the images flagged by both methods probably could have been retained without much degradation of the spectra. It is expected that the automated methods will come into more use since they are much quicker than the manual ones. However, the manual ones will continue to be used for global assessments of an image time series.

Efforts are underway to begin the preparation of the field sites to receive the GONG stations. A generic pro forma bid package has been prepared that describes the work that needs to be done at a typical site. These are being distributed to the managements at the various sites to begin discussions with their technical staffs and local contractors to develop site-specific packages. Project representatives have already met with the Big Bear group to get the permitting and engineering design started for the required landfill. The site selected is near the shoreline, adjacent to the causeway leading to the observatory.

Although an agreement in principle has been reached on the language of a site agreement with NOAA for the Mauna Loa station, problems still remain in selecting a suitable site on the mountain that does not interfere with possible future air-sampling operations. It is hoped that this will be satisfactorily resolved in November, so the preparation efforts can begin there as well.

Since the July restoration of funds previously cut from the FY 1993 budget, work has returned to near its normal pace. Unfortunately, health problems have befallen two key staff members: GONG's project engineer and senior technician. Don Farris is recovering nicely from his surgery and is already back at work part-time. Lonnie Cole has been formally named to the Project Engineer position while Warren Ball continues his convalescence. The rest of the staff has continued to do their best to fill in the meantime.

The project's funding for FY 1994 remains uncertain, as is usual for this time of the new fiscal year. GONG has requested $2.85M. Funding at this level will be essential if the project is to stay close to its schedule, particularly in the face of the slow down that occurred last Spring and Summer due to the mid-year budget cut.

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# Activities of the US Gemini Project Office (1Dec93)

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Activities of the US Gemini Project Office (1Dec93)
(from US Gemini Project, NOAO Newsletter No. 36, 1 December 1993)

The US Gemini Science Advisory Committee held its most recent meeting on 19-20 October in Tucson. Four new members have been added to the US SAC: Jay Gallagher (U. of Wisconsin), John Huchra (SAO/Harvard U.), Gerry Neugebauer (California Inst. of Tech.), and Charles Telesco (NASA/MSFC). The SAC was given an overview by the Gemini Project Scientist on the current status of the Project and the preparations for the primary mirror system Preliminary Design Review. The US SAC was pleased to see that the Project continues to address critical mirror-related issues. A second major topic at this meeting was a discussion of the desired performance capabilities for the first-light complement of Gemini instruments and US priorities for procurement. To meet the conflicting demands of a very short timescale for preparation of an instrument procurement plan by the Gemini Project and a desire for competitive opportunities for US institutions to provide instruments to Gemini, a "strawman" plan for the US was developed. It is based on the responses to the request for letters of intent, and will be described in more detail in a letter which will soon be distributed by the US Gemini Project Office (USGPO). You may obtain a copy of this letter by contacting the USGPO at usgpo@noao.edu.

The US delegation participated in the Gemini Science Committee (GSC) meeting in Tucson on 27-28 October, preceded by a national Project Scientists' meeting on 26 October. The GSC is the primary scientific advisory group in the Project, and is chaired by the Project Scientist, Matt Mountain. GSC meetings provide a forum for the presentation of national perspectives on Gemini as well as for the development of scientific specifications for the Project. The US members are Alan Dressler, Chas Beichman, Jay Gallagher, Bob Gehrz (Steve Ridgway filled in for Gehrz at this meeting), Fred Gillett and Richard Green. This meeting saw an enlarged GSC, with participation by scientists from Argentina, Brazil and Chile. To maintain representation roughly proportional to contribution, the number of US members was expanded from four to six. Major topics of discussion included the scientific performance of the primary mirror system design, the telescope image quality specification, the telescope interface to the instruments, advances in adaptive optics, capabilities of first-light instruments, and the software control system design.

The initial set of instrumental capabilities is derived from seven small international working groups which the project assembled to develop recommendations on adaptive optics, acquisition and guiding, IR imaging, IR spectroscopy, optical imaging, optical multi- object spectroscopy, and optical high-resolution spectroscopy.  The Working Groups had completed their reports, which served as the basis for the GSC discussion. From this input, the Gemini Project and the national Project Scientists will develop a procurement plan for the approval of the Gemini Board at their May meeting.

Matt Mountain has convened a Science Working Group for the Primary Mirror PDR. Its task is to assess whether the primary mirror system will satisfactorily meet the scientific performance requirements, assuming that the thermal and mechanical systems will perform as specified. The members are Jeremy Allington- Smith (U. of Oxford), Jacques Beckers (NSO), Fred Gillett, Richard Green, Paul Hickson (U. of British Columbia), Robert Laing (Royal Greenwich Obs.), Matt Mountain (Chair), Jerry Nelson (Keck Obs.), and Paul Schechter (Massachusetts Inst. of Tech.). In addition, Jay Gallagher and Bob Gehrz were invited participants. The group's first meeting was held in Tucson on 10-11 September.  The major performance questions center on response to wind buffeting and ambient temperature changes. The working

group gave the Project recommendations on investigating the power as a function of frequency in the wind spectrum, and in modeling the closed-loop thermal control system to predict mirror front surface temperature for actual recorded weather data on Mauna Kea. The Science Working Group is scheduled to meet again on 18-19 November to complete its assessment prior to the Primary Mirror System PDR.

Jay Gallagher, who is working out of Madison as the interim Associate US Gemini Project Scientist, is leading an effort to present colloquia or seminars describing the Gemini Project to the US astronomical community.  Presentations and discussions by the USGPO and NOAO staff are planned with more than a dozen astronomical departments the Fall. We value the informal discussions about the Project as well as the opportunity to make a more formal presentation. If you would like a USGPO associate to visit and talk about Gemini, please contact us.

Jay Gallagher, Fred Gillett, Richard Green

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# Magnetic Tape Storage (1Dec93)

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Magnetic Tape Storage (1Dec93)
(from CCS, NOAO Newsletter No. 36, 1 December 1993)

We still have many old tapes hanging in our tape library that are signed out to non-NOAO staff, including mountain T-tapes. On 1 July 1994 we plan to recycle or discard tapes that have a date on them prior to 1990. No warnings of any kind will be issued. If visitors or prior NOAO staff members have tapes that may be dated earlier than 1990 and are concerned about keeping the data, please contact us as soon as possible.  We have tried in the past to contact as many people about the old tapes as possible but it has become increasingly time consuming to do this. And we cannot hold onto these tapes forever. So we have arbitrarily set these dates to help clean up our computer areas.

If you have any concerns about these policies please contact jbarnes@noao.edu.

Jeannette Barnes, Bruce Bohannan, Steve Grandi

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# NOAO Newsletters Available on WAIS (1Dec93)

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NOAO Newsletters Available on WAIS (1Dec93)
(from CCS, NOAO Newsletter No. 36, 1 December 1993)

The latest issues (1 June 1992 and later) of the NOAO Newsletters are available on the Wide Area Information Server (WAIS) system on the machine pandora.tuc.noao.edu. The source file needed for your local WAIS machine in order to connect to pandora can be obtained from pandora by anonymous ftp; the file is pub/noao-news.src.

The Newsletters can be searched by topic or by issue. To extract all the articles for a particular issue, search on the date of the issue, i.e., 1Sep93.  Since WAIS defaults to a maximum of 40 articles you may

want to click on the "Prefs" box and increase this number to 100 or so,
if you are running XWAIS.

We will attempt to install the latest issue of the NOAO Newsletter into
WAIS as soon after its publication date as possible.

Jeannette Barnes, Caty Pilachowski

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# 1993 Software Conference Update (1Dec93)

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1993 Software Conference Update (1Dec93)
(from CCS, NOAO Newsletter No. 36, 1 December 1993)

The Third Annual Conference on Astronomical Data Analysis Software and
Systems (ADASS) was held in Victoria, Canada, on 13-15 October 1993.
The Conference was hosted by the Dominion Astrophysical Observatory and
the University of Victoria. Additional sponsors included the National
Optical Astronomy Observatories, the Smithsonian Astrophysical
Observatory, and the Space Telescope Science Institute with additional
funding/support from APUNIX Computer Services, Barrodale Computing
Services, Ltd., Digidyne Inc., Digital Equipment Corporation, NCD Inc.,
Silicon Graphics Canada Inc., SYBASE Canada Inc., ZED Data and BCnet.
The ADASS Conference provides a forum for scientists and programmers
concerned with algorithms, software, and software systems employed in
the reduction and analysis of astronomical data.

There were over 225 registered participants for the Conference from 19
countries. There were 43 oral presentations during the General Sessions
including 9 invited talks. More than 90 poster papers and several
software demos were presented as well. Five special sessions (BOFs)
were also held. The Proceedings for ADASS III, like those of the first
two conferences, will be published as part of the Astronomical Society
of the Pacific Conference Series. We expect this volume to be available
mid-summer 1994.

Plans are already in progress for the next ADASS Conference to be held
in Baltimore on 26-28 September 1994, hosted by STScI.  Information
about ADASS '94 is available by sending mail to softconf@stsci.edu. We
will keep you posted as plans develop.

Jeannette Barnes, Doug Tody

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# IRAF Update (1Dec93)

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IRAF Update (1Dec93)
(from CCS, NOAO Newsletter No. 36, 1 December 1993)

Most of the efforts of the IRAF group this past quarter were focused on
the development of the new graphical user interface (GUI) facilities
for IRAF. Much work was done on the high level IRAF GUI toolkit, and
the first version of this is now in use. A new image display server for
IRAF called XIMTOOL was written and is now in testing. XIMTOOL operates

under the X window system like SAOIMAGE, but like the old SunView program IMTOOL it provides multiple independent frame buffers, a true frame blink capability, and so on.  XIMTOOL and the graphics terminal emulator XGTERM, written earlier, are the key elements of the X11 support package for IRAF due to be released with IRAF version 2.10.3 in a few months.

There is however much more to the new IRAF GUI facilities than just XGTERM and XIMTOOL, used for "classic" style IRAF graphics and imaging. The new GUI toolkit can also be used to build IRAF tasks with graphical user interfaces, integrating scientific graphics and imaging and standard window system toolkit facilities to provide custom user interfaces for individual IRAF tasks. The first IRAF applications using the new GUI facilities are now functioning and were demonstrated along with the other new window system software at the ADASS conference in October (see article above). The IRAF GUI demonstration tasks written so far include an image browser and tasks for interactive aperture photometry and radial velocity analysis. A number of other demonstration tasks are planned. The exciting thing about all this is that, due to the high level nature of the new GUI facilities, it is much easier to develop sophisticated graphical user interfaces for IRAF tasks than is the case with most other approaches.

These first GUI demonstration tasks are being used to help develop the new GUI facilities and to experiment with how to make use of GUIs for interactive data analysis. A period of experimentation will be required before we can begin to make serious use of the new facilities in general IRAF tasks. Over the coming months all of the IRAF centers (STScI, SAO, CEA, Steward, Lick, etc.) will participate in this experiment. We will get the demonstration tasks out to the IRAF user community for comment as soon as is practical.

The other major IRAF system project currently underway is the IRAF Mail Network. This facility integrates a variety of network services into a single system to be used as an aid to plan, develop, distribute, and use the IRAF software and related information. Examples of the services to be provided include file transfer of various sorts, USENET news, electronic mail, the world wide web (distributed hypertext document presentation and retrieval), full text searching of archived documentation, and local execution of an IRAF system installed remotely. While this is still being set up and tested, portions of the facility are already online on the main IRAF server iraf.noao.edu.

A new manual for beginning IRAF users has been written and is currently undergoing review and editing. This document covers basic IRAF usage and should be a great help to people using IRAF for the first time, or to people who use IRAF only occasionally.  A draft of the document is available now upon request, and the formal announcement will appear in the next IRAF newsletter.

The next IRAF release will be version 2.10.3. Due to the amount of new software being prepared for this release, development and testing is being done in stages, with three beta test versions planned before the public release, which we hope to begin distributing around the end of the year. The first beta test version was released internally to NOAO and the IRAF TWG (Technical Working Group) sites several months ago and was intended mainly to test the new science software. The second beta, just released this October, was to test the GUI facilities and related software and make this available to beta test sites for development of GUI demonstration tasks. The third beta, planned for later this year, will include all planned routine IRAF core system work such as bug fixes, integration of the FITS image kernel, addition of Solaris support, feature requests, and so on. There is no fixed date yet for the public release of version 2.10.3, but this will follow when testing of the third beta is completed. Version 2.10.3 will be released simultaneously with the X11 support package, and user sites will need to upgrade to version 2.10.3 to make full use of the new X11 support utilities.

The new IRAF ports currently scheduled are to Solaris (Sun's new operating system) and to the DEC Alpha platform, beginning with OSF/1. Due to the effort required to develop the new GUI facilities this year we decided we could not afford a special release to support Solaris so the decision was made to delay this port until the final phases of the version 2.10.3 release preparation (beta-3).  The DEC Alpha port will follow as soon after as time permits; an early version of this based on IRAF v2.10.2 is functioning now at STScI. The only other new port currently planned is a PC-UNIX port, which will use some yet to be determined UNIX variant (e.g., Linux and/or Solaris) running on PC platforms such as the Intel 486.

The first phase of the "save-the-bits" data archiving and data backup project is now complete, and the automated data archiver is in

operation on Kitt Peak. Data taken by the IRAF-based data acquisition software (ICE) is converted to a standard FITS format and sent over the network to a central archive server node, when it is entered into a queue and eventually written to an Exabyte tape. The FITS header of each image is extracted and entered along with auxiliary information about the data into a catalog.  The archive tapes and the catalog are eventually transferred to Tucson for storage. Operation of the data archiving and backup system is transparent to the user.  Additional information on this project can be found elsewhere in this newsletter.

A similar system has been set up to automatically process and distribute, via the network, Kitt Peak (National Solar Observatory) synoptic solar data. Daily full disk images of the sun acquired at the vacuum telescope spectromagnetograph are made available both as remote archives and to users of the World Wide Web via HTML documents. Data is reduced automatically by an IRAF script and data products are sent to a downtown archive for automatic distribution via active mirror archives and FTP file transfer.  The data pipeline constructs HTML documents that make this data available for remote viewing by client programs such as NCSA mosaic. The NSO home page address is "http://argo.tuc.noao.edu/" and includes a prototype database search engine as well as a hyperlink to the "current data" described above.

There has been a lot of work on the IRAF science applications but these are difficult to present in detail here. Some of these projects have been mentioned in earlier editions of the IRAF Update. All this software will be included in the next IRAF release, version 2.10.3. The next issue of the IRAF Newsletter, to be sent out at the time of the public v2.10.3 release, will provide detailed information on the new software. The new software includes support for general image expression evaluation, image format conversions, image registration, surface fitting of irregularly spaced points, PSF modeling, CCD exposure time estimation, various digital photometry enhancements including the DAOPHOT-II algorithms, RV (radial velocity) package support for the multispec image format and for velocity measurements of single spectral lines, and many enhancements to the spectral reduction software. As mentioned earlier, prototype GUIs for selected reduction and analysis tasks are also under development.

We are currently in the process of revising both the IRAF long term plan and the near term applications development plan.  Interested users are encouraged to contact us, or any representative of the IRAF User Committee, with any suggestions for new software or opinions on priorities for the future development and use of the IRAF software.

Members of the IRAF group attended the Astronomical Data Analysis Software and Systems Conference in Victoria in October (see the accompanying article in this section of the Newsletter). The new IRAF software being developed for the V2.10.3 release along with new graphical user interface software was demonstrated throughout the Conference.  Several members of the IRAF group will attend the AAS meeting in Washington in January and will be demonstrating the latest IRAF software there.  Please drop by and say hello.

For further information about the IRAF project, please contact Jeannette Barnes, Central Computer Services.

Doug Tody, Jeannette Barnes

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# FTP Archives (1Dec93)

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FTP Archives (1Dec93)
(from CCS, NOAO Newsletter No. 36, 1 December 1993)

IRAF FTP Archives: ftp iraf.noao.edu (or 140.252.1.1)

NOAO FTP Archives: ftp gemini.tuc.noao.edu (or 140.252.1.11)

      weather   Directory containing weather satellite pictures.  [32]

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      noao      Directory containing miscellaneous information about NOAO.

Miscellaneous FTP Archives: ftp pandora.tuc.noao.edu (or 140.252.1.24),
      cd catalogs

      jacobyetal.spec     Directory containing the Jacoby et al.
                          spectral catalog.

[] NOAO Newsletter issues containing latest information on this entry.
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