NOAO Newsletter - June 1992 - Number 30

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AURA Corporate Office

Director's Office

Cerro Tololo Inter-American Observatory

Kitt Peak National Observatory

National Solar Observatory

Global Oscillation Network Group

Central Computer Services

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

New Board Chairman Elected (1Jun92)

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New Board Chairman Elected (1Jun92)
(from the AURA Corporate Office, NOAO Newsletter No. 30, 1 June 1992)

At its 8-9 April 1992 meeting, the AURA Board of Directors elected Maarten Schmidt (California Inst. of Technology) as its new chairman, effective 1 July 1992. Schmidt has served on the Board since 1983. We look forward to working under his leadership. Dick Margison (U. of Illinois) continues as Vice Chairman. Many thanks to Bob MacQueen (Rhodes College) for leading the Board during the past three years.

Goetz Oertel

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AURA Welcomes New Board Members (1Jun92)

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AURA Welcomes New Board Members (1Jun92)
(from the AURA Corporate Office, NOAO Newsletter No. 30, 1 June 1992)

We are pleased to welcome new institutional directors from the University of Wisconsin and Yale University. From Wisconsin, Phil Certain, Associate Dean of the College of Letters and Science, joins us. From Yale, Bob Szczarba, Deputy Provost for Physical Sciences and Engineering, comes on board. We appreciate the contributions of Blair Savage (Wisconsin) and Pierre Demarque (Yale) over the years and will miss them.

We also add one new director-at-large, Phyllis Kaminsky of Kaminsky Associates, an international consulting firm. We thank Bruce Margon (U. of Washington) for his service as an at-large director and will miss him, too.

Lorraine Reams

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Iowa State University Joins AURA (1Jun92)

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Iowa State University Joins AURA (1Jun92)
(from the AURA Corporate Office, NOAO Newsletter No. 30, 1 June 1992)

In April, the Board of Directors unanimously voted to admit Iowa State
University as AURA's 22nd member. Iowa State has strong astronomy
programs and is a user of NOAO facilities. We welcome our new member
and look forward to a closer association.

Lorraine Reams
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New Class of Membership in AURA (1Jun92)

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New Class of Membership in AURA (1Jun92)
(from the AURA Corporate Office, NOAO Newsletter No. 30, 1 June 1992)

Also in April, the Board approved a new category of membership in
AURA:  International Affiliates--institutions outside the United States
that are selected by the Board as affiliate members.

The Board invited the Universidad de Chile and approved the application
from the Universidad Nacional Autonoma de Mexico to become the first
affiliates under this program.

Goetz Oertel
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Revised Membership Guidelines (1Jun92)

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Revised Membership Guidelines (1Jun92)
(from the AURA Corporate Office, NOAO Newsletter No. 30, 1 June 1992)

AURA has always been open to universities and other non-profit
institutions. The Board has revised the membership guidelines to
reflect that fact. AURA is open to applications from universities and
other non-profit institutions with strong astronomy programs to become
more broadly representative of the astronomy community. For information
about membership in AURA, contact Goetz Oertel or me at:

               Suite 701, 1625 Massachusetts Ave., N.W.
                        Washington, DC 20036
                            (202) 483-2101.

Lorraine Reams
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AURA Achievement Awards (1Jun92)

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AURA Achievement Awards (1Jun92)
(from the AURA Corporate Office, NOAO Newsletter No. 30, 1 June 1992)

"And the winners are" Nick Suntzeff (CTIO) for science and Al Fowler (KPNO) for service! They receive a certificate of appreciation and a cash award.

Suntzeff received the AURA Award for Outstanding Science for his work on the bolometric luminosity evolution of SN 1987A. He measured and recorded its bolometric light curve to enable analysis of the energy radiated by the supernova in comparison with theoretical predictions. Suntzeff has also done outstanding research on stellar populations in our own and Local Group galaxies.

Fowler received the AURA Award for Outstanding Service for his efforts in the development of infrared arrays at KPNO. Fowler helped write the specifications for the first 58 x 62 InSb arrays and has provided KPNO with a series of state-of-the-art instruments for both imaging and spectroscopy.

Congratulations!

Goetz Oertel

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Management Changes (1Jun92)

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Management Changes (1Jun92)
(from the Director's Office, NOAO Newsletter No. 30, 1 June 1992)

At its meeting in England in May, the interim board for the Gemini telescopes project asked me to assume the position of Gemini Project Director through the end of this calendar year. The Board felt that the issues that must be addressed concerning the definition of the project and the creation of administrative and management structures were sufficient in scope to require the full-time attention of a Director. Accordingly, I will take leave from my position as Director of NOAO for the time period 1 June-31 December 1992. It is my intention to return to NOAO at the beginning of next year.

Richard Green will serve as Acting Director of NOAO during the time that I am on leave. He will also serve as US project scientist for Gemini. In this capacity, he will oversee the activities of the US project office for Gemini. Similar offices also exist in the other partner countries. The US project office will be responsible for working with the US community to define its goals and expectations for the Gemini telescopes, will advocate the US position to the Gemini project, will assist with developing and reviewing designs for the telescope, and will work with the project to identify work packages that can be carried out by various groups within the US.

Pat Osmer is continuing to serve as the Acting Gemini Project

Scientist. In this position, he serves the needs of all the partner countries and cannot serve as a spokesperson for the US position.

Sidney C. Wolff

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The Budget Revisited (1Jun92)

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The Budget Revisited (1Jun92)
(from the Director's Office, NOAO Newsletter No. 30, 1 June 1992)

The last Newsletter reported the budget figures contained within the President's budget submission to Congress for FY 1993. The percentage increase requested for NOAO was 3.5 percent. This percentage is equal to the federal government estimate of the cost increase required to maintain current services. Overall within the NSF, most of the requested budget increase for various divisions and national centers, which averages substantially larger than 3.5 percent, is committed to presidential initiatives and other new programs.

In the specific case of NOAO, we have now completed the calculations necessary to determine what budget increase would actually be required to maintain current services and to complete the GONG project according to the current project plan. If we assume US inflation at 3.5 percent, the scheduled GONG increase of $250,000, and Chilean inflation at a rate 15 percent higher than in the US, which is currently the case, then the President's request fails to cover our current program by $1M. In both FY 1991 and FY 1992, NSF did provide special funds to NOAO to cover the problem caused by the rapid increase of costs in Chile. The seriousness of the budget shortfall at NOAO for FY 1993 will depend on what fraction of the President's request is actually received and on whether or not the NSF again provides sufficient funds to cover the differential inflation in Chile.

Sidney C. Wolff

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NOAO Preprint Series (1Jun92)

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NOAO Preprint Series (1Jun92)
(from the Director's Office, NOAO Newsletter No. 30, 1 June 1992)

The following preprints were submitted during the period from 1 January to 30 April 1992. Please direct all requests for copies of preprints to the NOAO author marked with an asterisk.

Number	Author(s)	Title
410	*Stepp, L., Poczulp, G., Pearson, E., Roddier, N.	"NOAO Testing Procedures for Large Optics"
411	Coude du Foresto, V., *Ridgway, S.	"FLUOR: A Stellar Interferometer Using Single-Mode Infrared Fibers"

412	*Williams, R.	"Incorporation of Density Fluctuations into Photoionization Calculations"
413	*Walker, A.R.	"The LMC Cluster GLC 0435-59 (Reticulum): Photometry of the RR Lyraes, and a Color Magnitude Diagram"
414	*Geisler, D., Friel, E.D.	"The Metallicity Distribution of G and K Giants in Baade's Window"
415	*Pilachowski, C.A., Sowell, J.R.	"The Lithium Abundances of the Capella Giants"
416	*Pierce, M.J., Ressler, M.E., Shure, M.S.	"An Absolute Calibration of Type Ia Supernovae and the Value of HO"
417	Ostrov, P., *Geisler, D., Forte, J.C.	"The Metallicity Gradient and Distribution Function of Globular Clusters Around NGC 1399"
418	*Ridgway, S.T., Benson, J.A., Dyck, H.M., Townsley, L.K., Hermann, R.A.	"The Infrared Angular Diameter of Omicron Ceti Near Maximum Light"
419	*Lauer, T.R., Faber, S.M., Currie, D.G., Ewald, S.P., Groth, E.J., Hester, J.J., Holtzman, J.A., Light, R.M., O'Neil Jr., E.J., Shaya, E.J., Westphal, J.A.	"Planetary Camera Observations of the Central Parsec of M32"
420	*Kinman, T.D.	"The Stars of Spectral Types A and F as Probes of Galactic Structure"
421	*Hill, F.	"On the Interpretation of Inversions of Helioseismic Rotational Splitting Measurements"
422	*Blanco, B.M.	"RR Lyrae Variables in a Galactic Bulge Window"
423	*Joyce, R.R.	"Observing with Infrared Arrays"
424	*Mueller, B.E.A., Tholen, D.J., Hartmann, W.K., Cruikshank, D.P.	"Extraordinary Colors of Asteroidal Object 1992 AD"
425	*Armandroff, T.E., Da Costa, G.S, Zinn, R.	"Metallicities for the Outer-Halo Globular Clusters Pal 3, 4, and 14"
426	*Silva, D.R., Cornell, M.E.	"A New Library of Stellar Optical Spectra"
427	*Williams, R.E.	"The Formation of Novae Spectra"
428	*Ridgway, S.T, Hinkle, K.H.	"Strategies for Very High Resolution Infrared Spectroscopy"
429	*Kopp, G., Rabin, D.	"A Relation Between Magnetic Field Strength and Temperature in Sunspots"
430	*Luce, R., Buchholz, N.	"Fiber Optic Link Design for INMOS Transputers"

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Non-NOAO Preprints (1Jun92)

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Non-NOAO Preprints (1Jun92)
(from the Director's Office, NOAO Newsletter No. 30, 1 June 1992)

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.

Author(s)	Title
Bahcall, J.N., Jannuzi, B.T., Schneider, D.P., Hartig, G.F., *Greeen, R.F.	"The Ultraviolet Absorption Spectrum of H1821 + 643 (z = 0.297)"
Braun, D.C., *Duvall, T.L., LaBonte, B.J., Jefferies, S.M., Harvey, J.W., Pomerantz, M.A.	"Scattering of p-Modes by a Sunspot"
Braun, D.C., *Lindsey, C.A., Fan, Y., Jefferies, S.M.	"Local Acoustic Diagnostics of the Solar Interior"
Da Costa, G.S., *Armandroff, T.E., Norris, J.E.	"The Metal Abundance and Age of the Globular Cluster Ruprecht 106"
Eason, E.L., *Giampapa, M.S., Radick, R.R., Worden, S.P., Hege, E.K.	"Spectroscopic and Photometric Observations of a Five-Magnitude Flare Event on UV Ceti"
*Eggen, O.J.	"HR 1614 and the Dissolution of a Supercluster"
*Eggen, O.J.	"The Sirius Supercluster in the FK5"
Harrison, R.A., Carter, M.K., Clark, T.A., *Lindsey, C.A., Jefferies, J.T. (seven other authors)	"First Millimetre Wavelength Observations of an Active Region Solar Prominence Observed During the July 11, 1991 Total Solar Eclipse"
*Harvey, J.W., Livingston, W.C.	"The NSO Daily Observations of the Equivalent Width of the Solar He I Absorption Line at 10830 A as a Measure of Upper Chromospheric Activity"
*Howard, R.F.	"Some Characteristics of the Development and Decay of Active Region Magnetic Flux"
*Howard, R.F.	"The East-West Inclinations of Magnetic Fields in the Solar Photosphere"
*Howard, R.F.	"On the Large-Scale Distribution of Solar Magnetic Fields"
*Howard, R.F.	"Rotation of Leading and Following Portions of Plages and Sunspot Groups"
*Howard, R.F.	"The Rotation of Active Regions with Differing Magnetic Polarity Separations"
*Jaksha, D., Kopp, G., Mahaffey, C., Plymate, C., Rabin, D.M., Wagner, J.	"A Near Infrared Magnetograph (NIM)"
*Komm, R.W., Howard, R.F., Harvey, J.W.	"Torsional Oscillation Patterns in Photospheric Magnetic Features"
*Kopp, G., Rabin, D.M.	"Magnetic Field Strength and Continuum Intensity Measurements of Sunspots at 1.56 um"
Langer, G.E., *Suntzeff, N.B., Kraft, R.P.	"l3883 CN Band Strengths for 238 Metal-Poor Halo Giants: Evidence for Chemical Differences Between Globular Cluster and Halo Field Giants"
*Lindsey, C.A., Jefferies, J.T., (eight other authors)	"Observation of the Total Solar Eclipse of July 11, 1991 in 1.3 mm Radiation From the James Clark Maxwell Telescope"
*Livingston, W.C.	"Spectrum Variability of the Sun"
*Livingston, W.C., Barr, L.	"Proposed Upgrade of the McMath Solar/Stellar Telescope to a Four Meter Aperture"

Moran, T., Foukal, P., *Rabin, D.M.	"A Photometric Study of Faculae and Sunspots Between 1.2 um and 1.6 um"
Nave, G., Learner, R.C., Murray, J.E., Thorne, A.P., *Brault, J.W.	"Wavelengths in the Red and Infra-Red Spectrum of the Iron-Neon Hollow Cathode Lamp"
*November, L.J.	"Recovery of the Matrix Operators in the Similarity and Congruency Transformations: Applications in Polarimetry"
*Rabin, D.M.	"Spatially Extended Measurements of Magnetic Field Strength in Solar Plages"
*Rabin, D.M.	"Fine-Scale Magnetic Fields in the Solar Photosphere"
*Radick, R.R.	"Luminosity Variability of Lower Main-Sequence Stars"
*Radick, R.R., Restaino, S.R., Conan, J.	"Wavefront Sensing for Solar Imaging"
Ruedi, I, Solanki, S. *Livingston, W.C., Stenflo, J.O.	"Infrared Lines as Probes of Solar Magnetic Features. III. Strong and Weak Magnetic Fields in Plages"
*Smartt, R.N.	"Some Considerations for Instrumentation for a Lunar-Based Solar Observatory"
Solanki, S.K., Ruedi, I., *Livingston, W.C.	"Infrared Lines as Probes of Solar Magnetic Features. V. The Magnetic Structure of a Simple Sunspot"
Solanki, S.K., Ruedi, I., *Livingston, W.C., Stenflo, J.O.	"Strong and Weak Solar Magnetic and Fields"
Staveley-Smith, L., Davies, R.D., *Kinman, T.D.	"H I and Optical Observations of Dwarf Galaxies"
Storchi-Bergmann, T., Wilson, A.S., *Baldwin, J.A.	"The Ionization Cone, Obscured Nucleus and Gaseous Outflow in NGC 3281 - A Prototypical Seyfert 2 Galaxy"
*Suntzeff, N.B., Schommer, R.A., Olszewski, E.W., Walker, A.R.	"Spectroscopy of Giants in LMC Clusters. III. Velocities and Abundances for NGC 1841 and Reticulum and the Properties of the Metal-Poor Clusters"
van den Bergh, S., *Pierce, M.J.	"The Intrinsic Colors of Supernovae of Type Ia"
*Walker, A.R.	"The Absolute Magnitudes of LMC RR Lyrae Variables, and the Ages of Galactic Globular Clusters"
*Walker, A.R.	"The LMC Cluster NGC 1466: Photometry of the RR Lyraes, and a Color Magnitude Diagram"
White, O.R., Skumanich, A., Lean, J., *Livingston, W.C., Keil, S.L.	"The Sun in a Non-Cycling State"

John Cornett, Elaine MacAuliffe, Vicki Miller,
Shirley Phipps, Cathy Van Atta

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New FAX Number (1Jun92)

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New FAX Number (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

We have added a direct FAX line in La Serena, which entered into service on 11 May. The new number is:

56-51-21-4458

This was done by expropriating the Director's private line. The FAX machine on extension 342 remains available, since we use it for sending and receiving material internally. Just for reference, the various other CTIO FAX numbers are:

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56-51-22-5415 ext. 342        (La Serena)
56-51-22-5415 ext. 462        (Tololo)
56-2-49-6568                  (Santiago Office)
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This situation may change again in a few months, since we hope to convert the La Serena phone plant to permit direct dialing of all extensions from outside. We will not disconnect the new FAX number without adequate notice.

Jay Elias, Enrique Figueroa

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Bill Weller Joins Gemini Staff (1Jun92)

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Bill Weller Joins Gemini Staff (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

After eight productive years on the CTIO scientific staff, Bill Weller has decided to take a position in Tucson with the Gemini project as Instrumentation Scientist for the Optical and UV. During these years at CTIO, his main duties have been to oversee the maintenance and improvement of the optics and control systems of the various Tololo telescopes, and his expertise in this area will be sorely missed. Bill also was responsible for the implementation of CCD detectors on the Curtis Schmidt telescope and was one of the prime organizers of the Cerro Pachon site testing. Bill, his wife Lynda, and son Gregory will very much be missed by their many friends here in Chile, but we look forward to future visits as part of his activities with the Gemini project!

Mark Phillips

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Instrumentation News (1Jun92)

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Instrumentation News (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

As has been the case for some time now, our work has been concentrated on a few major projects. We are now starting to see "the light at the end of the tunnel" for some of them, as indicated below.

4-m seeing improvements. This is a multi-part project, described in detail in Newsletter No. 28. The 4-m oil cooler has been completed, installed and is now in operation. Right now it cools the oil at full capacity; future work involves setting the oil temperature to some optimal value (to be determined) relative to various temperature sensor readings. Preparations for the move of the console room continue, with the move itself scheduled for the August bright run. Work on the dome ventilation project has begun; the first stage involves installation of the sliding doors around the outside of the dome at the catwalk level. Once this is completed, the ventilation openings will be cut in the dome skin. In this way the work can continue during the southern winter without risk.

Arcon. Work on this project is described briefly in an accompanying article.

CCD TV cameras. As indicated in the accompanying article, production will soon begin on the last four units for CTIO. We are starting work, at a low level, on a follow-on project to use the camera's PC to handle the telescope. At present, the cameras are used for guiding by feeding the video output from the PC into the Leaky Guider units; incorporation of the guiding function in the PC should give better guiding and reduce the number of controls the night assistant (or the astronomer) has to manipulate.

Large format PFCCD and PFC/ADC. Commissioning tests for both of these instruments are scheduled for the end of the calendar year. Watch the next Newsletter for information on the status of these projects, in particular whether they will be officially "available" during the first semester of 1993.

1.5-m TCS. This is the second of the new telescope control systems on Tololo; the first, for the 4-m telescope, has been in use for about two years. Progress on final commissioning has been slow because we were initially reluctant to set aside a large block of time for the purpose, and the commissioning work has thus gone on during afternoons and shared engineering nights. As this has proven inefficient, a block of time will be set aside in late August or early September, after which the new system will be put into service. In the event that tests prior to then show it to be working flawlessly, we will recycle the time and put the TCS into service.

The TCS will be very similar in its operation to the 4-m; from the user's point of view its advantages will be greater speed in setting, greater reliability, plus the ability to work with object catalogs. The initial implementation will not provide control of the offset guider (GAM); this will eventually be done, thus providing the same kind of flexibility as currently exists on the 4-m telescope.

Implementation of the small telescope TCSs will occur as resources permit once the 1.5-m TCS is finished. The next telescope after the 1.5-m will be the 1.0- m (Yale) telescope, followed by the 0.9-m telescope.

Jay Elias

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CCD News (1Jun92)

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CCD News (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

In June we will begin the conversion from operating our CCDs with the VEB controllers to using the new Arcon controllers. This change-over process will continue for some 18-24 months by which time all our CCDs and some of the IR arrays will be operated by the Arcons, and much ancient hardware (VEBs, LSIs) and software (Forth) will have been retired. As far as the CCDs are concerned, the conversion is complicated by the VEBs being telescope-based whereas the Arcons are dewar-based. Thus, if we wish to retire a VEB off some specific telescope, we must ensure that all the CCDs we want to use on that telescope are first converted to Arcons, or else accept some smaller number of options. In addition, we do not want to impair significantly the rate at which we are able to commission new detectors, since over this period we are expecting another Tektronix 2048, a Reticon 1200 x 400, and several Loral CCDs. As we proceed, we will retire the last of our EEV (GEC) CCDs and the Thomson 1024s.

At the moment, we are operating a Thomson CCD at the Schmidt telescope (see Newsletter No. 29, page 15) with the prototype Arcon 2.1. This system is being shared for development work, but shortly the R&D will move to Arcon 3.1, which will also use a Thomson CCD. The latter will be a lab system only, employed for testing and verifying boards for the Arcons as they are produced. Arcon 3.2 will operate a Tek 1024, and Arcon 3.3 a Tek 2048. Both these CCDs have four low noise amplifiers and will benefit greatly from the quad readout capability of the Arcons. The change-over will also eliminate the difficulty of operating these mega-pixel arrays with the LSI 11/73 computers. Arcon 3.4 is destined for the NICMOS III HgCdTe IR array.

As soon as Arcon 3.2 is operating, we will retire the 0.9-m VEB, which will then become a spare for the VEBs remaining at the 1.5-m and 4-m telescopes. As a consequence, for a period of about two months next semester the Tek 1024 CCD will be the only CCD available at the 0.9-m, except for programs where U band sensitivity is paramount or where there is a clash with the 1.5-m or 4-m schedules. For these cases we will schedule the Thomson CCD from the Schmidt. We will try to juggle the 0.9-m schedule with the exact date of the VEB removal so that there is as little conflict as possible with people's programs. At the end of this two month period, the Tek 2048 will have also been converted to use an Arcon and will thus become available at the 0.9-m. However, users should be aware that TI and Tek 512 CCDs will not be usable at the 0.9-m for at least a year. We are sure that present users of the Tek 512 will be more than happy with the Tek 1024/2048 due to the much improved region-of-interest handling and the quad readout compensating for the longer readout time of the bigger CCDs. The TI CCDs are presently only used for the few programs where the U band sensitivity is of the utmost importance. There will unfortunately be a period of time where we will not be able to offer a CCD at the 0.9-m which has as good a UV QE as the TIs. Nearer the change-over time we will be contacting any observers who have requested a different CCD from the one which we will actually be scheduling.

Alistair Walker

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CTIO CCD-TV Acquisition Cameras (1Jun92)

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CTIO CCD-TV Acquisition Cameras (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

We are happy to report that the first two cameras for ESO, out of a total of four, were completed and successfully saw first light in March on La Silla. On a clear night, two days away from full moon and in 1.5 arcsec FWHM seeing, a V = 20.5 object could be clearly seen with a 3 sec integration at the Cass focus (about 0.2 arcsec/pixel) of their 3.6-m telescope, where one of these cameras will be in regular use.

This is the first time that a collaboration on a major instrumentation project has taken place between CTIO and ESO. Aldo Pizarro, one of their electronics engineers, has spent about 50% of his time over the last year and a half working with us to familiarize himself with the camera hardware and software and to participate in the replication of the four systems for La Silla. This long production period reflects the time it took to order and receive all the necessary parts, to have the cameras assembled and tested in Santiago, and then finally to fine tune them in our own labs in La Serena.

This successful joint effort was aimed at the replacement of some of the older ISIT-based cameras that have been in use on La Silla for many years. Our solid state, thermo-electrically cooled CTIO CCD-TV design confirmed on La Silla our experience obtained at CTIO telescopes, i.e. that there is a net gain in excess of two to three magnitudes to be realized with such a replacement.

Ricardo Schmidt, Alistair Walker

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The Incredible Shrinking 0.9-m Mirror (1Jun92)

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The Incredible Shrinking 0.9-m Mirror (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

As part of our program to improve the imaging performance of all our telescopes, on 17 March we installed a mask on the outer edge of the 0.9-m primary. Tests of the image quality over the past year have shown a variety of problems, including an obvious outer "hairy edge" on extra-focal images. We suspected this to be an effect of a turned down edge on the primary mirror, which is now confirmed by the improved appearance of the images. The extra-focal images are now more regular and symmetrical, and the radial profiles of in-focus stars appear smoother.

For reference, the clear aperture of the telescope is now 34.5 inches, or 0.88 meter. The resulting loss in throughput is 0.085 magnitudes. This should be more than compensated for by the improved concentration of light in the image.

Astigmatism is still evident when focusing this telescope, and we suspect problems with one of the mirror support mechanisms, so further improvements are being planned. Since this is a classical Cassegrain telescope, coma is also evident away from the optical axis. We have adjusted the collimation of the primary to place the optical axis as close as possible to the center of the chip, although we are still about 1.5 arcmin away from perfect centering (the optical axis is displaced to the SE). Because of this coma, images at the corners of the chips are noticeably degraded. This becomes especially evident with the Tek 2048 CCD (which has a 13 arcmin field of view), and observers attempting PSF fitting should be aware of this problem. A recent run with this detector showed a FWHM degraded at the corners by 0.2-0.3 pixels (0.08-0.12 arcsec), in moderate seeing (about 1.4 arcsec FWHM).

Bob Schommer, Bill Weller, Oscar Sa

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Photometry News (1Jun92)

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Photometry News (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

Several UBVRI filter sets for use with Ga As phototubes following the prescription of Bessell (1990, PASP, 102, p. 1181) have been purchased. Observers wishing to use these filters should ask for the UBVRI Bessell set.

Doug Geisler

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On-Line Filter Curves (1Jun92)

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On-Line Filter Curves (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

CTIO has a collection of 150 optical filters of various types. Each filter as it is received is scanned on the CTIO scanning photometer, and its transmission curve recorded on floppy disk. These records are kept on-line on the Sun network and are available to users over the network, or via FTP from other institutions. The catalog is called catalog.filters.Z and is found in /us12/ftp/pub/. The .Z indicates that the data are compressed. An explanation is found in README.FILTERS in the same directory.

The transmission curves are sampled every 2 A for the narrow band filters, and every 5 A for the broad band filters. The physical sizes of the filters include the thickness. This number could be used to estimate the focus setting offsets for the various filters. The measurements were made in an f/13.5 beam, at a temperature (normally) of 22 C. When using the interference filters at other f-ratios and temperatures, allowance should be made for the center wavelength and bandwidth shift.

The filter curves in the FTP public directory are reproduced exactly as written in the filter measuring system by the Instrument Group. The files comprise a header giving the filter data and any relevant comments and a tabulation of lambda and percent transmission. No attempt has been made to judge the optical quality of the filters, but it is known that some are suspect, especially in a fast beam. Users are advised to check the suitability of filters for their specific needs.

The disk version of the catalog of filters is written in Unix tar format, and then compressed using the standard Unix compress utility. The catalog occupies 1.1 Mbyte in tar format and 2.1 Kbyte in compressed format. The commands used were:

```
tar cvf catalog.filters *.flt filters.tex
compress catalog.filters
```

In order to rebuild the file structure of the catalog just type:

```
uncompress catalog.filters
tar xvf catalog.filters
```

An expanded version of the text of this file is included as filters.tex, and may be printed using the TeX program and a suitable dvi routine.

William Weller

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Service Observing by Yale Astronomers on 0.9-m (1Jun92)

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Service Observing by Yale Astronomers on 0.9-m (1Jun92)
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

As part of the agreement by which CTIO operates the Yale 1-m telescope, Yale astronomers are guaranteed a certain number of nights each semester on the 1-m and 0.9-m telescopes. At the request of the Yale staff and students, the 0.9-m time during first semester of 1993 (February-July) will be allocated in a few blocks of approximately one to two weeks duration each. The Yale observers have graciously expressed their willingness to carry out a limited amount of service observing for the NOAO community on an experimental basis as part of these runs. Depending on the number of requests received, one or more nights will be added to each of the block runs, with the observing on all nights to be performed by Yale personnel. We expect this arrangement to be especially attractive to those who desire a few frames of a particular object which require considerably less than a night to obtain, or for projects which entail frequent monitoring of a field over a period of several days.

Requests for service observing time on the 0.9-m as part of the Yale block runs should be submitted by 30 September using the normal CTIO observing proposal form. Please identify in Section 2 of the proposal form that the request is being made as part of the Yale Service Observing program. Please be very explicit with regard to the targets to be observed and the amount of time involved. All such proposals will be reviewed and graded by the TAC in the normal fashion. Of course, as with any observing proposal, we cannot guarantee results; accepted service proposals may fall victim to weather and other logistical problems, just like any other observation. We hope that this experiment will be of interest to a number of CTIO users, and wish to express our thanks to the Yale staff and students for their interest in bringing a limited service observing capability to the 0.9-m telescope.

Mark Phillips

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Observing Request Statistics: August 1992 - January 1993 (1Jun92)

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Observing Request Statistics: August 1992 -...(1Jun92)
January 1993
(from CTIO, NOAO Newsletter No. 30, 1 June 1992)

4-m Telescope

# of Requests@		# of Nights Requested				
Dark	Bright	Dark	Bright	Instrument	Nights	%
32	9	112	35	CS/CCD	147	32.5
7	11	24	43	Ech/CCD	67	14.8
1		2		PF/Plates	2	0.5
22	1	73	2	PF/CCD	75	16.6
1	9	4	33	IR/IRS	37	8.2
11	6	41	26	Argus	67	14.8
1		4		ASCAP	4	0.9
3		10		CF/CCD	10	2.2
1	2	2	6	RF/P	8	1.8
	6		25	IR/Imager	25	5.5
	1		5	Visitor	5	1.1
	1		5	IR/Phot	5	1.1
--	-	---	-		-	---
79	45	272	180		452	100%

	Now	Last Semester	Semester Before Last
No. of requests	124	109	118
No. of nights requested	452	397	420

	Now	Last Semester	Semester Before Last
Oversubscription*	2.77	2.55	2.55
Average request	3.64	3.64	3.6

* 163 nights available after engineering

1.5-m Telescope

# of Requests@ Dark	Bright	# of Nights Requested Dark	Bright	Instrument	Nights	%
27	4	117	20	CF/CCD	137	42.3
10	5	58	38	CS/CCD	96	29.6
1	3	2	26	Visitor	28	8.6
	1		3	IR/Phot	3	0.9
	2		6	IR/IRS	6	1.9
	5	5	29	IR/Imager	34	10.5
	1		6	ASCAP	6	1.9
	1		3	Ech/CCD	3	0.9
	1		11	RF-P	11	3.4
--	-	---	--		--	---
38	23	182	142		324	100%

	Now	Last Semester	Semester Before Last
No. of requests	61	59	58
No. of nights requested	324	329.5	280
Oversubscription*	1.91	1.97	1.68
Average request	5.31	5.59	4.8

* 169 nights available after engineering

1-m Telescope

# of Requests Dark	Bright	# of Nights Requested Dark	Bright	Instrument	Nights	%
5	6	38	81	ASCAP	119	68.8
5	3	33	21	CS/2DF	54	31.2
-	-	--	--		--	----
10	9	71	102		173	100%

No. of requests = 19
No. of nights requested = 173
Oversubscription* = 1.02
Average Request = 9.1 nights
* 168 nights available after engineering

0.9-m Telescope

# of Requests Dark	Bright	# of Nights Requested Dark	Bright	Instrument	Nights
19	17	113	127	CF/CCD	240

No. of requests = 36
No. of nights requested = 240
Oversubscription* = 1.41
Average Request = 6.66 nights
* 170 nights available after engineering

Curtis Schmidt

Plates	3 req. for	62 nights	58.5%
CCD	10 req. for	44 nights	41.5%
	--	--	----
	13 req.	106 nights	100%

No. of requests = 13
No. of nights requested = 106
Oversubscription* = 0.61
Average request = 8.15 nights
* 174 nights available after Michigan time

0.6-m Telescope

ASCAP3 requests for 23 nights

@ Note: requests for two or more instruments on the same telescope for the same lunar phase are counted as a "request" for the first instrument only, however, all nights requested on individual instruments are included in the "# of Nights Requested" column.

Doug Geisler

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Telling the Telescopes Where to Go (1Jun92)

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Telling the Telescopes Where to Go: Coordinate...(1Jun92)
Transfers Make it to the Mountain
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

For astronomers who have a large number of objects to observe and would like to have coordinates loaded before their run, this article is for you. Indeed, any observer who makes extensive use of coordinate caches should follow these procedures, as last minute entry of coordinates can lead to chaos with things not going in the smooth manner we would like.

Coordinate lists may be sent via e-mail at least two weeks before your observing run to coords@noao.edu. Files should be ASCII text, no longer than 2000 lines. For ease of use we suggest breaking large files into smaller ones. Start your file with your name, a cache name, telescope, and dates of your observing run. Coordinates will be checked for format, loaded into the appropriate telescope computer, and an acknowledgement sent to you that all is ready for your arrival.

Each object in the file should be on one line of text. The format for data entry is object name (which will be truncated to twelve characters by some of the telescope control computers), right ascension (starting in column 16 or greater, delimited by the first blank after column 15; hours, minutes, seconds), declination (degrees, minutes, seconds), and epoch. Each field should be separated by one or more spaces. Do not use tabs. The delimiter in the RA and Dec fields may be either spaces or colons. Decimals are permitted in both the seconds of RA and Dec entries.

For example:

```
            alpha Lyr  18:36:21.70 +38:46:02.0 1983.0
```

Note that the right ascension must start in column 16 or greater and that the sign of the declination must be adjacent to the declination degrees (i.e. -6 and -06 are allowed, but - 6 is not).

Users of the 2.1-m telescope can take advantage of the ability of the telescope control program in use there to apply proper motion corrections. This feature will be added to the telescope control programs at other telescopes as they are upgraded. Proper motion in right ascension and declination (arcsec per year) may be added to entries after the epoch field. For example:

```
         HD 172167  18 36 21.7 +38 46 02 1983 +0.20 +0.28
```

While this would be valid data entry for files that can be loaded at any telescope, the proper motion correction would be ignored everywhere but at the 2.1-m at present.

If you have edited or added to your object cache during your observing run and wish to have your cache e-mailed to you after the run, send the request to coords@noao.edu. The telescope computers should not be used for long-term storage of your coordinate files.

More extensive instructions and options for the data format are available by e-mailing to coords@noao.edu with a request for complete documentation. We would also be interested in your thoughts for the future of this service.

Coordinate lists have been around for decades in various formats. At this time we do not do paper tape, punch cards, or magnetic tape.

Bruce Bohannan, Paul Harding,
Jean Nowakowski, David Chamberlin

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For Boldly Going Where (1Jun92)

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For Boldly Going Where . . . (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

KPNO staff member Tod Lauer has received the NASA Exceptional Scientific Achievement Medal. This award is given for unusually significant scientific contributions toward achievement of NASA's space exploration goals. Lauer was cited for pioneering in the analysis of Hubble Space Telescope data and for research on the cores of dense stellar systems. Lauer has been a member of the HST Wide Field/Planetary Camera team since 1985 and is heavily involved with imaging research using the WFPC.

Sidney C. Wolff

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WIYN on the Fast Track (1Jun92)

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WIYN on the Fast Track (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

This last quarter has seen remarkable progress on the construction of the WIYN telescope. Ground-breaking ceremonies for the observatory were held on 14 March on Kitt Peak. Representatives from all four of the WIYN institutions were present to turn shovels of dirt, and congratulatory letters from Senators Dennis DeConcini and John McCain and Representatives Jim Kolbe and Ed Pastor were read. The weather was perfect, the speeches were short, and a good time was had by all. The ground-breaking ceremony was followed by a picnic in the Picnic Grounds featuring some of Tucson's best Mexican food and a spectacular cake baked in our own KPNO kitchen. All in all, a fine kick-off for the construction phase of the project. NOAO's official shovel now resides in Caty's office--stop by to see it and the pictures of the ground-breaking when you come to Tucson.

Those of you who have visited the mountain in the last two months have no doubt noticed the pace of construction activity. At the time of writing this article (late April) site preparation work (aka blasting!) is complete, and work needed in order to pour the foundations is underway. We expect completion of the observatory and control building by January 1993.

The telescope itself is being fabricated at L&F Industries in California. The basic weldments for the pedestal and the cone are essentially complete, and the azimuth disk is well underway. The base of the fork weldment is in fabrication. The telescope should be delivered to the site in March 1993.

The optical fabrication is also proceeding. Testing of the primary mirror, now polished to a sphere, will soon be completed, and the mirror will be removed from its active supports in preparation for repolishing it to the proper asphere for the WIYN telescope (see the following article for more details). We expect delivery of the primary mirror to the telescope in early 1994. The secondary mirror is being fabricated. A request for proposal to polish the secondary has gone out, and bids will be reviewed soon.

Matt Johns, Caty Pilachowski

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Update on the 3.5-m WIYN Mirror Project (1Jun92)

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Update on the 3.5-m WIYN Mirror Project (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

The 3.5-m WIYN mirror is scheduled for delivery at the telescope by February 1994. The mirror has already been polished to a superbly accurate spherical surface, but must still be ground and polished to an asphere, and then aluminized. For the last 18 months we have been testing the thermal control system and the active support system. Testing will continue for another month or so. Meanwhile mechanical drawings for the flexible bar lap, which will be used for first grinding and then polishing the optical surface of the 3.5-m mirror to its final aspheric configuration, are being released for fabrication. The design of the control system for the actuator in the lap is well along and will be tested with the prototype lap soon.

Two null lens assemblies are needed for optical testing while we generate the asphere. An IR null lens, which allows measurements on an unpolished surface, will be used during the grinding phase in conjunction with a Hartmann screen. During polishing a visible null lens will be used, also in conjunction with a Hartmann screen test. The mechanical design of these null lens assemblies is underway.

Wayne Pollard, Michael Merrill

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TAC Deliberations (1Jun92)

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TAC Deliberations (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

The Bright and Dark TAC committees met the first week of May to review proposals for the fall 1992 semester. We are writing the final schedule and will notify the principal investigators the first week of June. We received a total of 274 proposals, and as usual the overall quality of the proposals was excellent. Oversubscription rates are again high, and once again it was impossible to schedule many proposals. As in the past, we shall provide on request a summary of the TAC comments and discussion for those proposals that did not receive time. Please note that the deadline for requesting a summary of TAC comments is 11 September 1992. Allow 4-6 weeks for a response to your request.

In response to comments from various committees and individuals, KPNO is reevaluating the methods used to provide a summary of TAC comments to the principal investigators of unsuccessful proposals. We plan to have a revised system in place for the spring 1993 semester, and we would welcome any comments you may have on how this procedure could be improved. Please bear in mind that budget constraints will not permit a significant increase in personnel to be devoted to this project and that it is not wise to add to the labors of an already overburdened TAC.

Please send any suggestions you have to me; they will be most welcome and will be carefully considered.

David De Young

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Science Fair: Another Way to Get 4-m Time! (1Jun92)

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Science Fair: Another Way to Get 4-m Time! (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

Two students each won a night on Kitt Peak for their outstanding projects in the Southern Arizona Regional Science Fair. J.D. Wallace, a ninth-grader from Emily Gray Jr. High School in Tucson, spent a night on the 4-m with George Jacoby and Robin Ciardullo. Wallace's project, titled "Satellite Detection Efficiency of Small Optical Telescopes," described his attempt to locate and track satellites and space debris with an 8-inch Celestron. Avery Moon, from Green Fields Country Day School, entered a project titled "Law of Gravitation." Avery wrote a program tracking the orbits of different planets under the influence of a massive body passing through the solar system. Avery will spend a night at the 4-m in May or June.

At the middle school level, Joshua Hammond of Fickett Math-Science Middle School won two tickets to a Kitt Peak Public Evening for his project "Is it Possible to Make a Telescopic Pin-hole Camera?" (It is.) Elementary students Josh Farrar of Otondo School, Janice McKusick of Holy Angels School, and Katherine Hill of Booth School each won astronomy posters for their projects entitled, respectively, "Why do Planets Appear to Retrograde?," "What Causes an Eclipse?," and "Why do Shadows Change?"

NOAO judges for the Science Fair this year were Roberta Toussaint, Todd Boroson, and Karie Meyers. Thanks to everyone who took the time to judge and host students at the telescopes.

Karie Meyers

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How Bright Is the Kitt Peak Night Sky? Revisited (1Jun92)

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How Bright Is the Kitt Peak Night Sky? Revisited (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

We are once again trying to monitor the brightness of the night sky over Kitt Peak, this time using observers' CCD frames of Landolt standards. The work is being done by Henry Roe, a high school student from Tucson who is working part-time for NOAO. Henry is a former winner of an NOAO prize for a project in astronomy at the Southern Arizona

Regional Science Fair.

We are collecting observations of Landolt standards to use to monitor sky brightness. If you are willing to contribute data to this program, please contact Caty Pilachowski. The procedure is simple. If you observe on a night you judge to be photometric, and if you observe sufficient Landolt standards in U, B, V, R, or I filters to determine the extinction, we would appreciate receiving a copy of that night's data (a KPNO T-tape would be great!). We prefer data which has already had bias and flat-field calibrations applied to it. We only need the observations of the Landolt standards and will not use the data for any purpose other than to monitor sky conditions.

Caty Pilachowski, Henry Roe

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Reading Out CCDs: Where Does the Time Go? (1Jun92)

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Reading Out CCDs: Where Does the Time Go? (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

When CCDs had only a few hundred thousand pixels to be read, and readout times were half minute or less, observers exhibited only mild irritation, and their behavior was relatively rational, at least compared to their usual behavior. However, with the advent of larger CCDs, observers found millions of pixels waiting to be read at the end of each exposure and readout times of 5 minutes, and began to experience correspondingly more discomfort.

There have been some changes made since the last Newsletter to try to reduce that level of discomfort by reducing the readout times of the devices that are in service. The goal was to introduce these changes in a manner transparent to the user.

There were three major changes. First, the preclear of the array prior to integration was shortened by summing 10 rows and then clearing the horizontal register. This reduced the preclear time to about 11% of the previous time required. Actual time for each CCD is shown in the following table. Second, for those arrays with more than a million pixels, the hardware integrator components were changed to permit shorter pixel integration times and yield approximately the same gain, noise, and dynamic range. This saves 14 microsec per pixel, thus trimming 1 minute off the readout time of the 2048 x 2048 devices. The third change is beneficial when reading out only a sub-array of some region of interest (ROI). Since there are almost an infinite number of combinations of ROI, information is contained in the table and the first figure to permit optimization of readout speed for specific observing programs.

CCD	Pre Clear (sec)	Fast Preskip 4 Rows (ms)	# Pixels Per Row	Pixel Time (us)	Row Read Time (ms)	Full Frame Readout (sec)
TIx	&lt 1	18.5	892	49	43.7	35
F3Kx	&lt 2	18.5	3134	35	109.7	115
T2Kx	&lt 7	41.0	2110	38	80.2	165
T1Kx	&lt 2	21.0	1116	35	39.1	40
T5Hx	&lt 1	21.0	604	49	29.6	16
S2Kx	&lt 5	21.0	2110	37	78.1	160
S1Kx	&lt 2	21.0	1085	35	37.9	39

[figure not included]

What can be done to get even greater speed performance? Faster analog to digital converters, multiple readouts of single CCDs, and perhaps trimming a microsecond or two from some of the hardware overhead requirements. All these things are currently being pursued.

Just where does the time go? The second figure demonstrates a typical pixel timing wave form. This time per pixel represents the bulk of the time required to read out a CCD. This waveform is for a single pixel with no binning. Vertical binning divides readout time by the binning factor (2, 3, 4) with a very small overhead for each vertical shift. Horizontal binning adds an HCLK time (see the second figure) for each binning factor (2, 3, 4) then divides that sum by the binning factor. Confused yet? Things will get even more confusing with multiple ROIs, readout amplifier selection/multiple readouts per CCD, and the MOSAIC.

[figure not included]

Rich Reed

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More on the Fiber-Positioner Hydra (1Jun92)

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More on the Fiber-Positioner Hydra (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

Multi-object spectroscopy at the 4-m is now carried out with Hydra, a fiber positioner which feeds light from the R- C focus into 97 blue or red fibers, which then carry the light down to the Bench Spectrograph in the large coud room. Hydra saw its first major use by visitors during a long observing block in February and March. These runs were quite successful, barring a few glitches and poor weather.

The blue fiber cable was completed and installed for use during that observing block. The following throughput estimates were made for the blue cable under moderate seeing of about 1.3 arcsec:

0.9% at 3500 A with grating KPC-10B
2.7% at 4000 A with grating KPC-10B
2.9% at 4500 A with grating KPC-10B
2.7% at 5000 A with grating KPC-10B

The detector used was the T2KB CCD. The numbers give the percentage of photons incident onto the primary mirror that were detected. Raw flux counts (photons/second/A) are shown in the figure below for the flux standard star Feige 66 (m[3200] = 9.7, m[3500] = 9.8, m[4000] = 9.9, m[5000] = 10.3). The dominant throughput losses in the blue are due to the atmosphere and CCD quantum efficiency, not the fiber! The blaze efficiency of the grating (KPC-10B) dominates the efficiency slope redward of 4000 A. Potential users should realize that the efficiencies achieved in normal operations could be lower than the values cited above under conditions of poor seeing, in the event of astrometry errors, or at high airmasses where exact modeling of differential refraction is uncertain.

[figure not included]

The following figure shows the transmission curves for the blue and red fiber cables. Note that the blue cable can be used for observations out to 7000 A (and even out to 8500 A, if the 7200 A dip is acceptable). The quality of the prism mountings onto the fibers is better for the blue cable than for the red; this results in smaller fiber-to-fiber variations in throughput for the blue cable than for the red. The red cable also contains about a dozen fibers with very poor transmission blueward of 4500 A. It is therefore suggested that the blue fiber cable is the optimum choice for any observations blueward of 7000 A and that the red really only be used for observations redward of 7000 or 8500 A. Each cable contains 97 fibers.

[figure not included]

This observing block also saw the first use of the Bench Spectrograph automation hardware/software. Users were able to view the fiber ends and back-illuminate the fibers remotely via a program running on Khaki, the 4-m data acquisition computer.

A second major observing block is scheduled for May and June. The internal comparison sources will be in use by that time. These lamps, used to illuminate a screen that is positioned by the gripper over the fibers, will improve the ease with which users can obtain wavelength calibration. Further improvements in the Hydra software are also underway, and more functionality is being added to the Bench Spectrograph automation hardware/ software.

Further details of the instrument, and greater discussion of throughput issues, can be found in the extensive instrument manual. Copies of the manual can be obtained through the observing support office or through anonymous ftp. For access via the computer, ftp to orion.tuc.noao.edu (140.252.1.22), login as anonymous using your last name and machine for the password. Change directories with cd kpno/hydra, change transfer type with binary, and get the manual with get hydramanual.ps.Z which is in a compressed format. Uncompress the file with uncompress hydramanual.ps.Z and print it out with lpr -s -PlwN hydramanual.ps. The manual is on the order of 70 pages long and has several figures in it which will take some time to print out.

Sam Barden, Taft Armandroff

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GoldCam Gets a Big New Ford Chip and TI3 Gets Sacked (1Jun92)

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GoldCam Gets a Big New Ford Chip and TI3 Gets Sacked (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

In mid-February we replaced the TI 800 x 800 CCD (TI5) in the 2.1-m CCD spectrometer "GoldCam" with a thinned Ford 3K CCD. Although this new chip is not perfect, it represents a major improvement in the capabilities of GoldCam. The new chip has 3072 columns (along the dispersion) and 1024 rows. The pixel size is 15 um. The chip was thinned, packaged, and backside treated by Michael Lesser at Steward Observatory. The backside treatment consisted of a steam oxide (which allows the chip to be UV flooded) and a silicon dioxide AR coating. Shown in the plot below is the DQE of the UV-flooded chip compared to that of the UV-flooded TI chip which we replaced.

Although the chip is flat, the image quality is satisfactory over only 2200 of the 3072 pixels. Also, the best focus we have been able to achieve is about 2.7 pixels FWHM. Thus, the gain is about a factor of two over the TI chip in terms of resolution elements.

As was the case for the TI chip, there are obvious fringes longward of about 7000 A. These can be removed with flat fields taken using the internal projector quartz lamp.

The chip has a number of cosmetic defects. It has one bad column and a number of traps. These traps can be filled by a uniform signal of about 150 electrons, which raises the effective readout noise from 9.5 electrons to about 15 electrons. The charge transfer is excellent. A complete writeup on the properties of the new chip and observing strategies to get around some of its problems is available from the observing support office. Those of you used to the GoldCam parameters with the old TI chip may want to note that you will have the same dispersion (A/pixel) but roughly 2.7 times the spectral coverage (2200 pixels vs. 800) with the new Ford chip.

After replacing the chip in GoldCam, we realized that TI5, the previous GoldCam detector, is a significantly better chip than TI3, which has commonly been used in a Universal Dewar at the Coude Feed. Therefore, we have replaced TI3 with TI5, giving higher QE (particularly below 4000 A) and better cosmetics.

[figure not included]

Todd Boroson, Diane Harmer, Rich Reed

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GoldCam Comes to the 0.9-m As WhiteCam (1Jun92)

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GoldCam Comes to the 0.9-m As WhiteCam (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

With the introduction of a big, blue-sensitive chip into the GoldCam camera, we suddenly have a capability hitherto unrealized for spectroscopy. We were anxious to try this instrument at the 0.9-m, as a reasonable physical slit width would project to a sufficient number of arcsec on the sky to provide accurate flux determination. Furthermore, the use of the GoldCam detector at the 0.9-m would provide capabilities not currently offered by the aging Intensified Reticon Scanner (IRS).

Accordingly, we mated the GoldCam camera/detector combination to the White Spectrograph. Voila: WhiteCam. (The physical details of the White Spectrograph, other than its color, are identical to that of the Gold Spectrograph, GoldCam's normal home.) The instrument was used on three nights in mid-April to see just how well we could do.

The upper two plots to the right show the spectrum of the A0I star Eta Leo. The upper of these simply shows the raw counts in pixel space. No flat-fielding has been done, and we can see that vignetting and loss of focus makes the detector unusable below pixel 400 or above pixel 2600. Still, this 2200 pixel "good" region provides approximately 800 spectral resolution elements (best focus is about 2.7 pixels, as discussed in the article above.) This may be compared to the IRS, where there are at most 300 spectral resolution elements.

We see for the wavelength axis in the second plot that the detector is indeed plenty hot down to the atmospheric cutoff. We were able to detect the He I lamdba3187 line in our comparison spectrum. The DQE measurements of the Ford chip used to construct the plot in the article above shows a 57% DQE of the detector at 3200 A. This may be compared to the 8% DQE cited in the IRS manual for the response of the first photocathode down in the blue. Although the shot-noise is a little bit higher with the CCD spectrometer (15 e- read noise vs. the equivalent of 3 e-), the anticipated introduction of a new Ford chip in GoldCam this summer, and the factor of 7 improvement in sensitivity of the CCD over the photo-cathode of the IRS, makes up for this in any but the SNR &lt &lt 1 regime. (If you are in that regime, we suggest trying a bigger telescope!)

On another night we pressed the instrument to see how far we could usefully observe into the red. Although the DQE measurements of the Ford chip shown in the article above stop at 9500 A, we can see in the plot of the planetary nebula NGC 6543 that the detector still has some sensitivity at the He I lamdba10830 line! To the best of our knowledge, this is the first detection of this line with an "optical" CCD at Kitt Peak. Although it is not clear from the plot of the PN spectrum, there is very significant fringing (25% peak-to-trough) in the red, which we could reduce only by factors of 2 using simple techniques. We are still working on it though. Again, for comparison, the IRS is essentially dead longward of 8000 A.

[figures not included]

The largest slit width that will not degrade the spectral resolution is about 4 arcsec, so it will generally be necessary to observe at the parallactic angle to avoid compromising the accuracy of the flux calibration. We mounted the spectrograph so the slit was N-S and simply kept our observations to within an hour of the meridian. None of the three nights were photometric, but on the two "OK" nights we were able to achieve relative fluxes of 3-5%, and absolute fluxes at the 10% level.

For successful proposals that requested the IRS, we will give the observers the option to switch to WhiteCam for the Fall, and we anticipate that WhiteCam will be the detector of choice for spectroscopy in the 3200 A to 1 m region at the 0.9-m during subsequent observing semesters. For questions and details please contact one of us.

Phil Massey, George Jacoby,
Dave Silva, Jim De Veny, Di Harmer

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New Grating for CRSP (1Jun92)

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New Grating for CRSP (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

The Cryogenic Spectrometer (CRSP) is a longslit IR spectrometer utilizing a 58 x 62 InSb array for low and medium resolution spectroscopy in the 1-5 um range. Thanks to the efforts of Gary Hill (U. Texas), the useless grating #3 in CRSP has been replaced by one of resolution intermediate between the high resolution grating #1 and the low resolution grating #2. The new grating has 150 l/mm, blazed at 17.5 degrees, and yields a resolution/pixel of 0.004 m in the K-band. The narrow blaze range limits efficient operation in the H band at m = 3 to the short wavelength half of the band. This grating may be desirable for observations of broad-lined objects for which spectral coverage is preferred over resolution. This grating is permanently installed in CRSP and is available to all observers. Particulars of the wavelength settings and resolution are in the latest version (November 1991) of the CRSP manual.

Dick Joyce

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Making Reasonable Choices for High Dispersion Spectroscopy at the CoudÃ© (1Jun92)

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Making Reasonable Choices for High Dispersion...(1Jun92)
Spectroscopy at the Coude
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

With a variety of improvements and additions over the last decade, the instrumentation available at the Coude Feed telescope is now quite diverse, allowing a broad range of resolution and spectral coverage. A review of the choices available may help observers to plan their observing programs.

The traditional Coude Spectrograph is still the choice of most observers. The Coude Spectrograph provides two cameras for use with CCD detectors, a long focal length camera for very high spectral resolution (Camera 6) and a fast, short focal length camera (Camera 5) for moderate/high spectral resolution. The spectrograph can be used with a wide range of gratings, from low angle R-C Spectrograph gratings to conventional coud-type gratings, to even an echelle grating for very high spectral resolution. The orders of the echelle grating can be separated using grisms borrowed from the 4-m CryoCam. The slit can be replaced with an optical fiber feed to reduce guiding errors for radial velocity measurements.

In addition to the Coude Spectrograph, the Fiber Optic Echelle (FOE) spectrograph is also available with the Coude Feed telescope. The FOE can only be used with an optical fiber. The FOE operates in two modes, the "quasi-Littrow" mode and the "high dispersion" mode. In quasi-Littrow mode, the beam from the echelle grating is cross-dispersed with a prism in double pass; a fast camera is used to image the spectrum. The spectrum format is fixed to provide nearly complete spectral coverage from the calcium H and K lines at 3900 A to the calcium triplet at 8500 A. The resolving power is 5,000 to 10,000, depending on the detector.

In the FOE's high dispersion mode, the beam from the echelle grating is fed to a grating for cross dispersion, and then to a longer focal length camera. Both the echelle grating and the cross dispersing grating can be adjusted to center the wavelengths of interest on the detector. A slit at the output of the optical fiber is needed to obtain high spectral resolution, from 30,000 to about 80,000, again depending on the detector. The spectral coverage is limited to a few orders of the echelle grating and is incomplete within the wavelength region chosen.

How does an observer choose the best configuration for a particular observing program? For very high resolution work (say 250,000), the best choice is the echelle grating on Camera 6 of the Coude Spectrograph. For merely high resolution (about 100,000), the best choice is the echelle grating on Camera 5. With conventional gratings, Camera 5 works well for resolutions in the range 10,000-30,000. With R-C gratings, resolutions of a few thousand are possible for faint stars. The FOE is the instrument of choice if broad spectral coverage is needed to monitor variable stars or if ultra-precise radial velocities are needed. Unless the stability of the FOE is needed for velocities, we recommend the echelle grating on Camera 5 with the Coude Spectrograph for high resolution spectroscopy. The table below identifies what combinations of camera and grating are good for particular spectral resolutions.

Instrument	Resolv. Power	Disp. A/mm	Camera	Grating	Wavelength Coverage
Coude	250,000	0.4	6	Echelle	6 A
Coude	100,000	1.5	5	Echelle	24Ax20 orders
Coude	30,000	6	5	A	100 A
Coude	10,000	15	5	KPC-007	185 A
Coude	3,000	60	5	R-C 250	700 A
FOE	10,000	20	QLM	Echelle	3900-8600 A
FOE	60,000	2	High	Echelle	32Ax5 orders

For further information and advice, consult thee Coude Feed instrumentation manuals or call one of us!

Daryl Willmarth, Sam Barden,
Caty Pilachowski, Phil Massey

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Feeding the CoudÃ© Spectrograph with the 2.1- Telescope (1Jun92)

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Feeding the Coude Spectrograph with the 2.1-m...(1Jun92)
Telescope
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

The Coude Spectrograph is almost always used in conjunction with the 0.9-m Coude Feed telescope, but we wish to remind you that this is not a strict requirement. The Coude Spectrograph can also be used with the 2.1-m telescope; if your scientific program would benefit from this combination, we will be happy to receive a proposal for this configuration. However, you should bear in mind the fact that the Spectrograph and 2.1-m is no more than half a magnitude faster than the Spectrograph and Feed. This is because slit losses are greater given the factor of 2.3 larger plate scale and because the 2.1-m telescope's five mirror coud train loses more light and produces poorer images than the three mirror Feed system. So if one assumes at most a factor of 2 faster and then factors in the extra setup time involved in using the 2.1-m, there may be a very limited range of programs that would benefit in a significant way.

David De Young

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New Mountain Phone Numbers (1Jun92)

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New Mountain Phone Numbers (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

Effective 30 April 1992, the Kitt Peak mountain phone number will be changed. The main number has been changed to (602) 322-3300. The number to use during nights and weekends is 322-3386.

The extension numbers on Kitt Peak remain the same, and their direct-in-dial numbers will be 322-33XX and 322-34XX. For example, the 4-m operator's console is now 322-3320. The Fax number for the mountain is 322-3424.

There will be a recording on the old numbers advising callers of the new number through July.

The phone numbers for the NOAO Tucson headquarters remain unchanged.

Pat Patterson

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New Observing Technician (1Jun92)

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New Observing Technician (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

We welcome David Summers to the mountain staff as an Observing Technician. You may see him setting up your instrument on the telescope, filling your dewar, or responding to your call for help with an observing problem.

Summers obtained his B.S. in physics from the New Mexico Institute of Mining and Technology, where he also worked on the Automated Novae Search. Prior to coming to KPNO, he worked as the Resident Observer at

the University of New Mexico's Capilla Peak Observatory. His research
interests are in the photometry of variable and chromospherically
active stars.

With Summers' arrival we will be able to provide technical and
observing support until late evening seven days a week.

Paul Harding, Bruce Bohannan

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A Walkie-Talkie You Can Call Your Own (1Jun92)

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A Walkie-Talkie You Can Call Your Own (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

Portable two-way radios are now available in the small telescopes--1.3-m, 0.9-m, Coude Feed, and Burrell Schmidt--to provide a measure of safety for observers in domes without Telescope Operators and where an astronomer may be working alone. We ask that you carry this radio with you at all times. If you need medical aid or cannot contact technical observing support via the telephone, a call on the radio will bring the needed assistance as all of the mountain employees carry radios at all times. The Instrument Support person who helps you with startup will explain operation of the radio. Please remember to return it to the charger at the end of your run.

These radios were purchased for your safety. Please use them!

Bruce Bohannan

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Changes in the Reception on the Mountain (1Jun92)

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Changes in the Reception on the Mountain (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

To provide increased security on the mountain, a gate has been installed on the window in the reception area of the Administration Building on Kitt Peak. Keys for dormitory rooms will no longer be readily accessible when the office is closed. Should your arrival to the mountain be after 4 p.m. weekdays or on weekends, you will be able to get your dorm key by calling Security or one of the Observing Technicians (OT) on duty. Before 6 p.m. go to the Kitchen and ask them to call Security for you. After 6 p.m. an OT must be called. While their office is just down the hall from Reception, it is likely that you will need to call them on the radio. A sign is posted on the gate indicating how to do this. If you arrive after the OT has gone off duty, it will be necessary to call the Telescope Operator at the 2.1-m.

Bruce Bohannan, Joanne Wilcox

Pavarotti Meets The Grateful Dead (1Jun92)

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Pavarotti Meets The Grateful Dead (1Jun92)
(from KPNO, NOAO Newsletter No. 30, 1 June 1992)

For those who must listen to music in order to collect photons, please note that tape cassette and CD players are now available at all telescopes. FM stereo receivers are also provided in case you prefer "pot luck." Feel free to bring a sample of your music collection with you during your next visit. Remember to be a good neighbor, though, and keep that Pavarotti to a reasonable decibel level; I may be in the next dome trying to listen to the subtleties of The Grateful Dead.

Silicon Sally and the Night Listeners

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An Algorithm for Locating the Solar Limb (1Jun92)

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An Algorithm for Locating the Solar Limb (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

We have developed an algorithm for measuring the location of the solar limb in full disk images that is insensitive to atmospheric seeing conditions. The algorithm also provides an estimate of the form of the point spread function for each observed image. After further testing, this algorithm will be available to the community.

The location of the solar limb is important for solar oscillation measurements. Any inaccuracies in the determination of the image geometry will translate into an asymmetry in the observed ridges in the solar oscillation power spectrum. Such `analysis induced' asymmetries can obviously lead to systematic errors in any estimate of the properties of the features in the power spectrum. The information on the point spread function is necessary for the correction of variations in the observed p-mode amplitudes due to changes in atmospheric conditions (a major drawback in trying to make accurate measurements of the oscillation amplitudes).

The method employed essentially consists of three steps: (1) Generate the Laplacian map of an image and use it to determine a high quality estimate of the coordinates of the center of the image and the values of the semi-major and semi-minor axes. (2) Use the property that the zero crossing points of the Fourier transform of the observed intensity profile (after appropriate edge extension to alleviate problems associated with truncation of the image signal) are related solely to the limb darkening profile. This then enables a determination of the error in the initial estimates for the semi-major and semi-minor axes and also of the form of the limb darkening function by least-squares methods. (3) Knowledge of the form of the limb darkening function makes it possible to estimate the form of the point spread function for the observation by deconvolution methods.

Cliff Toner, Stuart Jefferies

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IR Atlas of a Dark Sunspot Umbra from 1.16 to 5.1 um (1Jun92)

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IR Atlas of a Dark Sunspot Umbra from 1.16 to 5.1 um (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

This is an FTS spectral atlas of a sunspot umbra, with identifications where possible. Like the previous photospheric atlas, consecutive observations were used to extrapolate the observation to zero airmass, thus removing the telluric component. For reference, the original uncorrected spectrum is also displayed. Spectral type is estimated to be between K5 and M1. The field strength was 3360 Gauss. This atlas is available free as NSO Technical Report #92-001. A version on magnetic tape can be had by submitting your own 2400 foot reel, or, optionally for $20, NOAO will supply the tape.

Bill Livingston, Lloyd Wallace

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Upgraded Multiband Patrol Instrument (1Jun92)

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Upgraded Multiband Patrol Instrument (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

The upgraded Multiband Patrol (MBP) has been completed and is now mounted on the Hilltop Dome spar, awaiting final tests before beginning regular patrol observations of solar active regions and white-light flares. The MBP is a parfocal system that images a 3 x 4 arcmin field in four wavelengths simultaneously on a single film frame. A 7-inch Questar telescope with heat-rejection aperture shutter and dichroic beamsplitters forms the basis of the upgraded instrument. The original MBP was based on a 6-inch refracting telescope and rotating filter wheel that allowed five wavelengths to be acquired in sequence. Changes in atmospheric seeing between exposures in the old system introduced significant errors in measurements of the spectral distribution in white light flares; the new system is expected to perform considerably better in this respect and, without the filter selection wheel, will enable much higher time resolution. The MBP will observe in 50 A bandpasses at 3620, 4268, 4973, and 6803 A.

Donald Neidig

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Sacramento Peak Summer Workshop (1Jun92)

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Sacramento Peak Summer Workshop (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

The Thirteenth Sacramento Peak Workshop, entitled "Real-Time and Post-Facto Solar Image Correction," will be held in Sunspot, New Mexico, on 15-18 September 1992. The workshop will review the state of the art and the potential of real-time and post-facto techniques for improving solar observations, and it will consider issues such as: How well do conventional wavefront sensing techniques operate using solar features? Are there non-conventional wavefront sensing concepts that offer better performance? Are there imaginative ways to increase the correctable field of view for solar observations? If you are interested in participating in the 1992 Sacramento Peak Workshop, please contact Richard Radick (505-434-7000) or e-mail:

radick@sunspot.noao.edu or rradick@solar.

Richard Radick

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Proceedings of the Tucson Cool Stars Workshop (1Jun92)

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Proceedings of the Tucson Cool Stars Workshop (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

The Proceedings of the Seventh Cambridge Workshop on Cool Stars, Stellar Systems and the Sun were completed in April and submitted to the PASP offices for publication. The 731-page compilation of invited review and contributed papers presented during the Cool Stars Workshop that was held in Tucson last October will appear as Volume 26 in the ASP Conference Series. The book is edited by M.S. Giampapa (NSO) and J.A. Bookbinder (Smithsonian Astrophys. Obs.). It consists of eight parts that include reports and reviews on the latest advances in solar-stellar physics. A part is devoted to the most recent discoveries from new missions such as HST and ROSAT. Other parts focus on observational and theoretical advances in solar and stellar convection, solar and stellar magnetic fields, winds and angular momentum evolution, the computation of stellar atmospheric models and the development of new observational facilities and networks for the advanced study of solar and stellar phenomena. Extensive subject, object and author indices make the Proceedings a valuable reference work. The volume is expected to be available by mid-June.

Mark Giampapa

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Proceedings of the Twelfth NSO/Sacramento Peak Workshop on the Solar Cycle (1Jun92)

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Proceedings of the Twelfth NSO/Sacramento Peak...(1Jun92)
Summer Workshop on the Solar Cycle
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

The Proceedings of the Twelfth NSO/Sacramento Peak Summer Workshop on the Solar Cycle were completed in April and submitted to the PASP offices for publication. These 580-page Proceedings include 11 invited reviews and 47 contributions presented during the Workshop held at NSO/Sacramento Peak, 15-18 October 1991 and will appear as Volume 27 in the ASP Conference Series. The book is edited by K.L. Harvey (SPRC). It is divided into six parts, focussing on the six fundamental questions addressed during this meeting. These include (1) What does surface magnetic flux tell us about subsurface magnetic fields? (2) Is the flux we see at the surface causally involved in the solar cycle? How can we use stellar cycles to understand phenomena of the solar cycle? (3) Do the observed large-scale velocity patterns provide information concerning solar cycle mechanisms? (4) What does the "extended" solar cycle mean? (5) How does solar luminosity change during a solar cycle? What can we infer about the cycle mechanisms from stellar luminosity variations? and (6) Proposition: No existing model, either phenomenological or theoretical, of either solar or stellar cycles, deserves to be a paradigm. Brought to these strongly focussed topics is the expertise of both solar and stellar cycle researchers, observationalists and theoreticians, in an effort to resolve some of the activity cycle problems. These Proceedings are expected to be available by mid-June.

Karen Harvey

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The McMath Solar-Stellar Program (1Jun92)

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The McMath Solar-Stellar Program (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

Some of you may not be familiar with the unique opportunities available to conduct both synoptic and visitor programs of high-resolution spectroscopy in the general area of solar-stellar physics at the NSO McMath telescope on Kitt Peak. The next deadline for proposals for programs beginning in the fourth quarter (October-December) is 15 July 1992. You may submit proposals via e-mail in care of:

bartlome@noao.edu (INTERNET) or,
NOAO::BARTLOME (SPAN).

You may fax any figures to accompany the e-mail version of your proposal to 602-325-9278. TeX and Unix roff templates of the NSO observing proposal form are available for your convenience from the above e-mail addresses.

The NSO operates a program of solar-stellar spectroscopy at the McMath telescope which is open to the entire astronomical community. We operate on a "six on-six off" schedule where our resident observer (Paul Avellar) obtains spectra for approved programs during six consecutive nights. The six nights immediately after a `synoptic run' are available for visitor programs. During `visitor time,' the PI is expected to travel to Kitt Peak to obtain his or her own observations. These programs are usually of a short-term nature, though a PI is welcome to use visitor time to extend a synoptic program. `Visitor time' is usually allocated in three- or six- night blocks. A PI may apply for both synoptic and visitor time during any quarter. Proposals, either synoptic or visitor, are approved for up to four consecutive quarters. Thereafter, the PI must reapply with a progress report if more time is desired. It is not necessary to apply for time each quarter once your program is approved. Besides proposals for visitor or synoptic time, PIs may apply for `targets of opportunity' pending, for example, the scheduling of approved spacecraft observing time. This allows the possibility of obtaining coordinated observations with current missions such as IUE, HST, and ROSAT. The quarterly scheduling generally permits the kind of flexibility that is needed to operate joint McMath/ spacecraft programs, and programs coordinated with other ground-based facilities.

The instrument complement that comprises the solar-stellar spectrograph currently includes a TI 800 x 800 UV-enhanced CCD array along with both conventional (Milton and Roy) and echelle gratings. The echelle is not yet cross-dispersed; individual orders are isolated using interference filters. We plan to install a large-format array (1024 x 3072 SAIC/Ford Aerospace CCD) and a cross-dispersing element during the next year. The output of the spectrograph is imaged onto the CCD with a Nikon transfer lens. At Ha, resolutions in the range of R = 42,000 to R = 122,000 can be achieved. The broad range available across the visible spectrum is R = 22,000-122,000. The principal transfer lenses that are used include the 180 mm lens (for the highest resolution programs) and the 105 mm lens (for lower resolutions). We also have a Kinoptic (130 mm) lens available that yields superior throughput in the blue, which is especially useful for programs that emphasize the Ca II H and K lines.

For those of you who are familiar with the KPNO Coude Feed, the McMath solar-stellar spectrograph has at least twice the throughput of the feed. As an example, a recent observation of a dK8 star (V = 9.66) at Ha with the 105 mm lens and Milton and Roy grating 1 in second order yielded S/N = 29 in the continuum in 25 minutes. We can work to a practical faint limit of about V = 12. This limit is mainly determined by the sensitivity of our present TV and guider system which will be upgraded during the next year.

If you have any questions concerning the performance of the system or the McMath solar-stellar program, please contact the program scientist, Mark Giampapa:

(giampapa@noao.edu or NOAO::giampapa)

or our technical support staff member, Dave Jaksha

(jaksha@noao.edu or NOAO::jaksha).

Mark Giampapa

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NSO Observing Proposals (1Jun92)

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NSO Observing Proposals (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

The deadline for submitting observing proposals to the National Solar Observatory for the fourth quarter of 1992 is 15 July 1992. Forms and information may be obtained from:

R.N. Smartt, P.O. Box 62, Sunspot, NM 88349,
(sp@sunspot.noao.edu)

for the Sacramento Peak facilities and for the Kitt Peak facilities:

J.W. Brault, P.O. Box 26732, Tucson, AZ 85726,
(nso@noao.edu).

At your request, a TeX or UNIX roff version can be e-mailed.

James Brault, Raymond Smartt

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NSO/SP Visitor Center (1Jun92)

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NSO/SP Visitor Center (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

The New Mexico State Legislature recently appropriated $150,000 as initial funding for a Visitor Center at Sacramento Peak. This is approximately one-third of the total cost. The Center will be run jointly with the Lincoln National Forest Service, the Apache Point Observatory and other local institutions. Other funds are currently being sought from both government and private sources. An account has been established at a local bank to accept private donations.

With the designation of the Sunspot road, State Road #6563, as a National Forest Scenic Byway, the number of public visitors coming to the Observatory will predictably show a significant increase, and the need to provide appropriate visitor facilities will correspondingly increase.

Frank Hegwer, Rex Hunter

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Progress in Wavefront Sensing for Solar Applications (1Jun92)

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Progress in Wavefront Sensing for Solar Applications (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

A critical area of Adaptive Optics (AO) technology is the wavefront sensor system for measuring the rapidly varying incoming wavefront. The Sun presents unusual problems for wavefront sensing. Unlike objects in the nighttime sky, the Sun does not provide natural, high-contrast point sources, and creation of artificial beacons bright enough to be visible against the solar disk remains problematic with current technology. Conventional wavefront sensors such as shearing interferometers and Shack-Hartmann systems appear to have some limitations when used with targets such as solar granulation. Therefore, a program has been carried out at NSO/SP to investigate the performance and limitations of various wavefront sensor concepts for solar imaging.

The Lockheed AO system is based on the Hartmann test. This system appears to work well, but is best suited for targets such as sunspots and pores. A more universal system is under development at SP that uses a programmable liquid- crystal mask. Two other wavefront sensing techniques have recently been tested on-line and in parallel at the Sacramento Peak Vacuum Tower Telescope in an attempt to critically compare their performances. These two tests were the classical Shack-Hartmann test using a lenslet array and a CCD camera, and the "focal volume" technique. Both tests gave similar magnitudes and forms for the residual instrumental aberration, but quantitative differences were present in the measurements which may be significant. Further analysis of the results should resolve this point.

Sergio Restaino, Richard Radick

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New Members of the Scientific Staff at Sacramento Peak (1Jun92)

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New Members of the Scientific Staff at Sacramento...(1Jun92)
Peak
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

We are looking forward to two additions to the scientific staff at Sacramento Peak. Matthew Penn will join the staff as a Post-doc in late summer and Jeff Kuhn as an Astronomer early next year.

Jeff is currently a Professor at Michigan State University, and he has been working recently on very high precision measurements of solar irradiance fluctuations, IR measurements of the photospheric network, as well as the dynamics of dwarf spheroidal galaxies. Jeff is a familiar face at the Peak, after several extended visits, and he has previously served on the NSO Users' Committee. His experience in innovative instrumentation will be a welcome addition.

Matt Penn is finishing his Ph.D. at the University of Hawaii on the interaction of solar p-modes and solar active regions, using data from the imaging spectrograph. Matt will be investigating the variation of 7Li abundance across the solar surface using the 22 mA Fabry-Perot system, and participating in the instrumentation program.

John Leibacher

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Infrared Solar Physics Has Arrived! (1Jun92)

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Infrared Solar Physics Has Arrived! (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

More than 95 astronomers and physicists from 15 countries gathered in Tucson during 2-6 March 1992 for IAU Symposium 154, "Infrared Solar Physics, 1 um-1 mm." The range and depth of the scientific results presented at this meeting left no doubt that infrared observations now play a vital and growing role in the understanding of key problems in solar physics.

The festivities opened with a session on infrared and sub-millimeter observations at the total eclipse of 1991. The highlights included three independent searches for elusive and controversial circumsolar dust, submillimeter observations that probed the inhomogeneous structure of the chromosphere, and a direct measurement of the height of formation of the 12 um emission lines. A later session devoted to the 12 um and related atomic lines proved that the essential physics of these once-mysterious transitions is now well in hand.

Several contributions on solar activity vividly illustrated that the infrared and submillimeter regime is an almost unexplored frontier in the understanding of solar flares and activity. Other sessions explored the use of infrared observations in elucidating inhomogeneities in the solar atmosphere over a wide range of heights, the unique power of the infrared for measuring and mapping the true strength of magnetic fields in the photosphere, tantalizing glimpses from space of the large portions of the infrared spectrum blocked by the atmosphere, and progress in laboratory spectroscopy and atomic physics, the bulwarks of solar and stellar astronomy.

The participants were united in the belief that infrared solar physics is entering a period of rapid, worldwide growth. Their view of the future embodied this conviction in the form of wide-ranging plans: space-based observations, the Large Earth-based Solar Telescope, a 4-m McMath Telescope, a large reflecting coronagraph, a new sub-millimeter observatory, adaptive optics and interferometry, and the development of instrumentation incorporating infrared array technology.

A successful meeting depends on the efforts of many people and organizations. The Scientific Organizing Committee is grateful for generous support from the IAU, the Local Organizing Committee (A. Barringer, M. Giampapa, J. Jefferies, G. Kopp, C. Lindsey, D. Rabin, J. Wagner), NSO and NOAO, NSF and NASA, and Infrared Laboratories, Inc. The proceedings will be published by Kluwer Academic Publishers.

Doug Rabin

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Update on IR Instrumentation in Tucson (1Jun92)

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Update on IR Instrumentation in Tucson (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

After a successful engineering run at the McMath using the 128 x 128 InSb array from Amber Engineering, we are looking forward to installing the array in its new home, an IR Labs dewar featuring dual filter wheels and dual nitrogen flasks (we will be able to cool the array to about 55 K by pumping on the inner flask). Even better, we have received approval to procure a 256 x 256 InSb array from Amber, which the dewar has been designed to accommodate. With the new camera, a graphical user interface (almost complete), anamorphic transfer optics to ensure proper sampling in the spatial and spectral dimensions (designed and procured), and faster-switching liquid crystals for polarization control (under procurement), the Near Infrared Magnetograph (NIM) will reach its operational configuration. In combination with the infrared grating in the new dual-turret (visible/IR) McMath main spectrograph, the 256 x 256 camera will also be available for general spectroscopy in the 1-5 um range, including the long-awaited fundamental vibration-rotation transitions of carbon monoxide. The dual-grating system is tentatively scheduled for installation late this summer.

Dave Jaksha, Greg Kopp, Chuck Mahaffey,
Keith Pierce, Claude Plymate,
Doug Rabin, Jeremy Wagner

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Daily Coronal Images Available from NSO/SP (1Jun92)

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Daily Coronal Images Available from NSO/SP (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

Observations are made at the National Solar Observatory at Sacramento Peak with the Fisher-Smartt Emission Line Coronal Photometer (ELCP).

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This instrument photoelectrically records the solar corona when fed
with the John W. Evans Solar Facility 40-cm Coronagraph.  It operates
at high precision due to its ability to subtract the sky background
from the signal in emission lines through use of a lock-in amplifier
oscillating at a rate of 100 kHz between the continuum and lines at
637.4 nm (Fe X), 530.3 nm (Fe XIV) and 569.4 nm (Ca XV), which are
formed at approximate temperatures of 1, 2 and 3 MK, respectively. A
1.1 arcmin aperture is scanned around the limb daily from 1.15 to 1.45
solar radii for Fe XIV, 1.13 Ro for Ca XV and 1.15 Ro for Fe X. The
output of the ELCP is sensed by a photomultiplier, digitized and
recorded every 3 degrees of latitude. Absolute intensities in
millionths of the brightness of the center of the disk at each
wavelength are obtained by calibrating the system through a neutral
density filter. All Fe X, Ca XV and the 1.45 radius Fe XIV scans are
scaled to have at least one absolute zero intensity data point. Fe XIV
scans at other radii are adjusted by the amount subtracted from the
1.45 radius scan.

The pseudo-full-disk maps are produced by joining together 15 days of
1.15 Ro (Fe XIV) or 1.13 Ro (Ca XV) data from the East or West limbs
into a synoptic map and projecting it onto a sphere.  The most recent
scan is at the beginning of the map, and the data on the central
meridian are from seven days prior to the date of the map. Data are
incremented from the central meridian at 12.857 degrees per day.
West-limb maps, which show the far side of the Sun on the day they are
produced, have been given an effective date two weeks into the future,
so that they may be compared with East-limb maps of the same date. Maps
are currently only produced for Fe XIV and Ca XV and are normally
available for each Monday through Friday, excluding holidays.

A brief synopsis of how to obtain the images is given here. Map file
names are ion.mmddyyl, where ion is fexiv or caxv, mm is the month, dd
is the day, yy is the year, and l is the limb from which the data are
taken (e or w).

SPAN/DECnet procedure (for VAX VMS users): to get a directory listing
(Caution: there are many files!):
     dir 5355::ga0:[ftp.spcm.fexiv or caxv]
to get the readme file:
     copy 5355::ga0:[ftp.spcm]readme localname
to copy a file:
     copy 5355::ga0:[ftp.spcm.fexiv or caxv]filename localname

Representative Internet procedure for copying data: You type:
     ftp draco.tuc.noao.edu (or ftp 140.252.1.5)
when connected, respond with login as:
     anonftp
use as a password:
     guest
change the directory to spcm:
     cd spcm
copy the readme file:
     get readme
enter a data directory:
     cd fexiv or caxv
to get a directory listing (Caution: there are many files!):
     dir
or copy the data using:
     get filename
     bye

For further information, contact thenry or raltrock at NOAO:: or noao.edu.

Dick Altrock
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Active Region Observing Campaign Data (1Jun92)

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Active Region Observing Campaign Data (1Jun92)
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(from NSO, NOAO Newsletter No. 30, 1 June 1992)

The Air Force group at NSO/SP has just completed a 20-day observing campaign on solar active region evolution. During these campaigns target active regions are selected, normally coinciding with the Max '91/Flare 22 targets chosen for Yohkoh and/or COMPTON and the VLA. These regions are observed on a daily basis for periods of several hours each day. Instruments used include the narrowband filter at the VTT, the spectroheliograph (SHG) at the Evans Facility and the vector magnetograph (VMG) at the Hilltop facility. In addition, the normal activity patrol instruments are used. During April, several of the observed regions produced flares, and thus a fairly good set of pre-activity build-up data was obtained. Observations were obtained for National Oceanic and Atmospheric Administration Active Regions 7124 (4 Apr), 7123 (5-10 Apr), 7128 (12, 13, 15, 16 Apr), 7131 (14 Apr), 7132 (17, 18 Apr), and 7135 (20 Apr). The narrowband filter is tuned through several magnetic and non-magnetic lines, using a 1/4 wave plate to measure the magnetic field. The field of view of the narrowband filter is about 1 arcmin in diameter, so only a portion of the active region is imaged. The VMG uses lambda6122 to make line-of-sight and transverse magnetic field measurements with a field of view of 4 arcmin x 5 arcmin. The SHG is used to scan the Sun in Ha and the Ca K line. All of the data are available for collaborative studies of these active regions. Please contact Steve Keil (505 434-7039) or K.S. Balasubramaniam (505 434-7047) if you are interested in the data or collaborations.

Stephen Keil

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New Mountain Phone Number (1Jun92)

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New Mountain Phone Number (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

Effective 30 April 1992, the Kitt Peak mountain phone number will be changed. The Main Number has been changed to (602) 322-3300. (Nights and weekends: 322-3386.) The extension numbers on Kitt Peak remain the same, and their direct- in-dial numbers will be 322-33XX and 322-34XX. (Examples: The McMath Main Observing Room is 322-3340, and the Vacuum Telescope Observing Room is 322-3346. The Mountain Fax number is now 322-3424.)

There will be a recording on the old numbers advising callers of the new number through July. The phone numbers for the NOAO Tucson Headquarters offices remain the same.

Jeremy Wagner, Pat Patterson

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NSO Telescope/Instrument Combinations (1Jun92)

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NSO Telescope/Instrument Combinations (1Jun92)
(from NSO, NOAO Newsletter No. 30, 1 June 1992)

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Vacuum Tower Telescope (SP):
   Echelle Spectrograph
   Universal Spectrograph
   Horizontal Spectrograph
   Universal Birefringent Filter
   Fabry-Perot Interferometer Filter System
   Advanced Stokes Polarimeter
   Slit-Jaw Camera Systems
   Correlation Tracker
   Branch Feed Optical 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):
   H-Flare Telescope 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 Telescope Complex (KP):
   160-cm Main Unobstructed Telescope
   76-cm East Auxiliary Telescope
   76-cm West Auxiliary Telescope
   Vertical Spectrograph
   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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GONG Update (1Jun92)

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GONG Update (1Jun92)
(from GONG, NOAO Newsletter No. 30, 1 June 1992)

The Global Oscillation Network Group (GONG) is a community-based project to conduct a detailed study of solar internal structure and dynamics using helioseismology. In order to exploit this new technique, GONG is developing a six-station network of extremely sensitive and stable solar velocity imagers located around the Earth to obtain nearly continuous observations of the Sun's "five-minute" oscillations or pulsations. GONG is also establishing a major, distributed data reduction and analysis system to facilitate the coordinated scientific investigation of the measurements.

Jim Kennedy, GONG's project manager, recently returned from visits to four of the six GONG network sites. The primary reason for his trips was to work out the final details of the Memoranda of Understanding (MOUs) between AURA and the various host institutions. The project now has signed MOUs for Big Bear Solar Observatory in California, Cerro Tololo Inter-American Observatory in Chile, and Udaipur Solar Observatory in India. Negotiations have been completed at both the Australian and the Canary Island site, and the project plans to collect the necessary signatures on those MOUs within the next few weeks. The project is continuing to negotiate with the National Oceanic and Atmospheric Administration for access to the High Altitude Observatory site on Mauna Loa.

In the meantime, the GONG "staging area" adjacent to NOAO's main parking lot is the scene of considerable activity as carpenters and electricians work to convert the six shipping containers into GONG field stations. A fast and efficient crew made up from the NOAO Central Facilities Operations group and other temporary help plans to finish all of the improvements early this fall.

Production work is also proceeding in the instrument shop. The largest, and probably the most complex, mechanical element of the GONG instrument is the light feed assembly. A "proof" version of that element has been fabricated, assembled, and is currently being tested. Parts for the remaining field light feeds are now being made in production style. A second shift will soon be added in the instrument shop to keep the MAHO CNC milling machine running 80 hours per week until the GONG parts are finished.

Prototype activities are still focussed on the quest for a good calibration scheme. The prototype Doppler imager--though better in every way than the old breadboard version of the instrument-- has yet to yield well calibrated velocity images. The GONG instrument observes changes in the phase of a modulated signal at each pixel of the CCD camera. These phase shifts are proportional to velocity changes on the Sun's surface. This phase-detection scheme eliminates the need for the "flat field" calibration familiar to most CCD users. There is, however, an analogous calibration which must be performed (again, pixel by pixel) to remove a component of the observed modulation that is entirely instrumental in origin. Several new strategies have been developed and tested, and a solution seems near at hand.

The GONG data management group is pressing ahead with some of the more challenging aspects of the data reduction and analysis process. Part of the group is working closely with the instrument team to read and process prototype data. In addition to this, progress continues to be made on the mode-frequency identification algorithm. Loosely referred to as "peak bagging," this process leads to a table of temporal frequencies associated with the various spatial oscillation modes observed on the Sun. This table is one of the fundamental end products supplied to the science teams. The new algorithms produce frequencies which are in good agreement with earlier results.

Another major data activity involves the determination of the seeing and scattering point-spread function for the solar images. A procedure has been developed which uses Hankel and Abel transforms. This scheme has been applied to about three thousand images; after deconvolution, there is a significant lowering of the noise in solar radius measurements.

Progress has also been made on the image merging problem discussed in the last Newsletter. Beginning with artificial data, a simple merge was performed by averaging remapped degraded images. All images were given equal weight. A preliminary visual comparison of the spectrum of the "perfect" data with the merged degraded data indicates that this baseline merging scheme does not substantially alter the apparent frequency of the modes. This further suggests that the measured frequency may be insensitive to the merging process. This tentative conclusion needs to be tested using accurate frequency determination techniques, however. The amplitudes of the modes do appear to be sensitive to the merging process. The same merging scheme is now being tested on the spherical harmonic coefficients.

Rob Hubbard

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IRAF Update (1Jun92)

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IRAF Update (1Jun92)
(from CCS, NOAO Newsletter No. 30, 1 June 1992)

The IRAF version 2.10 distribution began in late April with the release of V2.10.0 Sun/IRAF. Initial releases for the IBM RS/6000 and Macintosh-A/UX, and upgrades for DEC Ultrix, VAX/VMS, SGI, HP, and so on will follow throughout the coming months. As was the case with V2.9, a series of patch upgrades (V2.10.1, V2.10.2, etc.) will likely follow throughout the next year containing bug fixes and minor enhancements for the core IRAF system. Additional software is available in the many layered packages available for IRAF, from NOAO and elsewhere.

The IRAF software is available via anonymous ftp from node iraf.noao.edu (140.252.1.1). Mailed distributions are also available upon request. Information about requesting a tape distribution can be obtained by contacting the IRAF group (iraf@noao.edu).

Detailed release notes are included in the distribution, and additional information describing the new software available in V2.10 is provided in the IRAF Newsletters. Please refer to these documents for a complete description of all the new software available in V2.10 IRAF. A brief summary of what is new follows.

The magtape system has been completely rewritten, generalizing the device model and making it table driven via a "tapecap" file. New device entries can be added by the user at a remote site by merely modifying the tapecap file, without need to modify the actual device driver in IRAF. Generic device entries are provided for most devices, e.g., DAT, Exabyte, 1/2 inch reel tape, 1/4 inch cartridge tape, floppy disk, and so on.

A new IRAF network driver has been added which eliminates the repetitive password prompts encountered with the old system. In most cases network connections will now be transparent, and the user need not know what network node a resource resides on.

World coordinate system support has been added to the most commonly used core system tasks, allowing for example, RA and DEC or spectral units to appear on the axes in plots produced by general IRAF utility tasks. The old catch-all NOAO PROTO package has been replaced by the new core system packages PROTO and OBSOLETE, and by the corresponding new NOAO packages NPROTO and NOBSOLETE. All core system tasks present in the old NOAO PROTO package have been moved into the core system where they belong, making the core system more self contained. The main core system packages are now loaded automatically at login time.

Some modest changes were made to IMTOOL allowing user defined lookup tables and a wider selection of color lookup tables. Much work was done on the QPOE, MWCS, and other interfaces as part of the new image structures project. Many other system enhancements and bug fixes were made as noted in the detailed release notes.

Two new X11 system utilities have been written; an IRAF help browser for X and a magtape status utility used to monitor tape jobs. These will be released, along with the new XGTERM graphics terminal emulator, in a small package of X window system support utilities due out later this year as an add-on for V2.10.

A completely new DIGIPHOT package was installed in the NOAO layered package. This new package includes a revised version of the aperture photometry package APPHOT, the new IRAF DAOPHOT package, a new photometry calibration package PHOTCAL, and a new photometry tools package PTOOLS. DAOPHOT/IRAF was a collaborative effort with Dennis Crabtree and Peter Stetson (Dominion Astrophys. Obs.), and PHOTCAL was a collaborative effort with Pedro Gigoux (CTIO). The new RV package, used to compute radial velocities using Fourier cross correlation techniques, has been installed. New versions of the APEXTRACT and ONEDSPEC packages are available which use the new world coordinate system facilities and which eliminate the need to linearize spectra. Much reorganization and work has been done on the IMRED (instrument reduction) packages, including the addition of automated reduction scripts. A new version of IMCOMBINE is available providing support for combining misregistered images, and enhancements to the pixel combine and rejection algorithms.

Version 1.5 of the IRAF Control Environment (ICE) software, used for

CCD data acquisition, was installed on Kitt Peak in early May. This version adds a number of new features, including the ability to change the exposure time during an exposure, improved concurrency control, and support for scanned observations. The first shared-risk runs with visitors have been conducted with the CCD photometry program CCDPHOT. Preparation of ICE 2.0, due out this summer, is in progress. ICE 2.0 will include the new IRAF telescope system interfaces (including a new IRAF socket driver used for general client-server communications) and will include the first production release of CCDPHOT, integrating CCDPHOT and CCDACQ together in the same IRAF/ICE layered package. The ICE software is the result of a collaborative effort by NOAO and Steward Observatory.

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

Doug Tody, Jeannette Barnes

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1992 Software Conference Update (1Jun92)

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1992 Software Conference Update (1Jun92)
(from CCS, NOAO Newsletter No. 30, 1 June 1992)

The Second Annual Conference on Astronomical Data Analysis Software and Systems (ADASS) will be held in Boston on 2-4 November 1992. The Conference is sponsored by NOAO, Smithsonian Astrophysical Observatory (SAO), and Space Telescope Science Institute (STScI), and is being hosted by SAO. 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.

The first two days of the conference will be devoted to contributed and invited speakers, while the last day will be reserved for user-group sessions and special interest discussions. Contributed posters will be on display throughout the conference. We expect the Proceedings of ADASS '92, like those of the first conference, to be published as part of the Astronomical Society of the Pacific Conference Series. Since the dates for this meeting encompass Election Day, instructions for casting absentee ballots are included with the registration materials, which were mailed in early May to all pre-registrants.

Contributions to the program are invited in the areas of algorithms, software, systems, and related topics, with emphasis on practical solutions to the problems of treating real data. The special topics for this year's conference are next generation systems and languages, user interfaces and data visualization, data acquisition, and databases, catalogues, and archives. As always, papers in other areas may be accepted as well.

Invited speakers for this year's program include Miguel Albrecht (ESO), Geoff Croes (NRAO), Alan Farris (STScI), Margaret Geller (Harvard-SAO), Jim Gettys (DEC), Andre Heck (Strasbourg), James Himer (Calgary), Mark Johnston (STScI), Bob Kibrick (UCO-Lick), Doug Tody (NOAO), Michael Van Steenberg (NSSDC), and Don Wells (NRAO).

If you are interested in registering for this conference, please contact Tricia Buckley (Smithsonian Astrophys. Obs., MS-83, 60 Garden Street, Cambridge, MA 02138) or send e-mail to softconf@cfa.harvard.edu (Internet) or 6699::softconf (SPAN). Registration and abstract forms are available on-line via anonymous ftp to sao-ftp.harvard.edu; get the files pub/softconf/register and pub/softconf/abstract. Detailed information on the conference arrangements and program is available upon request.

Doug Tody, George Jacoby, Jeannette Barnes

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