NOAO Newsletter - June 1995 - Number 42

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NOAO Highlights!

Director's Office

Cerro Tololo Inter-American Observatory

Kitt Peak National Observatory

National Solar Observatory

Global Oscillation Network Group

US Gemini Program

Central Computer Services

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

GONG First Light (1Jun95)

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GONG First Light (1Jun95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 42, June 1995)

The GONG Project has achieved ``first light'' from the first of the six elements of its network with the deployment of the first station at the El Teide Observatory of the Instituto de Astrofisica des Canarias on Tenerife. GONG Project personnel and collaborators from the IAC obtained 4 hours and 30 minutes of observations on 17 January; the station has since begun daily observations.

[Photo not included]

The GONG station at the El Teide Observatory of the Instituto de Astrofisica des Canarias on Tenerife, Spain

Observations were obtained simultaneously at El Teide and in Tucson, with the station destined for the Big Bear Solar Observatory, of one of the 1.3 million individual modes of oscillation that the GONG stations measure. Each GONG image is transformed into roughly 1.3 million spherical harmonics. The comparison of simultaneous measurements of one of these modes shows that the El Teide data nicely fills in the gaps in the ``Big Bear'' data. Obtaining continuous measurements is what GONG was created for. More remarkable, however, are the very small differences---only a few cm/sec---between THe two stations when they are observing simultaneously (see figure below). Of course, a lot more instrumental and data processing adjusting will take place before the full network comes online early this fall---and with the recent completion of the Learmonth, Western Australia deployment there are still four more deployments to complete---but these first results are heartening confirmation that the instrument can perform well and that the analysis procedures are capable of isolating the same one mode out of the millions superimposed, enabling the merging of data from multiple sites.

We anticipate providing a 36-day run of data from a three-site, mini-network to the community by mid-summer.

[Figure not included]

John Leibacher and the GONG Team

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More New Neighbors for the Milky Way (1Jun95)

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More New Neighbors for the Milky Way (1Jun95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 42, June 1995)

[Photo not included]

The Maffei 1 Field

Marshall L. McCall (York) and Ronald J. Buta (Alabama) got more than they bargained for when they trained the Burrell Schmidt Telescope on Maffei 1, a famous heavily-obscured galaxy once thought to be a member of the Local Group. Their plan was to use deep 0.8 mm CCD images to gauge the size and luminosity of Maffei 1, which in turn would yield a better estimate of its distance. But it wasn't Maffei 1 that got McCall and Buta's attention, but two previously unknown nearby galaxies that were captured by their wide-field images. These two new galaxies may be within the physical neighborhood of Maffei 1, but in any case are most likely to be no more than 3 Mpc away.

Maffei 1 may be the nearest giant elliptical galaxy to the Milky Way. Present measurements place it only 2 to 4 Mpc away. Maffei 1, however, has a galactic latitude of only -0.6d, and is so heavily obscured (5 magnitudes in V) that it wasn't even discovered until 1968 (by Paolo Maffei of the Laboratorio di Astrofisica). We now know that there is a group of 13 galaxies in the same general area of the sky, dominated by Maffei 1 and the giant spiral IC 342.

Understanding the role of Maffei 1 in the dynamics of the Local Group is of particular interest. M31 is located in the same general direction as Maffei 1 and is thus even closer to it. With Maffei 1 moving away from the Milky Way at 145 km/s, and Andromeda moving towards us at 121 km/s, it's possible that M31 and Maffei 1 had a close encounter about 7 billion years ago (assuming a distance to Maffei 1 of 3 Mpc). Dependent on the mass of Maffei 1 and its companions, a past encounter with Andromeda could have been interesting and might have repercussions for understanding the interaction of M31 with the Milky Way.

[Figure not included]

Object 1, the Barred Spiral Galaxy

The path to deducing the mass of Maffei 1 begins with obtaining accurate measures of its magnitude and diameter. Good photometry is key to determining its luminosity and distance via the fundamental plane of elliptical galaxies. The Burrell Schmidt is ideally suited to this task. Early work by McCall and Buta suggested that if Maffei 1 were unobscured, it might be as big as 15' in diameter and have an apparent visual magnitude of about 6, making it one of the biggest and brightest galaxies in the northern sky (only M31 and M33 would be brighter). These results led them to seek an instrument capable of observing very low surface brightness levels over a very wide field. The Burrell Schmidt equipped with a Tektronix 2048 X 2048 CCD provides a 70' X 70' field of view. This is big enough to image either Maffei 1 or IC 342 with lots of surrounding sky.

When McCall and Buta acquired their first 10-minute exposure of Maffei 1 in the I-band, they were delighted to find Maffei 1 covering 14' of sky. They also noticed a fuzzy blob about 20' to the southwest, which they strongly suspected was another galaxy, although at first glance a reflection nebula might also produce such a feature. Full reduction of the images, which involved removal of the copious foreground stars, was required before a definitive answer could be obtained. Indeed, it was during this process that they discovered a second galaxy candidate. Both galaxy candidates were extremely red. Furthermore, after processing, the first candidate was revealed to be a barred spiral, perhaps as big as 6' in diameter, which at a distance of 3 Mpc would make it about 15% of the size of the Milky Way. The second galaxy candidate proved to be a dwarf irregular.

After McCall and Buta submitted their results, Walter Huchtmeier (Max-Planck Inst.) searched for neutral hydrogen emission from the galaxies, using the 100-m Effelsberg telescope in Bonn. The spiral was detected at a heliocentric velocity of 189 km/s. Although this velocity is somewhat high with respect to Maffei 1, it supports membership in the Maffei group. Surprisingly, the 21 cm flux was a factor of at least 3 lower than what it should have been given the visible area of the galaxy. The velocity and HI deficiency suggest that it is interacting with Maffei 1. Unfortunately, the dwarf irregular was not detected. However, the motions of galaxies in the Maffei group overlap those of neutral hydrogen in the Milky Way. If the irregular were moving at around the same velocity as Maffei 1, or slower, it would be overwhelmed by emission from the Milky Way.

[Figure not included]

Object 2, the Dwarf Irregular Galaxy

The two new galaxies discovered by McCall and Buta may play an interesting role in understanding the local influence of the Maffei group---the original goal of McCall and Buta. First, with more information, it should be possible to apply the Tully-Fisher relation to the spiral to arrive at an independent distance estimate for Maffei 1, which is key to determining the timing of past interactions with the Local Group. Second, it may be possible to constrain the amount of matter in the Maffei group as a whole from the dispersion of galaxy motions within it. The more galaxies known, the better the answer will be.

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NGC 1316: A Merger in Progress (1Jun95)

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NGC 1316: A Merger in Progress (1Jun95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 42, June 1995)

Glen Mackie and Giuseppina Fabbiano (Harvard-Smithsonian Center for Astrophysics) used the CTIO Schmidt telescope to show that the elliptical galaxy NGC 1316 may be the site of a galaxy-merger in progress. Narrow-band images obtained by the two astronomers identify a region of extended emission that may be the gaseous remnant of a low-mass galaxy cannibalized by NGC 1316. The "fuel" provided by this event, or other ones like it, may help power the nuclear activity in NGC 1316.

[Photo not included]

The southwest quadrant of NGC 1316. Grayscale depicts residual B band light after model galaxy subtraction. The main feature is the tidal tail L_1. Contours show H alpha + [NII] line emission, with the EELR indicated. The line emission was derived from narrowband exposures centered on 6606 and 6693 Angstroms.

NGC 1316 sits at the heart of the Fornax group of galaxies. It has unusual morphology, featuring strong central dust bands, as well as low surface brightness shells and tidal tails at large radii. A gas disk appears to be associated with the dust lane in the nucleus. NGC 1316 also exhibits low-ionization nuclear emission, an unresolved UV bright nucleus, and a steep spectrum radio core with dual-opposing jets. On the larger scale, a double-lobe radio continuum source with a diameter of ~35' extends well beyond the galaxy in the optical. All of these features may point to a common cause---recent mergers of gas-rich galaxies. This possibility was raised by Schweizer (1980 ApJ, 237, 303), who presented extensive optical observations of NGC 1316, and argued that this galaxy may have had several low-mass, gas-rich mergers over the last 2 X 10^9 yrs.

Mackie and Fabbiano obtained deep B-band and narrowband Ha + [N II] emission line images, aided by the 30' field provided by the CTIO Schmidt. They discovered an extended (81" X 27" or 9 X 3 kpc) emission line region (EELR) at a projected distance of 35 kpc from the nucleus of NGC 1316 (see the figure). Intriguingly, the EELR is located at the base of a ~90 X 35 kpc tidal tail (L_1 in Schweizer 1980) that has a smooth light distribution and is morphologically consistent with the stellar remnant of a low mass merger (Hernquist and Quinn 1989 ApJ, 342, 1). The extreme length of L_1 and its narrowness argue for a disk progenitor. The EELR's major axis is roughly perpendicular to the predominant direction of L_1. The discovery of the EELR supports the merger scenario, but raises new questions on the nature of gas interaction during such events.

The large size and position of EELR argues against it being a giant H II region, and probably connects it with the merger event. However, simulations of low-mass mergers (Weil and Hernquist 1993, ApJ, 405, 142) suggests that the separate stellar and gaseous components of low-mass mergers rapidly segregate, with the gas flowing quickly into the nucleus of the primary galaxy. The smooth light distribution and extent of L_1 suggests that it is

substantially evolved, however. L_1 is estimated to be ~5 X 10^8 yrs old. This might imply that any gas intrinsic to its progenitor should already reside in the nucleus of NGC 1316. There is no evidence for a concentration of residual B-band light near the EELR. NGC 1316 is not a strong X-ray source, but inspection of ROSAT X-ray images shows that the EELR is positioned on the edge of an extended region of broadband (0.2-2.4 keV) emission extending away from the main nuclear X-ray emission of NGC 1316. This suggests that the EELR is not only specially positioned in the tidal tail, but also positioned at a hot gas interface region. Based on the above, the most likely ionization source of EELR is shock excitation (predicted by Schweizer (1980) based solely on the existence of dust lanes that occur 1' from the EELR), although optical spectroscopy will be required to verify this hypothesis.

The Mackie and Fabbiano observations may imply that we are witnessing a galaxy merger at a unique time in its evolution. The morphology and optical luminosity of the tidal tail imply the progenitor was at least a 3 X 10^9 L_o disk galaxy. The optical properties of NGC 1316 suggest that the recent frequency of infall or merger events is 1 per 5 X 10^8 yrs or higher. This adds weight to the possibility that gas-rich mergers provide fuel for nuclear activity. The discovery of the EELR was due to the wide, ~0.5d field of view of the CTIO Schmidt coupled with the excellent quantum efficiency its CCD detector. It is appropriate that the CTIO Schmidt was used for this discovery, as it was also used almost 20 years ago by Schweizer in his pioneering study of NGC 1316.

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Imaging Accretion the Coude Way (1Jun95)

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Imaging Accretion the Coude Way (1Jun95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 42, June 1995)

Mercedes Richards and Geary Albright (Virginia) used the KPNO 0.9-m Coude Feed telescope to obtain images of the gas streaming between the two stars in Algol-type interacting binary systems. Their technique was to was obtain spectra of Ha emission over the orbital periods of the systems, and then use tomography to construct maps of the accreting gas. Their images suggest that the disks in Algol systems are similar in some respects to those found in cataclysmic variables.

Interacting binary star systems typically contain at least one star that fills or nearly fills its Roche lobe. In the Roche lobe-filling binaries, mass transfer feeds gas along a stream from the Inner Lagrangian point of the binary towards the mass gainer. Eclipsing Algol-type binaries provide an excellent laboratory for the study of mass transfer, containing an evolved Roche-lobe filling G to K giant or subgiant star and a luminous B to A main sequence companion (the primary). In these systems, the mass gainer (the primary) is large relative to the binary separation. In this situation, the morphology of accretion structures is determined by the radius of the mass gainer relative to the distance between the stars. In the long period Algols, there is enough room for an accretion disk to form around the mass gainer. However, for the shorter period systems (Porb &lt 6 days), the size of the mass gainer prevents the formation of a classic accretion disk. Instead, the gas stream strikes the surface of the star and the resulting accretion regions have been referred to as a transient accretion disk.

[Figure not included]

Figure 1: Ha difference of U CrB plotted in the rest frame of the primary star to illustrate the relative motions of the emission components.

Richards and Albright used the Coude Feed to obtain roughly 1000 Ha spectra around the entire orbit of over 10 Algol binaries. The observed Ha line profiles typically showed only weak emission peaks in the wings of the observed line profiles. This emission was enhanced by subtracting the combined theoretical (ATLAS9) photospheric absorption line profiles of the stars from the observed line profile. The resulting Hadifference profiles represent the non-photospheric emission and excess absorption in the binary. A representative set of difference profiles are shown in Figure 1 for U CrB.

[Figure not included]

Figure 2: Doppler Tomogram of U CrB. The solid trajectory in the Doppler image represents the path of the gas stream. The outermost solid circle represents the Keplerian velocity at the surface of the primary and the inner circle around the binary represents the Keplerian velocity at the Roche surface. A standard accretion disk would lie between these two circles. The U CrB tomogram shows that the Ha emission arises primarily along the predicted free fall trajectory.

Richards and Albright, with the assistance of undergraduate summer student Larissa Bowles, used the Ha difference profiles and the technique of Doppler Tomography to reconstruct images of the accretion regions in Algol binaries. In brief, the spectra serve as 1D "slices" through a 2D Doppler image that contain both velocity and spatial information as we view the binary at different positions in its orbit. The spatial information is provided by the Doppler radial velocities of the emission features in the spectra. The quality of the reconstruction improves with orbital resolution. With the advent of large, efficient CCDs, fast computers, and multi-night observing shifts, it is now possible to reconstruct observational images of the accretion regions. Images of the accretion disks in cataclysmic variables have been successfully reconstructed using this technique, for example. The Doppler images of the Ha emitting regions of the short-period Algols show a very distinct flow of gas along the predicted gravitational free fall path of the gas stream in the rotating reference frame. The most prominent gas stream was found in U CrB (Figure 2). This contour map was obtained from the difference profiles shown in Figure 1. These images of gas streams in the Algols are the first such images for the entire class of interacting binaries. Initial results also show that systems with Porb > 4.5 days display a near-Keplerian accretion disk around the mass gainer with little evidence of any emission from a gas stream. These results suggest that the disks seen in the Algols are similar in some respects to those found in the cataclysmic variables (see Richards, Albright, Bowles 1995 ApJ, 438, L103).

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Gemini No. 1 Primary Mirror Blank Successfully Slumped (1Jun95)

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Gemini No. 1 Primary Mirror Blank Successfully Slumped (1Jun95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 42, June 1995)

On 28 February at Corning's Canton, New York facility, the Gemini No. 1 primary mirror blank was heated to more than 1400d C and successfully slumped over a refractory form to give the blank its final meniscus shape. The blank, now dished approximately 29 cm (11.4") from edge to center, was cooled at a controlled rate over the following four days for proper annealing.

The convex surface has since been generated to final shape, the blank turned over, and now the concave surface is being generated to shape in preparation for final grinding and polishing. Finally, the outside diameter and central hole will be ground to final dimensions. All surfaces except the concave surface will also receive an acid etch treatment to increase strength and durability of the blank.

The No. 1 blank will be completed at Corning by mid-November, 1995 and then transported to REOSC Optique near Paris, France for grinding and polishing of the optical surface. Work is progressing smoothly towards a December 1995 fusing of blank No. 2.

[Photos not included]

The blank being lifted into place on the refractory form.

The blank rests on a 1 meter diameter contact point of the refractory form prior to slumping. The furnace is seen in the background.

The successfully slumped blank showing the minor fire polishing caused by the furnace jets near the rotating surface of the blank.

The blank in its final meniscus shape is ready for generation.

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Long Range Planning for NOAO (1Jun95)

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Long Range Planning for NOAO (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

Over the past year, substantial effort has been devoted to defining how to restructure NOAO to accommodate what are likely to be reduced levels of federal funding for science at a time when the scientific opportunities have never been greater. New telescopes and instruments will enable scientific programs that were impossible only a few years ago. The question is how the NOAO program must evolve to take advantage of new opportunities; that evolution must necessarily occur by substitution not growth, because of budget constraints.

The planning process has proceeded in several stages, with involvement of the user community at each stage. The first step was NOAO 2000, where the NOAO staff, after consultation with the users committees, defined in broad outline where we thought the program should go. The second important input came from the OIR Panel, chaired by Dick McCray, which outlined a set of explicit priorities for NOAO. Previous Newsletters have described these activities. Most recently, AURA sponsored a workshop in Albuquerque to evaluate internal NOAO planning and external recommendations of priorities in order to develop an integrated set of guidelines for more detailed planning. The key conclusions of that workshop are summarized in this article.

These three efforts---NOAO 2000, the OIR Panel, and the Albuquerque workshop---provide in broad outline a vision for how NOAO will develop over the next few years. What we must now do is translate that vision into a specific program that defines what telescopes and instruments will be built, what level of support will be provided, and (the most difficult part) what cannot be provided.

We plan to give the user community opportunity to participate directly in the formulation of this program. In this Newsletter we describe the opportunities to join the debates through an electronic forum. Please also feel free to send your comments directly to me on the priorities that you would like to see followed as we (NOAO, AURA, and the user community) develop the implementation plan (swolff@noao.edu).

Albuquerque Workshop

On 12-14 March of this year a workshop on "The Future of NOAO" was held in Albuquerque. Invited to this workshop were the leadership and selected staff of NOAO, the Observatories Advisory Committee (OVC) and other selected board members and staff of AURA, representatives from the three Users Committees, and some other individuals selected for their special expertise in instrumentation or involvement in major telescope projects. The mission of the workshop was "Focusing on NOAO's role of service to the astronomical community and AURA's role as trustee and advocate for the mission of NOAO, to develop, assess, and select strategies for the next decade, based on our understanding of NOAO and on advice from the community through the OIR panel (the McCray Committee) and the OVC." The underlying theme of the workshop was the question of how NOAO can plan so as to be able to provide the community with access to the telescopes and instruments---capabilities---needed for progress in astronomy into the next century. Obvious constraints considered in the discussions include both the probable financial constraints and the tremendous advances and changes in telescope and instrument design over the last decade, making it possible to build new telescopes that are (for a given aperture) cheaper to operate as well as capable of better performance (including fast and accurate slewing and acquisition, diffraction-limited imaging, and IR optimization).

A full report of the meeting has been compiled and sent to participants and to the National Science Foundation (NSF). Copies are available in the libraries at the various NOAO sites. The conclusions reached at the meeting have been

distilled into the following Executive Summary.

Executive Summary

A consensus was reached, explicitly or implicitly, on the following points:

1) The ideas and priorities presented in the McCray Committee Report provide a foundation for the next level of planning for nighttime astronomy.

2) "NOAO must lead as well as serve" (J. Nelson, in the final summary session). To lead, NOAO must have good communication with the community, must have good relations with other major observatories, and must have a first-rate scientific staff.

3) The National Solar Observatory is re-evaluating its strategic path, encouraged to do so both by emerging new observational techniques (super-polished mirrors, active image correction) and by mounting financial pressures as it operates two sites, each with unique capabilities. Major changes may be needed to ensure that it can maintain its position of leadership. A high-level review of solar physics, along the lines of the OIR panel, would be very helpful in such reassessments.

4) The establishment of a "facilities-class instrumentation program" by NSF, with support for instrumentation provided in exchange for public access to telescope time at the independent observatories, is an excellent idea, and AURA and NOAO must actively support its establishment. NOAO with AURA should also work closely with the independent observatories and the NOAO users in defining the details of the implementation of this program so as to ensure that it benefits all segments of the community. In anticipation of this program, and in recognition of the increasing specialization of astronomical facilities, NOAO policies regarding granting observing time to observers with privileged access to other facilities should be examined carefully, including the function of questions asked on the proposal form.

5) In both the nighttime and solar program, it is imperative to invest now in new telescopes and instruments in such a way as to improve the scientific capabilities while reducing long-term operating costs.

6) The plan presented by the discussion group on telescopes at this workshop is a strong first response to the opportunities and constraints that are presently apparent.

Specifically, the following comprises the "minimum viable telescope complement for NOAO":

at CTIO:	Gemini 8-m, CTIO 4-m, SOAR 4-m, 1.5-m
at KPNO:	WIYN 3.5-m, Mayall 4-m
in Hawaii:	Gemini IR-optimized 8-m telescope

In this worst case model, other presently operating facilities would be closed or privatized. However, we recommend strongly that another alternative be explored, to enable cutting-edge science by the community that NOAO serves:

- the replacement of the aging 4-m telescopes with modern, high performance, low operating cost telescopes of 4-m to 8-m aperture;
- the provision at both sites of identical 2.5-m wide field imaging telescopes.

Such new telescopes could be much more efficient in queue mode than existing ones, allowing fewer telescopes to pick up more of the science currently served by many small telescopes. It would also make it possible to site major telescopes together for maximum operating efficiency, with the possibility that, as present facilities are privatized or closed, some existing sites could be made available for use by universities or groups.

7) There will be significant changes in the equipment and services available to users, in the most frequent modes of observing, and in the ways that the national observatories and the independent observatories interact. These changes will have profound implications for the user community, both positive (access to powerful new instruments) and negative (a substantial decrease in direct access as less total time is available). The use of new modes of observing may allow more programs to be carried out on fewer telescopes, and enable new kinds of scientific programs to be carried out at NOAO, but their advantages may not be immediately apparent to users. It will require much improved mechanisms for communication between the community and NOAO to make sure that these changes can occur with widespread community support and involvement and with minimal negative impact on scientific progress.

8) Greater involvement by the community in the planning of instruments for NOAO is desirable, even necessary as the number of choices increases. The

establishment of a senior advisory committee, plus changes proposed for existing committees (OAC, OVC, and Users' Committees), were discussed as possible mechanisms for such input. The discussion group on instruments has provided a working plan to begin this process, including a strong recommendation in favor of a more ambitious effort to incorporate adaptive optics. Issues not fully resolved by the workshop include integrating the instrument plans with the telescope plans developed at the workshop; the level of effort that NOAO should be prepared to invest in adaptive optics for the next generation of telescopes, and the specific mechanism for wider community input into instrument selection for NOAO.

9) An improved process for procurement of instruments for Gemini is proposed. This process consists of three steps:

   (1) NOAO, in consultation with AURA, convenes an advisory committee.

   (2) This committee considers proposals from groups interested in building the instrument for Gemini. It recommends to NOAO, for transmission to NSF, (a) a rank-ordered list, (b) a single proposal, (c) a collaboration, or (d) a more formal competition (such as was used for the IR spectrometer).

   (3) The selected group(s) (in cases a-c) will prepare more detailed technical proposal(s) for review by a scientific and technical committee. On the basis of that committee's recommendations to the NOAO director, the US Gemini Program will negotiate final arrangements with the International Gemini Project and the proposer for carrying out the instrumentation work package.

Also, it is strongly recommended that NSF supplement Gemini funding to provide the US obligation for fair value to the International Gemini Project. This would allow for full cost recovery in many cases, and would therefore provide equal opportunity to independent institutions and to NOAO to propose to build instruments.

10) The interaction among the various groups represented at the workshop was extremely positive and productive. The NOAO users, the NOAO staff, the AURA board members who also represent a variety of institutions, and particularly those member of the community who came to share their experience and expertise in the areas of instrumentation and telescope construction all contributed in critical ways to the success of the workshop. It is important to continue this vital cooperation as we move into the future.

Lee Anne Willson (Chair, Observatories Council)
Sidney Wolff (Director, NOAO)

The Executive Summary was prepared by L.A. Willson in consultation with members of the Observatory Advisory Committee, J. Salzer (Users Committee representative), G. Oertel, and S. Wolff.

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An Open Letter from the Joint CTIO/KPNO Users Committee (1Jun95)

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An Open Letter from the Joint CTIO/KPNO Users Committee (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

The CTIO/KPNO Users Committee, in collaboration with the directors of NOAO, CTIO, and KPNO, is initiating an electronic forum to improve the exchange of information between NOAO and the US optical/infrared community. The goal of this program is to facilitate communication regarding proposed changes within NOAO that will affect the user community and to encourage community input to the decision-making process. We want to provide a mechanism for NOAO to inform the community in a timely manner about issues regarding operations or policy and to fold in community input before final decisions must be made. This electronic forum is meant to complement the existing NOAO Newsletter.

All astronomers with an interest in the future direction of our national observatories are encouraged to respond to this announcement in order to be

included in our e-mail distribution list.

In these times of constrained budgets, the resources available for carrying out astronomical research are becoming increasingly scarce. The recently released report by the Panel on Ground-based Optical and Infrared Astronomy (the "McCray Committee") presents strategies for how OIR astronomy can best move forward into the future. Two inescapable conclusions from this report are:

(1) Change is inevitable: the limited resources available precludes a "business as usual" scenario.

(2) The US OIR community needs to work together more closely to secure a healthy future for our science.

Both of these points require that better communication exist between all members of the US community. The first and most important step to enhanced cooperation is better communication.

The Joint CTIO/KPNO Users Committee will distribute a regular announcement describing a specific issue of concern to NOAO and the user community. These mailings will be relatively brief to avoid increasing the "e-mail overload" we all experience. A more detailed discussion of the issue will be made available via the World Wide Web or FTP, and an e-mail address will be provided for those wishing to voice an opinion on the specific issue(s) raised. Examples of issues that will be discussed through the forum include:

- Future Operations Models for KPNO and CTIO
- TAC Policies
- Access to NOAO facilities by astronomers with guaranteed access to private telescopes. Future TAC directions---a unified submission process and single discipline-based TACs for CTIO, KPNO, and Gemini.
- Science Opportunities from New Observing Modes (e.g. Queue Scheduling)
- Instrumentation for NOAO facilities---including Gemini
- NOAO in the Gemini Era---Operations and User Support

Of course, many issues could be productively discussed through this type of forum, and suggestions from the community are welcomed.

We sincerely hope that the US OIR community will take advantage of the opportunity to become more informed about the changes occurring within NOAO. Members of the Users Committee feel that it is absolutely essential that better two-way communications exist, and that ALL members of the US community have a mechanism for expressing their views.

To be added to the e-mail distribution list, simply send a blank e-mail message to forum-subscribe@noao.edu. The inaugural issue of the NOAO "electronic forum" is scheduled for distribution in late summer.

John Salzer, Suzanne Hawley
(for the CTIO/KPNO Users Committee)

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Announcing the New Joint CTIO/KPNO Users Committee (1Jun95)

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Announcing the New Joint CTIO/KPNO Users Committee (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

To respond both to the recommendations of our individual Users Committees and to the recommendations of the AURA/OAC Workshop, the existing KPNO and CTIO Users Committees will be combined into a new Joint CTIO/KPNO

Users Committee. The Committee will be comprised of twelve members, six appointed by the CTIO director and six by the KPNO director, following consultation among the two Directors and the NOAO Director. Each six will serve as a Subcommittee to advise the corresponding Director about his or her Observatory and programs. The Chair of the Joint Committee will alternate between the Chairs of the CTIO and the KPNO Subcommittees.

The Chair of the 1995 Joint Committee will be John Salzer, and the Chair of the 1996 Joint Committee will be the incoming Chair of the 1995 CTIO Subcommittee, Suzanne Hawley. The Chair of the Joint Committee will report to the CTIO and KPNO Directors jointly, and the Chairs of the Subcommittees report separately to the respective Directors.

The Joint Committee will also have an opportunity to report directly to the NOAO Director as part of its annual activities, and will provide formal input to the NOAO Director concerning the NOAO Instrumentation Program. In the longer term, the Joint Committee may also serve as the Users Committee for the U.S. Gemini Program.

The term of membership on the Joint Users Committee will be three years. The current membership of the Joint CTIO/KPNO Users Committee is:

CTIO	KPNO
Suzanne Hawley (Chair)	John Salzer (Chair)
Marc Postman	Elizabeth Lada
Kristen Sellgren	Verne Smith
George Wallerstein	Gus Oemler
Patricio Ortiz	David Koo
Steve Shectman	Martha Haynes

To define the role of the new Joint Users Committee, we set the following charge:

"The Joint CTIO/KPNO Users Committee is appointed in consultation by the CTIO, KPNO, and NOAO Directors to advise them jointly and separately on issues of concern to our users and to the broader astronomical community.

The tasks of the Committee include, but are not limited to:

- to advise CTIO and KPNO on the needs of the community, both short and long term;
- to help to evaluate how well CTIO and KPNO are meeting those needs;
- to advise on ways to improve existing services and programs at CTIO and KPNO;
- to suggest new services and programs needed by the community;
- to review plans for service and program changes to meet changing community needs and budgetary constraints;
- to advise on new instrumentation and the deployment of instruments and scientific capabilities north and south and on the plans and priorities of the NOAO Instrumentation Program;
- to advise on policies and process for the allocation of telescope time at CTIO and KPNO;
- to advise on CTIO and KPNO operations and policies;

  and

- to advise on the evolution of telescopes and facilities to provide a good balance north and south."

Malcolm Smith, Caty Pilachowski

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Response to the Joint Statement of the CTIO and KPNO Users Committee(1Jun95)

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Users Committees
(from Director's Office, NOAO Newsletter No. 42, June 1995)

At their first meeting, the CTIO and KPNO Users Committee issued a Joint Statement reflecting the common needs and concerns of users of both observatories. The Joint Statement endorsed the new NOAO Joint Instrumentation Plan, and emphasized the importance of an equal distribution of instruments at KPNO and CTIO.

> CTIO and KPNO are taking steps together (as a follow-on from last year's "NOAO 2000" meeting at Sac Peak) to ensure that an equal distribution does result from the output of the central NOAO instrumentation group in Tucson.

The joint committee urged NOAO to produce a clone of KPNO's highly successful Hydra fiber positioner for use at CTIO. It gave this instrument highest priority in its list of new O/UV instrumentation projects.

> We have since added that instrument into the long-range planning for the instrumentation program.

Other priorities for optical instrumentation suggested by the committee included detailed studies of new high and low dispersion spectrographs to replace the R-C and echelle spectrographs at CTIO and KPNO, and the fabrication of a second, large, Mosaic Imager.

> We are moving ahead as rapidly as possible with that plan.

The Joint Statement also endorses the innovative and ambitious program for infrared instrumentation outlined in the September 1994 NOAO Newsletter.

> CTIO and KPNO are committed to realizing as much as possible of this program. We believe it contains elements which are unique and of potentially world-leading capability.

The Joint Committees also noted the importance of IRAF to the mission of NOAO and urged that the IRAF group continue to be supported at least at its current funding level.

> We support this recommendation.

The Joint Statement also considered the role of small telescopes at KPNO and CTIO. The Users Committee encouraged us to consider innovative approaches to the operations of small telescopes to reduce costs and to consider replacing the small telescopes with modern 2-m class telescopes.

> Such plans are now under active discussion at CTIO and KPNO, and will be discussed more widely with users prior to refinement and implementation during the coming year.

Finally, the joint Committees also recommended that we give serious consideration to merging the CTIO and KPNO Users Committees into a single committee.

> We concur with this recommendation, and have moved to implement it, as described elsewhere in this Newsletter.

We note, in conclusion, that our speed in implementing some of these recommendations will necessarily be conditioned by the budget made available for their implementation.

Malcolm Smith, Caty Pilachowski

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Response to the Statement of the CTIO Users Committee (1Jun95)

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Response to the Statement of the CTIO Users Committee (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

The following remarks should be read in the context of my earlier status report in the March NOAO Newsletter No. 41, p.30. This includes information about plans and priorities, essentially as provided to the users' committee at its last meeting. The current note focusses on the specific concerns raised by our users at that meeting, as published in their statement (also in the March Newsletter, p.14). The Joint CTIO/KPNO Users committee, in collaboration with the directors of NOAO, KPNO, and CTIO are initiating an "electronic forum" to improve the future exchange of information between NOAO and the optical/IR community.

Loss of CTIO scientific staff

The CTIO Users committee statement opens with an expression of particular concern on two issues. The first is the reduction of the size of the CTIO scientific staff "which is now severely taxing their ability to maintain the excellence of the observatory and also carry out their own vigorous scientific research programs."

CTIO will not reduce its scientific staff positions any further prior to the Gemini commissioning phase. Any further unavoidable staff cuts that may arise in the next few years will have to be found from other areas of the observatory. Some transfers to Gemini seem likely, however, in the medium term. We will seek to replace some of the lost positions through grants such as the Gemini Fellowship and Hubble Fellowship programs, by encouraging visits by graduate students who can assist in our experimental service/queue observing programs, and by scientists associated with new "independent" or joint-venture telescopes that may be set up on Tololo or on Pachon. We of course very much share the concerns of the Users' Committee, but NOAO as a whole is facing a very difficult budgetary future.

The Threat Posed to the Smaller Telescopes

The other main concern of the committee is the threat posed to the smaller telescopes.

We expect to make significant improvements in the image quality at the 1.5-m telescope and move towards providing a smaller, but better-performing suite of instruments operating at one fixed focus at that telescope. The 1.5-m telescope presently is used with three different secondary mirrors, each with their own problems, and a wide variety of instruments. Its imaging performance, and therefore its scientific productivity, is limited by both optical and thermal problems. Our goals are to get the optics working properly with a single, fixed f/13.5 secondary and a restricted complement of instruments and to make major improvements to the thermal environment. The upgraded telescope initially would continue to be used with the optical and IR direct imagers and the optical low-resolution and Fabry Perot spectrometers. We would expect to shift some of these observational roles over to a new 2.5 m-class telescope in the future. This will keep the 1.5-m telescope competitive for another 5+ years consistent with the AURA Board's recent definition of a "minimum viable NOAO." In FY 1996 the major effort will go into installing large ventilation louvers into the dome walls (following the example of the KPNO 0.9-m), improving the removal of waste heat from the console and computer rooms, providing a corrector for the f/13.5 focus, and converting the spectrograph from the 1-m telescope to work at the 1.5-m telescope's f/13.5 focus. The latter will include the completion of a new spectrograph camera, built as a joint project with STScI, which will give good performance with large-format CCDs.

We are discussing with various groups the extent to which we can/should "privatize" the operation of our remaining smaller telescopes as an alternative to closure, while still retaining at least some of the benefits for our general user community. We expect that our user community will want to participate actively in these discussions! We shall be seeking to have discussions with Yale, Michigan, the SLOAN survey group, and our user committee with a view to developing a common vision for the future of the 1-m and Schmidt telescopes, and how they might be replaced at an appropriate time with a more modern substitute such as a shared 2.5-m wide-field telescope.

The MACHO project is bringing in funds that are now dedicated to this area, yet the effective cuts imposed on NOAO in FY 1995 were so large that they wiped out all the new earnings from MACHO and Gemini combined.

As explained elsewhere by Mark Phillips, CTIO hopes to operate the CTIO 0.9-m telescope, and possibly also the Curtis Schmidt, in a service observing mode. Astronomers will still be assigned specific observing periods during this initial trial period, but they normally will eavesdrop from their home institutions rather than travel to CTIO. In this small-scale initial experiment CTIO will attempt to identify enough direct savings (from not having to support the in-Chile expenses of visiting astronomers) to pay for the extra cost

of providing observing and data-handling personnel. We believe that this will improve the scientific productivity and overall cost-effectiveness of the CTIO 0.9-m telescope, and will allow CTIO gradually to phase into a queue observing program. This will let us gain experience with the new observing modes which will be used at telescopes such as Gemini and SOAR. These proposals will be discussed with users during the (northern) summer, using the electronic forum where appropriate.

The Committee endorses the ongoing efforts to improve the image quality at the 4-m, particularly in the following areas:

(1) the active primary support,
(2) the construction of the image analyzer,
(3) the autoguiding,
(4) installation of the f/14 secondary and
(5) upgrading the telescope control system.

After support of preparations for Gemini (see my article in the March NOAO Newsletter), CTIO's highest overall priority remains upgrading the image quality at the 4m telescope. CTIO is fully committed to pursue vigorously the five areas higlighted by the committee. The highest priority among these five items is currently being given to finishing the construction and installation of the image analyser.

The Committee urged that the highest priority (among instrumentation projects in the short term at CTIO) be given to finishing the implementation of the three new CCDs.

As the committee noted, this is being done.

The committee noted and endorsed the successful start to the joint efforts between KPNO and CTIO in the area of IR instrumentation.

CTIO and KPNO both indicated their intention to build on this early success. CTIO is very pleased with the effect this joint effort has already produced in allowing us to catch up with the deployment of 256 X 256 arrays for imaging and spectroscopy.

The committee endorsed the Rice/UNC plan to develop an IR Fabry-Perot for the CTIO 4-m, noting the success of earlier collaborations, such as the OSIRIS from Ohio State University.

CTIO intends to use the OSIRIS model as the way to proceed in this case also.

The committee has recommended a prioritized program of upgrades to the small telescopes.

CTIO intends to carry out these improvements as resources permit, bearing in mind that unless additional funding comes in from the NSF and/or universities (such as the case of the MACHO project), the highest priority at CTIO for the smaller telescopes must be given to the 1.5-m, as detailed above.

Malcolm Smith

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Response to the 1994 KPNO Users Committee Report (1Jun95)

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Response to the 1994 KPNO Users Committee Report (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

Kitt Peak National Observatory usually derives great benefit from the wisdom and advice of its Users Committee, and 1994 was no exception. We very much appreciate the thoughtful attention the Users Committee gives to the issues confronting KPNO. The format of the 1994 meeting provided an opportunity for a real dialog between the Committee and the Observatory staff; the advice of the Users Committee has been an important part of our planning for FY 1996 and beyond.

The Users Committee endorsed the four central concepts of the long term

vision for Kitt Peak developed through the NOAO 2000 process:

1) the emphasis on scientific capabilities,

2) the concept of complementing rather than competing with the Gemini 8-m telescopes,

3) the unification of the NOAO Instrumentation Program, and

4) our initiatives to build new, modern telescopes at Kitt Peak. And the Committee stressed that continued access to telescopes and state-of-the-art instruments remains the single most important job of KPNO. These concepts will continue to guide our planning.

The Users Committee also noted its concerns about aspects of the NOAO 2000 report. They felt our planning placed too much emphasis on KPNO as a support facility for Gemini, and that we had not fully addressed how important scientific capabilities would be provided under various options for new facilities on Kitt Peak. The Committee offered specific advice to guide our long term planning, and their recommendations are being folded into our plans. Specifically, the Committee recommended that we maintain significant capability for wide field, optical imaging, that we provide the capability for monitoring programs and calibration studies requiring substantial telescope time, and that we consider carefully the impact of changes in operations on graduate student training. The Committee recommended explicitly that a new 2-m class telescope be included in the planning to address these concerns. We have done so, and a progress report is included elsewhere in this Newsletter.

The Users Committee agreed with the decision to close the 1.3-m telescope this spring, given the reality of the budget and the beginning of operations of the WIYN telescope. They urged that we make the closing of the telescope as painless as possible for users. We attempted to do that by moving several highly ranked programs to the 2.1-m telescope, and by scheduling four programs using SQIID or the photoelectric photometer to completion on the 1.3-m telescope before it closed. The Committee stressed that they do not wish to see additional telescopes closed before replacement facilities become available. The Committee approved the proposed additional instrument retirements and urged us to make those changes also as painless as possible to the community by giving advance notice and by making an effort to see that ongoing programs can be completed.

As noted in the March 1995 NOAO Newsletter, the KPNO staff, as well as the staff throughout Tucson, was reduced by nearly 10%. The changes required because of these staff reductions include:

- The 1.3-m telescope has been closed.
- KPNO Mountain Manager Bruce Bohannan has assumed responsibility for supervision of the Observing Technicians.
- The Instrument Assistants have assumed day-to-day responsibility for monitoring instrument performance and coordinating response to any problems that arise.
- Hal Halbedel has assumed overall responsibility for the Kitt Peak Safety Program.
- Start-up and technical assistance at small telescopes will be reduced.
- The number of instrument changes will be reduced through instrument retirements and further block scheduling.
- Dining room services have been reduced.

Cuts in other NOAO/Tucson divisions led to a reduction in shuttle service to and from the mountain and a reduction in programmer support for Kitt Peak.

The Users Committee told us that "KPNO must give top priority to continuing to operate the remaining small telescopes." If followed literally, this advise would be a substantial shift from our existing priorities of WIYN and the 4-m telescopes. Fortunately, the Users Committee also recommended that we make an effort to change the style of operation of the small telescopes to lower the cost of operating them in order to keep them open until replacements can be built. They recommended that the 2.1-m telescope be run by observers rather than an operator, that less start-up assistance be provided on the smaller telescopes, and that creature comforts be cut before more telescopes are closed. We have implemented their recommendations starting with the fall semester 1995.

The Users Committee also urged us to continue to experiment with new programs like Save-the-Bits, the queue scheduling experiments, the WIYN queue program, and Key Projects in order to enhance scientific services and opportunities for the community. The WIYN telescope and WIYN queue

program are about to go into operation, and we hope that the new service observing program on the small telescopes will also provide new opportunities for users.

In response to the Users Committee suggestions concerning graduate student training and observing time for theses, we have advertised (in the last issue of the Newsletter) a program for graduate students to gain observing experience on Kitt Peak. We will be pursuing this program more vigorously for the fall semester. We are exploring the possibility of allocating longer observing blocks to graduate students on the small telescopes so that students can complete theses in a timely way.

The Users Committee also made two recommendations concerning instrument improvements on Kitt Peak: that the new camera for the GoldCam CCD spectrograph should receive high priority and that we move with all haste to procure a blue grating for the bench spectrograph on the WIYN telescope. We now expect that the camera for Goldcam should be available for testing on the telescope by the beginning of 1996. The blue grating will be purchased as soon as its performance characteristics are available from Milton Roy. The Committee also urged the completion of the Mosaic Imager, the Phoenix high resolution IR spectrometer, and the design and construction of the GRASP IR four-color spectrometer/imager to replace SQIID and COB. Those projects are receiving high priority and should be completed on schedule. The Committee also recommended that IRIM not be decommissioned for use at the Starfire Optical Range 3.5-m telescope, and we are seeking alternate means to support that collaboration. IRIM will remain at Kitt Peak until GRASP is commissioned. Following the suggestions of the Users Committee, we will also seek further collaborations with other groups in the community for new instruments. The replacement of the 4-m R-C spectrograph may be a good opportunity for such collaboration, as would adaptive optics.

Finally, the Users Committee applauded the effort of the KPNO staff to take on new roles---KPNO remains a truly world class facility through the dedicated effort of the staff. The Committee was pleased with the evaluation of the future of KPNO prepared by the staff which resulted in the NOAO 2000 planning document. They urged us now to reach out to the community and to listen to the needs of our constituents. And they urged you, the users of Kitt Peak National Observatory, to redouble efforts to speak out as advocates for your facilities and as a source of suggestions and improvements to our program.

Caty Pilachowski

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Instrumentation News: GRASP Design Review (1Jun95)

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Instrumentation News: GRASP Design Review (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

A concept and basic design approach for the multicolor near-infrared instrument, GRASP, was approved by a non-advocate review committee. GRASP is destined to be the workhorse IR instrument for the KPNO 4-m. The current schedule goal is to complete it in two years from this summer.

The principle of GRASP is to divide the input beam into four color bands with dichroics, based on the proven heritage of SQIID. With this approach, it is possible to use transmissive optics with highly optimized coatings in order to maximize throughput. The J, H, K and L arms will each be capable of imaging and spectroscopy. A slit wheel selects various slits or an open aperture. The dichroics follow, with lens collimators and a beam-expanding telescope arrangement. A grating turret in each arm allows a choice of dispersions. The cameras project to a scale of 0.3"/pixel on the 1024 square ALADDIN InSb arrays. Possible additional features include a cold multi-slit mechanism and a high-magnification mode for diffraction-limited imaging at L. A multiple-array controller for ALADDIN arrays will be designed for this instrument and SQIID; it will be integrated in operation and design to be much less complex and costly than four parallel single-array controllers.

The non-advocate design review committee evaluated the GRASP concept and

design on 15-16 March. The committee consisted of Ian McLean (UCLA) as chair, David Axon (STScI), Darren DePoy (Ohio State), Dan Vukobratovich (U. of Arizona, Optical Sciences), Bill Binkert (KPNO), Al Fowler and Rich Reed (NOAO Instrumentation). Their major conclusion was that GRASP should be built as soon as possible. They urged that GRASP play to the strengths of the Kitt Peak site and the 4-m as a complement to Gemini, by emphasizing wider field performance and the three bands covering K and shortward. They also prioritized a number of the options presented as part of the original concept. The elimination of some potential modes has led to significant design simplification, performance increase, and savings in volume, weight and cost.

IPAC considered the report of the committee at their meeting immediately following the Design Review. They approved the allocation of design resources to take the instrument to a Delta-PDR in mid-summer. At that time, several aspects of the design will be reviewed: the revised optical configuration, the mechanical layout and optical bench performance, the volume and weight of the dewar (the envelope may be comparable to that of the echelle spectrograph), data system requirements and functionality, user interface, data display, and data reduction impacts.

We are grateful to the Design Review committee, who gave their time and considerable effort to come up with a thoughtful and immensely helpful set of recommendations. Ian Gatley, Neil Gaughan, and the GRASP development team did an impressive job in preparing the design and its description for the review. Dick Joyce is now the GRASP project scientist. Please contact him with your suggestions and questions while the development is underway.

Richard Green

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Bring an Undergraduate to Observe at Kitt Peak! (1Jun95)

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Bring an Undergraduate to Observe at Kitt Peak! (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

The National Science Foundation expects to provide funding to NOAO/KPNO to support travel and room and board for undergraduate students to participate on observing runs at Kitt Peak. Education, particularly science education, is an important national priority, and astronomy is of special interest in the context of science education because it quickly captures the imagination of students and draws them in to the study of science. Observing trips to Kitt Peak during the academic year provide an exciting opportunity to involve students in research. There is no better way than a visit to a working observatory to interest and encourage undergraduate students to appreciate and to study science. This opportunity is not limited to physics or astronomy students; capable and interested students from all disciplines are welcome.

If you would like to bring an undergraduate student along on your observing run to Kitt Peak, please send a letter to the KPNO Director's Office with your Observing Run Preparation Form. The letter should describe the student and his or her involvement or interest in astronomy, and should request travel support, if needed. The NSF funds should be sufficient to support approximately 10 students during the 1995-6 academic year.

Caty Pilachowski

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NOAO Educational Outreach Activities (1Jun95)

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NOAO Educational Outreach Activities (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

With the appointment of a half-time Education Officer, whose charge is to develop and obtain funding for an educational outreach program, you can expect the outreach efforts of NOAO to intensify. Our overall educational outreach plan includes direct classroom involvement, support of educational technology, and, if funding permits, a new program of summer workshops for teachers that includes observing time on Kitt Peak. The following activities are underway in support of K-12 science education:

- NOAO will maintain an on-going program of direct involvement in local school districts. The specifics depend on the interests of staff members (not limited to astronomers) and needs of the schools. We are presently gaining experience with the abundance of hands-on-science activities for classrooms developed by Project ASTRO and others. Our current involvement with an elementary school is funded by a NASA IDEA Grant.

- In coordination with school teachers and college professors, we have submitted a preliminary proposal to the NSF Teacher Enhancement Program to fund a series of summer workshops for middle and high school science teachers. We offer teachers a research experience of observing with KPNO facilities and a mechanism for their students to obtain further observations for classroom research projects. The summer workshops would begin in 1997 and include enriched background instruction in astronomical concepts and observational techniques, instruction in the use of image processing and educational technology tools, and some hands-on resources for teaching science.

- We propose that the extensive computer facilities of NOAO be used as an electronic home base for the astronomy and science education community. One way in which we can support the expansion of electronic tools such as the Internet and World Wide Web is by making worthwhile information available through these means. The role of NOAO in electronically disseminating high quality science education materials will be discussed at the Astronomy Education Symposium at the ASP meeting in College Park, MD, this June.

Your comments on these initiatives are welcomed. Please send e-mail to sjacoby@noao.edu or talk with me at the ASP meeting. We will continue to inform you about the educational outreach activities of NOAO through this Newsletter and the NOAO Educational Outreach page of the World Wide Web, scheduled to come on-line in mid-June.

Suzanne Jacoby (Education Officer)

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Smithsonian Scholarship Awarded to Vivian Garcia (1Jun95)

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Smithsonian Scholarship Awarded to Vivian Garcia (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

Vivian Garcia (Kitt Peak Visitor Center employee) is the first Tohono O'odham ever selected to receive a Smithsonian Institution scholarship for the "Introduction to Archival Research" program. The program, sponsored by the Center for Museum Studies and the National Museum of the American Indian, selects fifteen Native American applicants per year.

Participants are introduced to archival research using Smithsonian archival collections, National Archives collections, and the Library of Congress. They are encouraged to gather information for use in American Indian cultural centers, tribal museums, exhibits, tribal histories, archives, and public programs.

Vivian attended the six-day workshop, 17-22 April 1995, in Washington, DC, and was one of only three participants to receive a certificate of completion in archival research methods. Vivian collected information and photos on the Tohono O'odham and Kitt Peak and was awarded two reference volumes on American Indian history for her extensive research efforts during the week. Vivian summed up her enthusiasm for the program by saying, "They gave us an appetizer and now I want more."

Yvette Estok

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News from AURA: AURA Elects New Chairman of the Board (1Jun95)

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News from AURA: AURA Elects New Chairman of the Board (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

At its April 1995 meeting, the Board of Directors unanimously elected Bruce Margon (Washington) as its new Chair effective 1 July 1995. Margon will succeed Maarten Schmidt (Caltech), who will step down after three years as Chair, the maximum term permitted by our by-laws.

In selecting Bruce, the Board reached beyond its membership. Margon is a councilor-at-large on the Space Telescope Institute Council (STIC), a position he will give up on 30 June 1995. Earlier he had been a director-at-large of the Board (1982-92), during which he had served in many roles including four years on the Executive Committee. We look forward to Bruce's leadership of the Board.

Thank You, Maarten Schmidt

Maarten Schmidt led our Board in the most outstanding fashion that is conceivable to me. His statesmanship and exceptional stewardship for the national observatories set a new standard. Thank you, Maarten, for your untiring dedication and unusually fruitful work on behalf of AURA and its mission. We wish you happy hunting for quasars and such, and hope that you will maintain an interest in AURA, too.

New Council Established

On 3 April 1995, the Board approved the immediate establishment of an Observatories Council (OC) and adopted a comprehensive charter to govern its operation. The charter gives the OC responsibility and significant authority to act on behalf of the Board as trustee and advocate for the mission of the National Optical Astronomy Observatories (NOAO). The OC replaces the Observatories Advisory Committee (OAC). Patterned after the successful Space Telescope Institute Council (STIC), the OC will be more broadly representative of the community in that it may include councilors-at-large who are not members of the AURA Board. Major functions of the OC in advocacy and oversight include the final say on the merits of tenure recommendations, appointment of the Visiting Committee and its chair, approval of long range and current year program plans for NOAO, final approval of the hiring of NOAO's Deputy Director, and a major role in the hiring of the Director. The OC also elects its own chair who, as in STIC, need not be a member of the AURA Board. The members of the former OAC are the initial members of the council, including its chair, Lee Anne Willson, and vice chair, Art Walker. Art plans to strengthen the OC's solar expertise, now represented by Juri Toomre and himself.

Goetz Oertel

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News from AURA: New Members of the Board and its Committees (1Jun95)

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News from AURA: New Members of the Board and its Committees (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

By 1 July several changes will have taken place within the board and its committees. We will say hello to new director-at-large Russell Hulse (Princeton Univ. Plasma Physics Lab.) and named a Nobel Laureate in 1993 for his discovery of the binary pulsar. Other new members of the board include: Frank Bash (Texas), Timothy Heckman (Johns Hopkins), Elizabeth Hoffman (Iowa State), Kenneth Janes (Boston), John Huchra (Harvard), and Wallace Sargent (Caltech).

On 30 June, we will say thank you and goodbye to long-term Board member David Morrisroe (Caltech), who served for sixteen years in many capacities. He and his outstanding knowledge and experience as an administrator will certainly be missed. Other members who have left the board include: Arthur Davidsen (Johns Hopkins), Gerry Fonken (Texas), Richard Hoffmann (Iowa State), Robert Kirshner (Harvard), and Alan Marscher (Boston).

Readers have expressed interest in a better understanding of the structure of our board. In the next issue of this Newsletter, we will summarize the membership of the board and its key committees.

Lorraine Reams

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News from AURA: New AURA Member Institutions (1Jun95)

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News from AURA: New AURA Member Institutions (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

Also during its April 1995 meeting, the Board unanimously voted in favor of the admission of the University of North Carolina at Chapel Hill and the University of Minnesota as its 24th and 25th members. We expect to be able to welcome these outstanding institutions in the near future and look forward to a closer relationship with the faculties and administrations of both.

With the two new institutions, the members and international affiliates will include:

Members

University of Arizona
Boston University
California Institute of Technology
University of California
University of North Carolina at Chapel Hill
University of Chicago
University of Colorado
Harvard University
University of Hawaii
University of Illinois
Indiana University
Iowa State University
Johns Hopkins University
University of Maryland
Massachusetts Institute of Technology
University of Michigan
University of Minnesota

State University of New York at Stony Brook
Ohio State University
Pennsylvania State University
Princeton University
University of Texas at Austin
University of Washington
University of Wisconsin
Yale University

International Affiliates

Universidad de Chile
Universidad Nacional Autonoma de Mexico
Observatoire du mont Megantic

Goetz Oertel

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News from AURA: Gemini Fellowships (1Jun95)

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News from AURA: Gemini Fellowships (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

We are pleased to announce the first class of Gemini Fellows who were
offered fellowships for the 1995-96 cycle:

Recipient	Home Country/Host Institution
Ivo Busko	Brazil Intl./Gemini Project
Alejandro Clocchiatti	Argentina/CTIO
Mario Hamuy	Chile/University of Arizona
Lucas Macri	Argentina/Harvard University
Marianne Takamiya	Chile/University of Chicago

Gemini Fellows are supported by the National Science Foundation. The
program provides research and study opportunities in the United States for
graduate students and post-doctoral researchers from South American Gemini
countries (Argentina, Brazil, and Chile). The Announcement of Opportunity
(AO) for the 1996-97 cycle will be distributed in late summer.

Many US institutions have already expressed their interest in serving as
Gemini Fellowship host institutions. We will list these institutions and their
research activity summaries in the next AO. If your institution is interested in
serving as a host, please let us know. For this and other inquiries, contact
Lorraine Reams, Gemini Fellowship Program Administrator via e-mail
(lreams@stsci.edu).

Lorraine Reams

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News from AURA: A Look at AURA 1994 (1Jun95)

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News from AURA: A Look at AURA 1994 (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

Copies of our latest report, "A Look at AURA 1994" are now available. This report outlines our vision, mission, and goals, criteria for new tasks we may take on, and guidelines for membership in AURA. It also describes the organization of the Board and the corporate office. In addition, it highlights recent results of the Hubble Space Telescope, presents an update on the International Gemini Project, and discusses NOAO activities. To request a copy, contact Anita Wheaton of the Corporate Office via e-mail (wheaton@stsci.edu).

Lorraine Reams

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NOAO Preprint Series (1Jun95)

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NOAO Preprint Series (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

The following preprints were submitted during the period 1 February 1995 to 30 April 1995. Please direct all requests for copies of preprints to the NOAO author marked with an asterisk.

647 *Sarajedini, A., Lee, Y.-W., Lee, D.-H., "Ages for Globular Clusters with Predominantly Red Horizontal Branches"

648 *D'Silva, S., Howard, R.F., "Sunspot Velocity Correlations: Are They Due to Reynolds Stresses or to the Coriolis Force on Rising Flux Tubes"?

649 *Samarasinha, N.H., Belton, M.J.S., "Long-Term Evolution of Rotational States and Non-Gravitational Effects for Halley-Like Cometary Nuclei"

650 *Williams, W.E., Toner, C., Hill, F., "Implementation of a MTF-Based Merging Algorithm for GONG Image Data"

651 *Walker, A.R., "The LMC Cluster NGC 1866 I. A Revised Photometric Sequence, and a Reconnaissance of the Surrounding Field Population"

652 *Lauer, T.R., Ajhar, E.A., Byun, Y.-I., Dressler, A., Faber, S.M., Grillmair, C., Kormendy, J., Richstone, D., Tremaine, S., "The Centers of Early-Type Galaxies with HST: I. An Observational Survey"

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Other NOAO Papers (1Jun95)

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Other NOAO Papers (1Jun95)
(from Director's Office, NOAO Newsletter No. 42, June 1995)

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

*Airapetian, V., "On the Frequency Distribution of Solar Flares"

*Airapetian, V.S., Balasubramaniam, K.S., "The Distribution of Solar Flares and its Implication for Coronal Heating"

Barnbaum, C., *Hinkle, K.H., "Infrared and Optical Velocities of Carbons Stars"

*Braun, D., "Scattering of p-Modes by Sunspots. I. Observations"

Da Costa, G.S., *Armandroff, T.E., "Abundances and Kinematics of the Globular Cluster Systems of the Galaxy and of the Sagittarius Dwarf"

*Eggen, O.E., "Pre-Main Sequence Stars in the Pleiades Supercluster"

*Fan, Y., Braun, D., Chou, D-Y., "Scattering of p-Modes by Sunspots. II. Calculations of Phase Shifts from a Phenomenological Model"

*Giampapa, M.S., Schmitt, J.H., and Fleming, T.A., "Coronal Activity of the Low Mass Stars in the Solar Neighborhood"

*Gu, Y., Lindsey, C.A., Jefferies, J.T., "Radiative Transfer in Stochastic Media"

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Service Observing on 0.9-m Telescope (1Jun95)

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Service Observing on 0.9-m Telescope (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

Beginning the first semester (February-July) of 1996, we are considering operating the CTIO 0.9-m telescope in a 100% service observing mode. Under this mode, blocks of time would continue (as at present) to be assigned to observers in advance. However, instead of the astronomer coming to Tololo to observe in person, the observations would be carried out by a trained observer on the CTIO staff.

We see several advantages to this type of operation. The first is convenience. It is often difficult for visiting astronomers to get away from teaching commitments or other responsibilities to travel to Chile for an observing run--particularly for a "small" telescope such as the 0.9-m. A second advantage is efficiency. A typical visiting astronomer who comes to CTIO a maximum of once or twice per year usually spends a significant fraction of his/her first night learning (or re-learning) the ins and outs of the operation of the telescope and instrument. This is particularly true for the 0.9-m, where the observer often does not have a night assistant. The third advantage of service observing is the money that it can save both for the observer and CTIO. A typical five-night run on the 0.9-m will cost the visiting astronomer between $1,100-1,700 for a round-trip ticket from the US to Chile, and costs CTIO approximately $300-400 in lodging and transportation costs. Service observing should save 100% of the former sum, and a significant fraction (at least 50%) of the latter. A fourth advantage of service observing is that it allows greater flexibility in scheduling---e.g., runs as short as 1/2 night should be feasible (see below), allowing users to carry out smaller-than-usual observing programs or to obtain test observations. Finally, converting the 0.9-m telescope to service observing will allow us here at CTIO to start to get experience in the types of alternative observing modes that are likely to be employed on next-generation telescopes such as SOAR and Gemini South. If this experiment is successful, service observing is likely to be extended soon to the Curtis Schmidt telescope. In addition, we hope to begin full queue observing on one or both telescopes, perhaps as soon as the second semester of 1996, possibly in conjunction with a resident graduate student program.

The basic ground rules of this proposed service observing are likely to be approximately the following:

1) Service observing only---No queue observing! Although we do eventually plan to get experience in queue observing, we prefer to concentrate initially on service observing only.

2) Smallest unit is 1/2 night (although even smaller requests might be scheduled if well justified). In addition to facilitating small projects, this may also prove to be an effective means of making more efficient usage of gray time.

3) Limited "eavesdropping" capability. It is our experience that the existing satellite link can be used, at least in a basic fashion, to monitor service observing, and we will therefore attempt to encourage such interaction between the astronomer and the CTIO staff observer.

4) The astronomer can still elect to be at the telescope if she/he so chooses. If you just don't trust anyone else to take data for you, you may come and observe for yourself. However, room and board will be charged in all such cases. This policy of charging fully for room and board would also be applied to graduate students working on theses.

We are interested in receiving feedback from potential users of the 0.9-m concerning this proposal. Would you find service observing to be attractive, or do you think it is a bad idea? Send your reactions to mphillips@noao.edu by 1 July if you want to have a voice in the decision making process. Depending upon the response, a more definitive announcement will be included in the September edition of the NOAO Newsletter.

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CTIO Instrumentation News (1Jun95)

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CTIO Instrumentation News (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

During the past quarter we completed a number of upgrades that directly improve the observational capability at the telescopes. Two new CCDs were commissioned: the Loral 3K X 1K on the 4-m R-C spectrograph and the STIS 2K X 2K on the Schmidt (see accompanying article). The Infrared Spectrometer now has a cross-dispersed mode well suited for multi-band

spectroscopy of faint objects, although the efficiency is somewhat lower than originally hoped. There has also been a significant improvement in the image quality at the 0.9-m telescope, following the installation of extractor fans at the bottom of the enclosed telescope tube (copying what was done on the Las Campanas 1-m; see accompanying article). In addition, the fibers of the Argus multiobject spectrograph can be positioned to higher accuracy than was previously possible, as the result of a recalibration of their mechanical motions using a new measuring device. The two visiting astronomers who have since used Argus report that it is now capable of blind pointing, with no need to recenter the fibers visually.

A site-seeing monitor is now working on Cerro Tololo. It consists of a Las Campanas seeing monitor (generously furnished by Carnegie Observatories) on top of a tower next to the 16-inch dome. There had been a long hold-up installing this system because of lack of a suitable telescope mount, but one has now been generously provided to us by SAO. The system measures image motion and then converts it to estimated image diameters using standard Kolmogorov theory. It will track stars on its own for 2-3 hours at a time, so we plan to run it for several hours every night. During the first three nights it was tested we recorded 0.45", 0.65" and 0.35" FWHM for the site seeing. On the third of those nights we recorded 0.65" FWHM at the 4-m f/8 focus.

Some less obvious improvements around the observatory are the completion of three additional CCD dewars, the replacement of the La Serena-Cerro Tololo microwave link with a more reliable system, and the completion of a project to adapt a commercial high-speed video board for use with our CCD TVs.

A very worrying occurrence during this period was a fire at the 4-m telescope, in the pre-dawn hours of March 10. It occurred at the rear of the telescope in an area occupied by the primary mirror cooling system, and was fortunately extinguished (mostly by Mauricio Fernandez, the night assistant) before any major damage was done. Fernandez and the observers (Malcolm Smith and Richard Elston) noted a serious deterioration in the seeing (!!) as well as strange noises over the intercom, and went upstairs to investigate. They were greeted by rather spectacular flames in the room containing the mirror cooler and the RA drives, which they were quickly able to control. The telescope was back on the air the following night.

The mirror cooling system involves a heat exchanger that uses glycol from the floor chilling system. There had been a major leak a few days before, which we had believed was thoroughly cleaned up. However, there was some exposed styrofoam insulation in the area that had become highly flammable after being soaked with glycol. It apparently ignited due to heating by a partially shorted electrical circuit in an adjacent outlet box. We are now working on improving the alarm systems and removing exposed styrofoam and other fire hazards from the telescope building.

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New Loral 3K CCD Available for Spectroscopy at the 4-m (1Jun95)

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New Loral 3K CCD Available for Spectroscopy at the 4-m (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

We have obtained a second Loral 3K X 1K CCD for use in the Blue Air Schmidt camera. This replaces the first of these devices, which was found to be defective when operated for the first time at CTIO (see NOAO Newsletter No. 40 p.25). This new CCD was installed in the camera and successfully tested with the 4-m R-C Spectrograph during an engineering run in February, and has since been used by several visitors. The Blue Air Schmidt plus Loral 3K will be the system of choice for most programs with the R-C spectrograph. The only exceptions will be work in the near IR where fringing of the Loral CCD may make the Folded Schmidt plus Tek 1K combination the better choice. The Blue Air Schmidt + Loral 3K has also been used successfully with the Argus Fiber fed spectrograph and will be the only camera/detector combination supported on that instrument (the Folded Schmidt cannot be used with Argus). We have yet to try the Blue Air Schmidt + Loral 3K on the echelle spectrograph (engineering time is scheduled in early May). We

anticipate that useable image quality will only be maintained over the central one third of the CCD in this case. However, in the blue/UV where entire orders of the echelle can be fitted on this section of the CCD, the very high QE of the Loral CCD may still make this an attractive choice for some programs. Further information will be posted on the CTIO Mosaic page shortly after the engineering run.

The Loral 3K X 1K CCD is a thinned front side illuminated device with a two layer AR coating designed to maximize its sensitivity over a wide wavelength range, while reducing fringing in the red. The table below gives the QE as measured in the laboratory at KPNO. Also included are values for the overall system efficiency (OSE: the fraction of photons striking the primary mirror that are detected by the CCD) obtained when using the Blue Air Schmidt + Loral 3K with the 4-m R-C spectrograph and grating KPGL1 (632 l/mm 4200A blaze) derived from measurements of standard stars. Both measures show that the sensitivity is up to a factor 1.8 greater than that obtained with the Reticon CCD.

Because of the wide wavelength coverage and high QE of the Loral CCD, it is important to pay attention to the selection of order sorting filters when planning observations. For instance, when taking intermediate dispersion spectra using a grating in second order, it is important to guard against possible contamination from both first and third orders.

Wavelength ()	QE (%)	OSE (%)
3200	78.9	2.4
3500	76.7	10.6
4000	73.0	14.1
5000	86.6	18.6
6000	93.0	14.3
7000	93.9	
8000	73.9	
9000	41.8	

Like NOAO's other Loral CCDs, this particular device has, by modern standards, rather high read out noise (~7.3e- RMS) but quite low dark current (~0.5e-/pixel/hour). Unfortunately, it has only one working amplifier so that, although it is being operated with an Arcon, the read out time is a glacially slow 136s.

Work at KPNO has uncovered a problem with the Loral CCDs that limits the best resolution that can be obtained, which has been attributed to diffusion of photoelectrons within the CCD. The effect is largest at UV/blue wavelengths, since such photons are absorbed close to the surface of the CCD and thus have more time to diffuse before being trapped in the wells of the CCD. When a very narrow slit is used on the R-C spectrograph, the measured FWHM of comparison lines is ~2.3 pixels at best focus for a wavelength of 4000A. For a slit width of 1" (150 um, which should project to 2 pixels on the detector), the best images have ~2.6 pixel FWHM, while for a 1.5" slit (225 um projecting to 3 pixels) line widths grow to ~3.0 pixels FWHM. There is slight curvature of the focal plane that results in some variation of the FWHM with position on the CCD. With a 1" slit the images are 3.3 pix FWHM or better over most of the chip (growing to ~4 pix in the extreme corners), while with a 1.5" slit the images are 4.5 pixels or better over most of the chip (~5 pixels worst case). Even the worst-case images are symmetrical and do not show the very broad asymmetric wings seen in out-of-focus images obtained with the Reticon CCD and the same camera, or the Tek 1K CCD on the Folded Schmidt. In general, the images obtained with the Loral are much more uniform than with these other CCD's. With Argus, where the fibers project to 3 pixels on the detector, comparison lines have widths of 3 pixels FWHM at best focus.

The table below gives the wavelength coverage and dispersion (A/pixel) obtained with the various gratings. This information is valid for both the R-C spectrograph and for Argus, since the parameters of the two spectrographs have deliberately been made the same. For reference, values are also given for the Folded Schmidt plus Tek 1K CCD; note that this camera/CCD combination is not available with Argus.

			B ASch + Loral 3K		FSch + Tek 1K	
Grating	l/mm	Blaze^1(A)	Coverage(A)	Dispn.(A/pix)	Coverage(A)	Dispn.(A/pix)
250	158	4000	11431	3.75	6096	6.00
400^2	158	8000	11431	3.75	6096	6.00
510^2,3	300	10000	5999	2.01	3199	3.22
181	316	7500	5708	1.91	3044	3.05
kpgl2	316	4400	5708	1.91	3044	3.05
kpgl3	527	5500	3417	1.16	1822	1.85
420^3	600	8000	2981	1.02	1589	1.64
kpgl^1	632	4200	2872	0.95	1531	1.53
kpglf	632	8200	2872	0.95	1531	1.53
450	632	11000	2872	0.95	1531	1.53
kpgld	790	8500	2290	0.75	1221	1.20

kpglg	860	11000	2101	0.68	1120	1.09
380^3	1200	8000	1563	0.48	833	0.76

^1 Littow value: for the actual R-C spectrograph configuration the effective
blaze wavelength is 0.92 of the Littrow value.

^2 This grating is silver coated and so does not reflect light below ~4000A.

^3 This grating is not very efficient when used in second order.

Despite the two-layer AR coating, the Loral 3K CCD does fringe at
wavelengths longward of about 7500A. We are still in the process of
evaluating the behavior of the CCD in this respect, so the following should be
considered preliminary: People planning to use the Loral 3K at extreme red
wavelengths should contact us (or see the CTIO Mosaic page) for updated
information on its fringing properties. Because of the fast beam of the camera,
the fringe amplitude depends not only on the wavelength of the light, but also
on how far off-axis that wavelength is imaged. For instance in a spectrum
covering 7050-9900A the largest fringe amplitude was 2% peak-to-peak, which
occurred at 8500A close to the center of the detector; the fringe amplitude at
9000A was below 1%. Conversely, when the grating tilt was changed so that
9000A was centered, the fringe amplitude rose to 12% peak-to-peak at 900A0
and was greater than 5% at 8500A. Onthe R-C spectrograph, the Folded
Schmidt plus Tek 1K may be a better choice when working exclusively at such
red wavelengths.

Please note that with the successful commissioning of the Loral 3K CCD, the
Reticon CCD, previously installed in the Blue Air Schmidt, has been
withdrawn from service.

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New Loral 1K CCD for Spectroscopy at the 1.5-m Coming Soon (1Jun95)

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New Loral 1K CCD for Spectroscopy at the 1.5-m Coming Soon (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

Work on the implementation of the Loral 1200 X 800 CCD for spectroscopy at
the 1.5-m telescope has been proceeding slowly due to shortage of resources.
At the time of writing, testing of the control electronics using an engineering
grade CCD has begun. If no unforeseen problems are encountered when the
science grade CCD is installed, we may be ready for a first engineering run at
the telescope in mid-May. Our goal remains to make this system available at
some point during second semester. This particular CCD only has a single
layer AR coating and was somewhat differently optimized. It therefore has
lower UV/blue QE than the Loral 3K CCD described in the preceding article,
but it is still substantially higher than that of the present GEC CCD. Since 3
Loral pixels are nearly the same size as 2 GEC pixels the resolution in
angstroms achieved when using a given grating should be very similar with
either CCD. Considering only the larger size of the Loral CCD, the wavelength
coverage should be a factor 1.4 greater. However, vignetting and image quality
problems due to the spectrograph camera may limit the useful range to
somewhat less than this. This CCD is expected to fringe redward of 7500A,
but we will not know how severe a problem this will be until after the first
tests with the spectrograph. Updated information on this system will be posted
on the CTIO mosaic page http://ctio.noao.edu/ as it becomes available.

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New Optics-CCD Combinations for the RFP (1Jun95)

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New Optics-CCD Combinations for the RFP (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

Since August 1994 we have been using Arcon controlled Tektronix CCDs as the detectors for the Rutgers Imaging Fabry-Perot. These CCDs have 24 um pixels, low readout noise (typically 3-4.5 e-), and excellent quantum efficiency and response flatness. The software interface for the Arcon users allows the standard RFP spectrograph control to be done via an IRAF parameter file, which makes the instrument use very transparent. A similar interface is in use on our 4-m R-C spectrograph with the Tek + folded Schmidt camera or Blue Air Schmidt + Loral 3K.

Because the Tek 2K and Tek 1K have large image areas we have also provided a longer focal length camera, which is of particular use on the 1.5-m. Below are the telescope/focus/camera options currently in use.

Telescope		135 mm (f/2.0) camera	200 mm (f/4) lens
4-m	f/7.76	0.36"/pixel	0.24"/pixel
1.5-m	f/13.5	0.54"/pixel	0.36"/pixel
1.5-m	f/7.5	0.97"/pixel	0.65"/pixel

The preferred options are the 135 mm camera for the 4-m, and the 200 mm camera for the 1.5-m (at f/7.5). With the 200 mm lens the field projects onto approximately 750 pixels at the detector. Either the Tek 1K or Tek 2K chip can (and have been) be used. The choice is sometimes driven by other scheduling constraints. Currently (February 1995) the Tek 2K in Arcon 3.6 offers slightly lower read noise (however, it is in heavy demand for 4-m instruments).

The FOV remains determined by the 1-inch focal plane aperture of the instrument. On the 4-m, this gives about 160" of useable field, while on the 1.5-m the FOV is 440" at f/7.5 and 245" at f/13.5.

It should be noted that the 4-m and 1.5-m at f/13.5 do provide significant numbers of nights with sub-arcsecond seeing. Due to optics problems the 1.5-m at f/7.5 never produces images as small as 1", and 1.5" is typical.

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New Camera on 1.5-m Bench-Mounted Echelle Gives Resolution of 98,000 (1Jun95)

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New Camera on 1.5-m Bench-Mounted Echelle ... (1Jun95)
Gives Resolution of 98,000
(from CTIO, NOAO Newsletter No. 42, June 1995)

A new 750 mm folded Schmidt camera has been permanently installed on the 1.5-m bench-mounted echelle spectrograph (BME). The 750 mm camera has

quartz optics with broad band anti-reflection coatings and offers excellent transmission and image quality from the atmospheric UV cutoff to 1mm. It replaces the 4-m echelle spectrograph Long Cameras, which previously were used on this instrument. This new camera is now the only camera available with the BME. This change greatly simplifies support of the BME as well as offering 27% greater resolution than the previous camera because of its longer focal length. The new camera was especially designed to match the echelle image to the size of the large format Tek 2K X 2K CCD with 24 um pixels. The full free spectral range is imaged onto the CCD out to about 9500A

In its first use, with a 30 um slit on the fiber tail, the BME produced excellent images on a 800 X 800 TI CCD and achieved a measured resolution of 98,000 at 2 pixels FWHM. Because the CCD is not flat, image size varied over the TI, with the best images measuring significantly less than two pixels fwhm.

However, the TI CCD has now been retired, and the new camera is currently available only with a Tek 2K X 2K CCD. This combination can be expected to give a maximum resolution of approximately 60,000 with the 45 um slit. Higher resolutions will await the availability of a CCD with smaller pixels. An 800 X 1200 Loral CCD with 15 um pixels is expected to be put into service later this year. Resolution, noise and potential availability of this chip are not known at this time. Please contact either of us or look on the 1.5-m BME section of the CTIO Mosaic page http://ctio.noao.edu for the latest information.

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Blow Those Seeing Blues Away (1Jun95)

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Blow Those Seeing Blues Away (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

As of April this year, air extraction fans have been implemented at the bottom of the 0.9-m telescope tube. Six 20-watt DC fans were mounted on the outer shell, under the supervision of G. Perez and J. Briones. D. Rojas and the mountain electronic crew wired in the power supplies. The fans are controlled via a Variac in the observer console. Initial reports are very encouraging and over the past two weeks images at the 1" level have been seen repeatedly. The improvement in seeing appears to be 0.2"-0.3" almost immediately upon starting the fans.

Temperature measurements made by G. Brehmer on several nights during the past semester indicated gradients of several degrees between the primary or "bottom air" and the top of the tube air or mid-high dome ambient. By conventional transformations, the elimination or reduction of these thermal gradients should yield improvements of approximately 1", which would be removed in quadrature from the 1.6" median seeing previously seen.

We are still gaining experience with the running, use, and limits of this system. Comments and reports by visitors and the nighttime staff should allow the seeing of this telescope to approach the optical limitations of its design.

I thank the night assistants G. Martin and M. Fernandez for following through on this project and providing me with feedback. I also thank Frank Perez (OCIW) and our colleagues at Las Campanas for providing information on the fans used on their telescopes.

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Schmidt Telescope Upgrade (1Jun95)

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Schmidt Telescope Upgrade (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

On 28 February 1995 the CCD field-of-view at the Curtis Schmidt telescope increased by a factor of 4.9, with the commissioning of the new 4-inch shutter-filter assembly and a STIS 2048 X 2048 CCD. The STIS CCD was obtained for CTIO by Richard Green from Bruce Woodgate, the PI of the STIS Project. The Thomson 1024 X 1024 CCD, which has operated with a prototype Arcon controller for more than two years, will be retired.

The shutter-filter unit was designed at CTIO and built at the University of Michigan. The filter bolt can hold up to five filters, each four inches square. Due to time pressure, filter operation at the moment is in "semi-manual" mode, but during April and May both the filter-bolt and the telescope focus will be brought under motor control. The user will then be able to focus the telescope and move the filters from the Arcon user-interface, thus greatly improving efficiency. Visits upstairs will then be restricted to the occasions when it is necessary to move the telescope or the dome. A set of 4 X 4 UBVRI filters has been purchased for the Schmidt; other 4 X 4 filters are shared with the 4-m PFCCD. Sets available include Washington, Stromgren, Gunn (only r,i,z) and some narrow band filters.

The STIS 2048^2 CCD is a front-illuminated device made for the Space Telescope Imaging Spectrograph program by Tektronix. It has 21 um pixels (scale is 2.03"/pixel) and is coated with Metachrome to provide UV response. The QE is thus almost identical to that of the Thomson CCD which it replaces (18% 3000-4700A, rising to 50%by 7000A, then falling to 10% by 10,000A). It is not cosmetically perfect, having some partially hot columns, some of which subtract out. All four amplifiers work at low noise, but for the first month of observing we used a single amplifier (lower right), which delivers an impressively low 3.8 e- rms noise at 2.3 e- / adu gain. Full-well is some 150,000 e- but linearity rolls off above 90,000 e-. Work on implementing quad readout and attempting to improve the linear range is also scheduled for April-May. The readout time using quad is expected to be 30-35s; at present it is four times longer. Given that exposures at the Schmidt are typically only a few minutes in duration, the disks fill up at a alarmingly rapid rate. At present the Schmidt has almost 5 GB of disk space and a DAT drive.

[Photo not included]

500s V exposure of Centaurus A, taken in moonlight. The efficiency of the Schmidt in detecting low-surface brightness extended structures is clearly seen.

Performance at the telescope is very satisfactory. Pat Seitzer (Michigan), assisted at times by Eileen Friel (Maria Mitchell) and the REU students, spent several nights painstakingly adjusting the tilts of the focussing assembly, with the result that image quality over the whole 69 X 69 arcmin field is very uniform, with FWHM 1.7 pixels. There is some vignetting due to the Newtonian flat being under-sized, but the pattern is centered and amounts to only 15% by the CCD corners. Twilight sky flats successfully produce a flat sky background.

In these days of tight budgets it is difficult to make substantive improvements to our small telescopes. This project was partially financed by the University of Michigan, and the ability to divide the work between CTIO and Michigan advanced the implementation date by many months. Gabriel Perez designed the filter-bolt and Scott Webster (Michigan) built it. Ricardo Schmidt commissioned the STIS CCD. Pat Seitzer and the under-signed orchestrated the project, with much advice and help from many others. A report on the motor-control implementation and the CCD work mentioned above will appear in a future Newsletter.

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Getting Your Data Home from CTIO (1Jun95)

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Getting Your Data Home from CTIO (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

The following provides up to date information on the methods available for transport of bulk data from CTIO to observers' home institutions. Optical CCD or IR images can be written in either FITS or TAR format on any of the following media:

Nine-Track Magnetic Tapes

Tape transports (6250/1600 BPI) are available at each telescope (except the Schmidt) and in the La Serena computer center. Schmidt observers can access the drives at one of the other telescopes (the 1-m is recommended) over the network.

Exabyte (8mm video tapes)

Exabyte drives are available at each telescope (two are available in the 4-m building) and in the La Serena computer center. These are a mixture of low density (8200) and dual density (8500) devices. Thus low density tapes may be written using the local drive at any location. High density tapes can be written, but at some telescopes this involves network access of a remote drive. Many of the problems of reliability that users have encountered with Exabyte tapes can be attributed to the use of the cheaper "video grade" rather than "computer grade" tapes. Tapes supplied by CTIO (see below) are computer grade. We strongly recommend that visitors select this type if bringing their own tapes.

DAT (4mm digital audio tapes)

DAT drives have been installed at each telescope, and one is also available for public use in La Serena. These are SUN/HP DATs, which can write in both "standard" and compressed mode. However, users are warned that compression algorithms differ from vendor to vendor, so that compressed-format tapes will only be readable on drives of compatible type. We also have some older Wang DATs on machines in La Serena that may be used to read compressed tapes written on such drives should this be necessary. We also note that the software driver we use writes tapes with variable block sizes. Some users have encountered problems reading our DAT tapes because the software at their home institutions could not handle variable block sizes.

We remind observers, especially those working with our larger CCDs, that it can take a long time to get all data written to tape. We urge users to begin the process early in their run and not leave everything to the last moment.

We can supply nine-track, Exabyte and DAT tapes, but you will be charged for all tapes you take away with you as follows:

Nine-Track:	600 foot	$13
	1200 foot	$18
	2400 foot	$21
Exabyte:		$25
DAT:		$25

These prices are relatively high because we must cover the costs of shipping and handling. Consequently, you may find it more economical to bring your own media---especially Exabytes and DATs.

Optical photometry data taken with the PC-ASCAP are usually written to floppy disk (both 5 1/4 and 3.5 inch disks are supported). Please bring your own floppies if you plan to take your data away in this form. In an emergency, we can usually give you an extra disk, but we do not maintain a stock of floppies on the mountain for this purpose. Alternatively, photometry data can be transferred to one of our Sun computers and thence written to tape or sent home electronically.

An alternative means of getting your data home is to send it over our satellite link using ftp. However, the limited bandwidth (56 Kbaud) of the link means that this technique is only suitable for transferring limited amounts of data. By all means use it to send your single channel photometry data, small format IR images, or a few optical CCD images in order to provide rapid feedback to your collaborators back home. Do not expect to be able to ship back a whole run's worth of Tek2048 images, however.

Steve Heathcote(sheathcote@noao.edu),
Dan Smith (dsmith@noao.edu)

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CTIO Scientific Staff Responsibilities (1Jun95)

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CTIO Scientific Staff Responsibilities (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

This is a current list of CTIO scientific staff responsibilities. The people listed below are appropriate to contact with questions, complaints, or suggestions regarding their areas of responsibility. Note that this list will be changing over the next year, as staff members leave on sabbatical or return.

Telescopes/Instruments

Telescope Optics, Guiders, Control systems:	
4-m:	J.Baldwin
1.5-m,1-m,0.9-m:	R.Schommer, S.Heathcote
Tip-tilt f/14 secondary for 4-m:	R.Elston
Cassegrain Spectrographs:	J.Baldwin, M.Phillips
Argus - Technical:	T.Ingerson^1
Scientific:	N.Suntzeff^1, R.Schommer
1.5-m Echelle - Technical:	T.Ingerson^1
Scientific:	N.Suntzeff^1, S.Heathcote
Rutgers Fabry-Perot:	R.Schommer
Direct CCD Imaging:	A.Walker
Optical Photometers:	O.Eggen
Infrared Instruments - Technical:	B.Gregory
Scientific:	R.Elston, J. Elias^2, R.Probst^3
CCDs:	A.Walker
Acquisition TVs:	A.Walker

Computers/Software

Computers - Hardware:	T.Ingerson^1, S.Heathcote
Software:	S.Heathcote
Networking/Communications:	T.Ingerson^1
IRAF:	S.Heathcote

Miscellaneous

Telescope Seeing Improvements:	J.Baldwin, R.Schommer
Telescope Scheduling:	J. Elias^2, M.Phillips
MACHO Project:	R.Schommer
Colloquium Chairman:	R.Schommer
Library:	O.Eggen
TAC members:	O.Eggen (Chair), J.Elias^2, M. Phillips
ETS Manager:	B.Gregory
ACTR Members:	J.Baldwin (Chair), B.Gregory, S.Heathcote, R.Schommer, A.Walker, R.Elston

^1 T.Ingerson and N.Suntzeff are currently on sabbatical at the Dominion Astrophysical Observatory, Canada.

^2   Jay Elias will be on sabbatical as of August 1995.
^3   R.Probst, on sabbatical from Kitt Peak, will fill in for some of J.Elias'
     effort in support of IR instrumentation.

Malcolm G. Smith (msmith@noao.edu)

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Current CTIO FAX Numbers (1Jun95)

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Current CTIO FAX Numbers (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

Following are the CTIO numbers to use for FAX transmissions:

Administration/Accounting and Electronic and Technical Services (ETS):
56-51-205-342.

Scientific Staff, Director's Office, Operations and Gemini La Serena:
56-51-205-212.

Cerro Tololo (mountain top): 56-51-205-439.

All of the above numbers may also be reached through the switchboard
number, 56-51-225415, requesting the operator to connect you to the extension
you need (342, 212 or 439).

The number for the Santiago Office remains 56-2-209-6568.

Elaine Mac-Auliffe (emacauliffe@noao.edu)

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News and Sports Updates While in Chile (1Jun95)

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News and Sports Updates While in Chile (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

We often get asked by visitors for latest news items or sports scores while on
the mountain. The following are my own opinions and comments on the "how
to stay in touch with that football/basketball/baseball score/game/standings"
that you just can't live without. My organization probably wishes to remind us
that the network exists for scientific purposes---but then they're not Bulls or
Cubs fans. Padres or Yankee fans need read no further.

1) If you understand or read Spanish, El Mercurio is a decent newspaper, with
fair international news coverage. It's better than most US papers, although
perhaps not the NY Times or the Washington Post. It is delivered daily to the
mountain (except not always on Sundays).

    Also the Chilean TV news (currently at 9 pm on two channels) has
10-15 minutes of international coverage, also quite acceptable in my opinion.
We may eventually feed the local cable channels up the mountain or find some
other way to get things like CNN and ESPN and HBO on the mountain. There
are mixed opinions on the value or appropriateness of these measures.

If anyone thinks a daily newspaper in English is necessary, he or she could consider a donation of an International Herald Tribune subscription. It is available here 3 or 4 days delayed, and is expensive (about $2.50/day, 6 days a week). It is a high quality paper, and also features Calvin and Hobbs, and Doonesbury.

2) You may chose to get personal pay-for-service e-mail or other network news/information services. For example, USA Today has an inexpensive e-mail (five days a week) headline service for sports, news, economy, etc, sections. Also Compuserve is reachable via the Internet and has AP news as part of their regular services. Ask me if you want details of either of these two commercial services.

3) The freebies on the net. There are a lot of them, and here is a list of some that I have found or used over the past year. No guarantees at this point, some of them may be out-of-date, etc. Also I will just give the Mosaic/url address, there are a variety of ways to reach these services.

http://www.mit.edu:8001/services/sis/NBA/NBA.html
Professional Basketball Server

gopher://cns.cscns.com/11/News%20and%20
InformationCommunity News Service

http://rs560.cl.msu.edu/~cookm/tigers/tigers.html
Detroit Tigers' Info

gopher://info.umd.edu:925/11/Todays_News
Today's News (midnight to midnight)

http://cyber.sfgate.com:80/sports/
San Francisco Chronicle Cybersports

http://tns-www.lcs.mit.edu/cgi-bin/sports
World Wide Web of Sports

http://www.clark.net/pub/watc/watc.html
Welcome to NPR's Weekend All Things Considered!

http://debra.dgbt.doc.ca/cbc/news.html
CBC News Experiment

http://www.nando.net/baseball/bbserv.html
The Nando X Baseball Server

http://www.ccnet.com/SF_Free_Press/sports/
The Sporting Gray

Note that Mosaic and other Web browsers are very easy to use if you have little experience, but surfing the Web may not be consistent with maximum productivity at the telescope.

I will happily take comments, suggestions and additions, and make a "hotlist-news/sports" file available for visitors.

Bob Schommer (rschommer@noao.edu)

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Telescope Time Requests (1Jun95)

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Telescope Time Requests (1Jun95)
(from CTIO, NOAO Newsletter No. 42, June 1995)

Telescope time requests for second semester 1995 were at a near record high, as summarized in the tables that follow. This is in part due to a substantial increase in 1.5-m proposals, some of which at least appear to have been diverted to CTIO by closure of the KPNO 1.3-m telescope.

The mix of instruments requested is similar to that in past second semesters.

Electronic Submission

The percentage of electronic submissions continues to increase, with the total now at roughly 90%. In fact, the 10% of "manual" submissions are mostly from local staff or astronomers who happened to be visiting CTIO in late March; the number of proposals sent by mail was less than a dozen.

The fraction of the proposals including figures (encapsulated PostScript) continues to increase as well, as well as the complexity (and disk space occupied - some 30+ Mb total) of the figures; nearly half of the electronic submissions now include figures. The volume on the last day approached 10% of the capacity of the satellite link.

Unfortunately, not all of the electronic submissions are problem-free. There were still several cases where the proposer obviously did not process and print out the version actually submitted, since these contained fatal (and usually obvious) LaTeX errors. There were a couple of other cases where people did not read the instructions (or look at the sample files) and submitted disconnected proposals and figures. At present, the number of such cases is small, so it is possible to take the time to deal with each individually; if the number of problem proposals continues to increase, we may be forced to become less tolerant.

It is also worth noting people's tendency to submit at the absolute last minute ---roughly 1/3 of the proposals arrived during working hours 31 March, and another 1/3 arrived after work but before midnight. (This tendency was strongest for the extragalactic proposals---time dilation due to redshift perhaps?) While there is a certain amount of flexibility---we did not reject the proposal that came in at two minutes after midnight, for example---it has its limits, especially when it comes to dealing with proposals that can't be processed and require fixes.

As a reminder, the current forms are available by ftp, from the CTIO Mosaic home page, or by sending an e-mail to ctioprop-request@noao.edu. The comments in the template file and the instruction file include current information on instruments available, submission procedures, etc. Therefore, even though the current form (or last semester's form) is acceptable, you may find it helpful to get the most recent version before submitting a proposal.

Jay Elias (jelias@noao.edu)

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Observing Request Statistics August 1995 - January 1996 (1Jun95)

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Observing Request Statistics... (1Jun95)
August 1995 - January 1996
(from CTIO, NOAO Newsletter No. 42, June 1995)

4-m Telescope: 157 nights available

Requests		Nights Requested				
Dark	Bright	Dark	Bright	Instrument	Nights	%
6	4	22	25	Argus	47	11.3
2	1	6	1	CF/CCD	7	1.7
31	13	100	45	CS/CCD	145	34.9
2	9	8	34	Ech/CCD	42	10.1
0	6	0	20	IR/Imager	20	4.8
0	12	0	39	IR/IRS	39	9.4
22	2	77	5	PF/CCD	82	19.8
1	0	4	0	PF/Plates	4	1.0
5	3	17	12	AF-P	29	7.0
--	--	---	---		---	----
69	50	234	181		415	100%

	Now	Last Semester	Semester Before Last
No. of requests	119	96	114
No. of nights requested	415	321	391
Oversubscription	2.64	2.10	3.05
Average request	3.49	3.34	3.43

1.5-m Telescope: 170 nights available

Requests		Nights Requested				
Dark	Bright	Dark	Bright	Instrument	Nights	%
1	1	9	8	ASCAP	17	4.6
20	2	97	17	CF/CCD	114	31.0
7	6	37	24	CS/CCD	61	16.6
0	7	0	34	Ech/CCD	34	9.2
0	18	0	92	IR/Imager	92	25.0
0	2	0	13	IR/IRS	13	3.5
2	3	10	12	RF-P	22	6.0
0	3	0	15	Visitor	15	4.1
--	--	---	---		---	----
30	42	153	215		368	100%

	Now	Last Semester	Semester Before Last
No. of requests	72	55	58
No. of nights requested	368	272	267
Oversubscription	2.16	1.62	1.58
Average request	5.11	4.95	4.60

1-m Telescope: 179 nights available

Requests		Nights Requested				
Dark	Bright	Dark	Bright	Instrument	Nights	%
3	5	24	70	ASCAP	94	81.7
0	3	0	21	IR/Imager	21	18.3
-	-	--	--		---	----
3	8	24	91		115	100%

	Now	Last Semester	Semester Before Last
No. of requests	11	14	12
No. of nights requested	115	151	103
Oversubscription	0.64	0.90	0.58
Average request	10.45	10.79	8.58

0.9-m Telescope: 174 nights available

Requests		Nights Requested				
Dark	Bright	Dark	Bright	Instrument	Nights	%
19	12	138	77	CF/CCD	215	100%

	Now	Last Semester	Semester Before Last
No. of requests	31	39	37
No. of nights requested	215	281	210
Oversubscription	1.24	1.61	1.24
Average request	6.94	7.21	5.68

Schmidt Telescope: 108 nights available

CF/CCD	14 requests for	155 nights	100%	

	Now	Last Semester	Semester Before Last
No. of requests	14	9	20
No. of nights requested	155	86	122
Oversubscription	1.21	0.80	1.16
Average request	11.07	9.56	6.10

0.6-m Telescope: 181 nights available

Visitor	1 request for	14 nights	100%	

	Now
No. of requests	1
No. of nights requested	14
Oversubscription	0.08
Average request	14.00

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WIYN Project Summary (1Jun95)

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WIYN Project Summary (1Jun95)
(from KPNO, NOAO Newsletter No. 42, June 1995)

WIYN activity is concentrating in three main areas: analyzing and correcting telescope performance issues identified during telescope commissioning; instrument commissioning; and completion of the Instrument Adaptor Subsystem (IAS).

By mid-February of this year, it had become clear that telescope performance needs further work in three main areas. First, the all-sky pointing accuracy was limited to 15"-20" RMS. Analysis of pointing data suggested that this problem was related to both systematic and random encoder errors. Second, when the telescope was pointed into the wind, significant wind shake (approximately 0.2" RMS) would begin at wind speeds of 10 m/s and increase with increasing wind speed. Preliminary analysis suggested that this problem was related to main axis servo performance or mechanical vibration of the truss structure that supports the secondary cage. Third, when the wind speeds reached sustained speeds of 16 m/s, with gusts above 20 m/s, the wind torque would exceed the available motor torque and blow the telescope off target. Investigation of project archival documentation by Dan Blanco, the Project Engineer, revealed that this problem arose from a series of specification mistakes (e.g., typographical errors incurred when transferring numbers from one document to another) and under-conservative design decisions. In other words, the as-built main axis motors and their power supplies deliver exactly the specified torque with a little overhead, but the specification was wrong.

The Project is now working with Kitt Peak Engineering to investigate these problems in more detail, and to develop plans to correct them. The friction-driven incremental encoder system is being "wrung out" by KPNO Engineering both mechanically and electronically. At this writing (late April), suspicions center on how the encoders are mechanically mounted. Electronically, the encoders seem to be performing correctly. The wind shake investigation is concentrating on understanding the servo disturbance rejection algorithm in the hopes of tuning it to a higher bandwidth. How successful this will be is questionable since the current bandwidth is 6 Hz and the first fundamental resonance of the telescope is at 8 Hz. Reducing wind shake further may involve using a more sophisticated rejection algorithm or reducing the wind buffeting mechanically (e.g., with a wind screen). There are two obvious solutions for increasing motor torque: (1) increase the power delivered to the current motors, if that is safe to do; or (2) install new motors that can handle more delivered power. Both options are being evaluated.

As this second phase of telescope commissioning continues, night-time activity is dominated by instrument commissioning.

Hydra commissioning is going very well. Multi-FOPS and gripper TV closed-loop guiding both work well. Astrometric solutions derived from photographic plates acquired as described in NOAO Newsletter No. 41 have been folded into the fiber position algorithm. While some fine tuning of the placement algorithm is needed, fibers have been successfully placed on stars under computer control. A number of minor performance issues have been uncovered and solutions are being developed. There are still many things to check out in both Hydra and the Bench Spectrograph, but progress to date has been encouraging. Training of support personnel is scheduled to begin in May. If MOS/Hydra commissioning continues smoothly, MOS/Hydra may be ready for science operations on 1 July (plus or minus two weeks).

Progress on commissioning the CCD imager has been hampered by a number of minor hardware problems and non-photometric weather. The Filter Shutter Assembly (FSA) built by Indiana University has been interfaced into the Arcon/IRAF observing software so that the observer can be prompted for the filter when taking an exposure and the filter can be changed if desired. A shutter timing problem was identified and corrected. Focusing the imager is currently very inefficient, but an improved IRAF/Arcon "focus" utility and a calibration of telescope focus as a function of telescope temperature should greatly improve matters. Software is being developed to implement these two features soon. The complete set of WIYN 4 X 4 filters has been received, but two of the Ha filters were returned for replacement. One had a bad red-leak, and the other showed signs of poor mechanical sealing. Unless some unanticipated problem develops, the Imager/FSA package should be ready for science operations by 1 June.

Mechanical work on the baseline Instrument Adaptor Subsystem (the WIYN guiding and acquisition system) was essentially completed in mid-February. The internal wiring harness is now being installed while the low-level control software is written. Wiring progress has been excellent and wiring should be completed by mid-May. At that time, the full-up low-level control software will be installed and tested. If all goes well, the IAS should be shipped to WIYN during the first week of June.

Nominally, IAS commissioning would begin at that point. Unfortunately, the interface between the main Telescope Control System (TCS) and the low-level IAS control system, originally scheduled for development in Madison, has unexpectedly become the responsibility of the Project. Completing the unanticipated control system task will take several months, slipping the completion of IAS commissioning by an equivalent amount of time. In the interim, it seems likely that imaging observations will begin using the "substitute" IAS constructed by Indiana University. Use of the substitute IAS will result in lower efficiency imager operations primarily because the substitute IAS guide probe samples a very small and specific area of the telescope field and because the higher level software needed for efficient guide star acquisition, focus control, and wavefront measurement cannot be implemented until the IAS/TCS interface is completed.

Responsibility for the operation, maintenance, and further development of the WIYN control system has been completely transferred from the University of Wisconsin Controls Group (UWCG) to the WIYN operations staff at KPNO. A variety of control system loose ends remained after the transition, the most significant being the IAS/TCS interface discussed above. The operations staff is working to tie up these loose ends, consulting with the UWCG as necessary.

The median WIYN Delivered Image Quality (DIQ) for June 1994 through March 1995 slipped to 0.8" FWHM, somewhat larger than reported in NOAO Newsletter No. 41. Since the delivered wavefront continues to be excellent (often within 120 nm RMS or smaller of the ideal wavefront), this suggests that the site seeing was not as good during this period. This conclusion is not surprising given the unstable weather conditions during most of February and March; for example, WIYN was forced to remain closed during roughly 50% of its scheduled nights in February due to inclement conditions. Nevertheless, WIYN continues to have the best median DIQ on Kitt Peak.

Science Operations are currently scheduled to begin on 15 July 1995, roughly the same time as the deadline for the September 1995 NOAO Newsletter. We anticipate that the next Project report will focus on a smooth transition to shared risk science operations.

Dave Silva, WIYN Project Manager

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Electronic Proposal Submission Update (1Jun95)

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Electronic Proposal Submission Update (1Jun95)
(from KPNO, NOAO Newsletter No. 42, June 1995)

The third round of electronic proposal submission for Kitt Peak went smoothly. We received 245 proposals, of which 210 (86%) were submitted electronically. This represents an increase in both the total number and fraction of electronic submissions over previous semesters. By comparison, 232 proposals were submitted last semester (78% electronically), and 231 proposals the previous semester, of which 73% were submitted electronically. There were 139 figures submitted via e-mail for 92 proposals. The process now seems to work fairly painlessly for both the community and ourselves, so no major changes are envisioned in the future.

There were the usual handful of problems, most of which were handled by David Bell.

1) People did not actually check the proposal by running LaTeX on it and printing it out. This was by far the most common problem. We then had to fix whatever minor typos that prevented printing. A new problem that caught our attention this time was that three proposals had no table giving the requested telescope/instrument combination---two "obsrun" blocks had been deleted, causing the table to collapse.

2) A few people running LaTeX2e had problems that caused the title to appear as "OT1" regardless of what they put in the title field. We're investigating a cure. The proposals printed correctly on this end.

3) Three proposals (and one figure) were submitted with lines that were too

long for the mailer to handle. We caught these and had the proposers resubmit.

4) One person submitted the PostScript version of the proposal. It was flagged as a figure, and correspondence then ensued. The proposal was resubmitted. Another person submitted a "uuencoded" file ("attached" the file in mailtool), and had to be contacted to resubmit.

5) The most serious problem occurred Friday at 1700 when someone submitted a 13 Mb figure---we thought we had ample diskspace at the time, but multiple copies created for backup caused the disk to fill. We're buying a larger disk!

6) A few figures and/or WIYN queue forms were misplaced when people submitting them mistyped the "subject" line on their submission.

7) The e-mail address for submitting thesis letters from advisors had a typo in the instructions. This has now been corrected. The correct address is kpnoprop-submit@noao.edu.

8) Several people added comments to the beginning of the proposal submission. This caused manual intervention to an otherwise automated process. Comments are best sent separately to kpnoprop-help@noao.edu, since the actual LaTeX file is generally not read by anyone.

If you have any comments for improvements or making the submission process smoother, please send e-mail to pmassey@noao.edu.

Phil Massey, Jeannette Barnes, David Bell,
Pat Patterson, Judy Prosser, Marlene Saltzman

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Status of KPNO Improvement Projects (1Jun95)

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Status of KPNO Improvement Projects (1Jun95)
(from KPNO, NOAO Newsletter No. 42, June 1995)

Preparations for major improvement projects scheduled for summer shutdown have received the highest priority during the past quarter: thermal control of the 4-m primary mirror and conversion of the 2.1-m to observer operation. Mechanical conceptual design work for cooling the 4-m primary mirror is complete and shop fabrication of the mechanical components is underway. When installed this summer, this system will maintain a fixed, manually selected temperature. Subsequent controller/software improvements will ultimately enable active thermal control of the primary mirror and the hydraulic fluid to better cope with the harsh reality of the (weather moderated) diurnal temperature cycles. Additional activities have been sparked by the cogent need to limit the operating expense of existing facilities through improved reliability and reduced maintenance.

Highlights of current activity and the perceived results of recent activity during the past quarter include:

At the 4-m, an improved seeing monitor---a "bare" COHU camera with a narrow bandpass filter mounted at one of the viewports---has been installed. Unlike the previous monitor, this system has no intervening optics to degrade the inherent image quality. Readily available irrespective of the instrument in use, the new monitor should provide a better, more uniform measure of the delivered optical performance at the Cassegrain focus with both the optical and the infrared secondaries---a prerequisite for monitoring the progress and assessing the impact of the assorted seeing improvements currently underway. The FTS observing room has been insulated to reduce heat transfer into the dome. The underside of the mirror elevator is targeted next. Software development for controlling the temperature of the hydraulic oil is nearly complete.

At WIYN, KPNO personnel continued their training to support routine WIYN operations, and have provided assistance on assorted control system, encoder, and motor drive issues.

At the 0.9-m, the dome vents (installed last summer) and the new f/8 secondary mirror cell and support system (installed last quarter) have led to measurable improvements in the delivered image quality. Tests are underway to quantify this improvement and to determine optimal procedures for balancing improvements in image quality obtained by maximizing ventilation against degradation incurred from increased wind shake. A new dome wheel design has been completed and fabrication is well advanced.

At the Coude Feed, last quarter's improvements to support the installation and operation of the near-IR NICMASS camera system at the CF spectrograph enabled three weeks of scientifically productive high spectral resolution observations in March.

At the Burrell Schmidt Telescope, the hardware for the new CCD dewar mount focus mechanism is nearly complete. This upgrade, which is scheduled for installation this summer, promises to deliver more accurate, reliable, and predictable focus.

At the McMath-Pierce Telescope and the Vacuum Telescope design upgrades for assorted mirror mounts to provide better stability and repeatability are in progress.

Michael Merrill

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Improvements at the 0.9-m (1Jun95)

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Improvements at the 0.9-m (1Jun95)
(from KPNO, NOAO Newsletter No. 42, June 1995)

Recent improvements to the 0.9-m telescope now provide observers with better data than ever before. As noted in NOAO Newsletter No. 36, KPNO has adopted the strategy of using the 0.9-m as an inexpensive proving ground for image quality upgrades where they can be implemented and evaluated quickly. At large telescopes, similar goals are costly and incur long feedback delays.

Improvements fall into two primary categories:

1) Optical components:

- A two-element corrector was installed in the fall of 1993 (NOAO Newsletter No. 36, December 1993). With the corrector in the beam, the point-spread functions are nearly constant across the full 23' square field of the Tektronix 2048 X 2048 CCD, thereby simplifying and improving the photometry from the telescope. The corrector also dramatically reduces the need to refocus the off-axis guide camera frequently, thereby raising observing efficiency.

- The f/7.5 secondary mount was replaced in the fall of 1994. Changes in collimation and secondary mirror shape with ambient temperature are now eliminated. The telescope was collimated after the new mount was installed and has not needed any adjustments during the four months of operation thus far.

2) Thermal environment:

- During the summer of 1994, the electronics rack on the observing floor was moved into the computer room.

[Figure not included]

- Also at that time, eleven ventilation louvers were placed in the dome skin (see picture above). These can be individually or collectively opened to flush the dome quickly and frequently of any heat buildup, while providing sufficient control to avoid wind shake when the air flow becomes vigorous (e.g., wind speeds &gt 7 m/s).

- In the spring of 1995, the telescope tube was ventilated to pull ambient air down the tube and across the mirror. This will prevent a

temperature stratification in the tube and reduce mirror seeing.

Recent tests demonstrate that these steps have had a positive impact. Users report that the images are limited by the 0.68" pixel sampling nearly half the time. Tests with a small pixel CCD (15 um = 0.43") showed that the telescope is capable of producing images smaller than 0.85", these being limited by the inherent astigmatism of the primary.

Clearly, better pixel sampling is needed to take full advantage of the better delivered image quality and wide field available at the 0.9-m. We are planning to upgrade the f/13.5 secondary mount by January 1996 for those programs which can benefit from the improved images. This will provide a scale of 0.38"/pixel and a field of view of 13' square.

Tests to evaluate the state of the primary will take place in the fall. Should we find that the images frequently are limited by the primary mirror astigmatism, we will consider alternatives to improve performance.

George Jacoby, Phil Massey, Taft Armandroff,
Bill Schoening, Todd Boroson, Ron Probst

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Alternative Observing Modes! (1Jun95)

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Alternative Observing Modes! (1Jun95)
(from KPNO, NOAO Newsletter No. 42, June 1995)

For some time KPNO has upon special request informally supported alternative observing modes. Beginning with fall semester 1995 we formally offer the following non-traditional services to scheduled programs using CCDs at the 4-m, 2.1-m and 0.9-m telescopes. All observing runs using these alternative modes require at least one observer to be present at the telescope during night-time operations.

1) Automatic FTP data transfer to a computer at your institution:

After each exposure, the image is passed to a queue that automatically transfers it to your computer using FTP. This process operates in the background and will not affect observing efficiency. The FITS data will be automatically compressed using STScI's hcompress, which is available for Unix and VMS systems from ftp://stsci.edu/software/hcompress. Due to limited bandwidth off the mountain, we are not able to make this service available to all users, only those requiring immediate transmission of their data for their scientific program.

2) Remote observing station:

The KPNO observing environment will be duplicated as far as possible on a computer at your home institution. At present we are only able to support Sun SparcStations running SunOS (not Solaris) and IRAF. The remote window environment will include the ICE data acquisition window, IRAF data reduction window, and an Ximtool quick look image display. Audio and video connections will be provided through the commercial teleconferencing package "PictureWindow" from BBN. The video connection will allow access to the acquisition and guide TVs. Audio and video connections will provide valuable interaction and feedback between those on Kitt Peak and those eavesdropping from "home."

You will be responsible for providing the video conferencing hardware and software at your institution, including some or all of the following: microphone, speakers or headphones, Sun VideoPix board, TV camera, PictureWindow software. All long-distance telephone charges during the run between investigators on site and at the home institutions remain the responsibility of the observers, but the network audio link should make the phone unnecessary.

You must request alternative observing modes in advance of your observing run when you send in your Observing Preparation form (aka the "pink form"). A special form will be included with the "yes" letters. Questions about this

service should be directed to Rob Seaman (rseaman@noao.edu, (520) 318-8248).

We welcome suggestions for other new observing services. In particular, please
let us know if you would like to use these non-traditional modes but cannot
because of different computer hardware or other compatibility issues.

Bruce Bohannan, Rob Seaman

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Workshop Summary Reports on the Web (1Jun95)

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Workshop Summary Reports on the Web (1Jun95)
(from KPNO, NOAO Newsletter No. 42, June 1995)

Preprints of the summarizing reports from the High Resolution Spectroscopy
with Very Large Telescopes Workshop held in Tucson on 13-15 October 1994,
are now available on the World Wide Web. See the URL:

http://www.noao.edu/noao/meetings.html

These reports will be published in a forthcoming issue of the Publications of
the Astronomical Society of the Pacific.

Tom Kinman

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Phoenix Progress (1Jun95)

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Phoenix Progress (1Jun95)
(from KPNO, NOAO Newsletter No. 42, June 1995)

[Photo not included]

Larry Junco, senior instrument maker, checking the optical bench for
the Phoenix foreoptics. The optical bench is being made on the MAHO
numerically controlled tooling center in the NOAO machine shop.
Phoenix, a high-resolution infrared specrograph, continues to progress
rapidly toward first light next winter.

Ken Hinkle

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The KPNO 1.3-m Telescope---A Retrospective (1Jun95)

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The KPNO 1.3-m Telescope---A Retrospective (1Jun95)
(from KPNO, NOAO Newsletter No. 42, June 1995)

Budget constraints and the need to reduce operating costs have resulted in the closing of the 1.3-m telescope as an observatory facility, with the last such scheduled night on 11 April 1995. This telescope had been in service on Kitt Peak for nearly 30 years, and a brief review of its history seems appropriate.

The telescope was originally proposed by the Space Sciences Division at KPNO as the Remote Control Telescope System (RTCS) to be an engineering research platform for the development of remote control protocols for envisioned orbital telescopes. The telescope, to be located on Kitt Peak, would be operated from Tucson, using commercial telephone lines for control and data transmission. By the end of 1963, the telescope mount was installed at the downtown office for testing of the communications system and control console. The telescope was moved to its present location in 1965 and the 50-inch metal mirror was installed by the end of that year. By that time, the goal was a fully automated remote-control telescope for ground-based astronomy. This was a conceptual precursor of today's robotic telescopes, somewhat disadvantaged by the computer hardware available at that time. The control electronics occupied five large racks which almost filled the present-day telescope assistant electronics lab.

By 1969, the telescope was transferred to the Stellar Division, to be operated in manual mode, in part to reduce operating costs. The present observing floor was installed, and the 50-inch became a full-time visitor facility in April of that year. Shortly thereafter, the metal optics were replaced by the present Cer-Vit optics, and the telescope entered the role of optical and infrared photometry, which continued for 25 years. Refinements such as the chopping secondary, observing room (built in part to escape the noise made by the first chopping secondary), TV guiding, and computerization made the operation more comfortable and efficient.

This telescope has played a pivotal role in the development of infrared arrays for astronomical applications, as well as the IR instrumentation (IRIM, CRSP, SQIID, COB) used on the Kitt Peak telescopes. By using the 1.3-m telescope as a test and engineering facility for new, complex instrumentation, the need for significant engineering time when using these instruments on the 2.1-m and 4-m telescopes was virtually eliminated. Finally, the observing record of IRIM (eight years) and SQIID (four years) points out the scientific value of a modest aperture, wide field telescope for infrared surveys and imaging of spatially extended regions. We expect that the forthcoming 1024 X 1024 ALADDIN InSb arrays will help retain this valuable capability.

Dick Joyce

[Photo not included]

The 50-inch RCT after its 1965 installation on Kitt Peak. During its service with the metal primary mirror, the telescope was stowed pointing at the nadir, with heat lamps to prevent condensation on the optics.

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From the NSO Director's Office (1Jun95)

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From the NSO Director's Office (1Jun95)
(from NSO, NOAO Newsletter No. 42, June 1995)

These are busy times for the National Solar Observatory. The past quarter included a number of important events.

GONG Deployment Starts

The first two GONG stations arrived at their sites on Izaa/Tenerife and

Learmonth/Australia. Under the leadership of Frank Hill and Rob Hubbard they were commissioned promptly and are supplying data to the Tucson central facility. Data inter-calibration and merging is going well and together with the GONG station in Tucson, the GONG mini-network is in place. It provides about 70 % coverage. First (v,l) diagrams are in hand. Full deployment of GONG is expected by the end of September this year. For more information I refer you to the Global Oscillation Network Group report in this Newsletter.

NSO's Future Directions Plan/SOLVE

Our 10-15-year research plan for "The Understanding and Prediction of Solar Variability" was mailed to many members in of the solar community. It is also known under the acronym SOLVE (Solar Variability Enterprise). The plan is the result of internal planning within NSO, with the participation of our resident partners (USAF, NASA, SPRC, NJIT). It is based on new capabilities that will be available shortly to "look into" the solar convection zone. These include the GONG and SoHO/SOI facilities, precise surface photometry by RISE/PSPT, surface flow and magnetic field observations and observations of other large scale features, by Yohkoh for example. The plan was discussed by the NSO User's Committee as well as by a small group of helioseismology experts that gathered during the January AAS meeting. There was a strong recommendation by both groups to broaden the participation in the program to include a wide segment of the solar community both within and outside the USA. If you have not received a copy of the plan yet, please ask me for one (jbeckers@noao.edu). At the upcoming meeting of the Solar Physics Division (Memphis, 4 - 8 June) there will be a public session on SOLVE. Two related workshops are being planned as well: 16-21 October 1995 at Sac Peak on "Solar Drivers of Interplanetary and Terrestrial Disturbances" and 28-30 March 1996 in Tucson on the structure of the solar convection zone and solar cycle diagnostics.

The Future of NOAO/NSO

The AURA Observatories Advisory Committee held a workshop in Albuquerque 12-14 March to discuss the future plans for NOAO. It was followed by a similar discussion during the AURA Board meetings in Washington DC on 3-5 April. The prospects for the National Solar Observatory received a great deal of attention. What was generally recognized as a good plan for the future development of solar astronomy within NSO is threatened by budgetary pressures on a program that is already stretched to the limit. As a result of the two discussions, AURA will ask the National Science Foundation to commission a high level study of ground-based solar astronomy, somewhat along the lines of the recently completed McCray Committee study for nighttime astronomy.

Collaborations

In efforts to optimize the use of solar community resources, I am encouraging collaborations---especially where they result in a win-win situation. Recent examples are (1) the joint construction of a 1024 X 1024 high-speed (7frames/sec) CCD camera with the Kiepenheuer Institute, and (2) a collaboration with the Rome Observatory to build a copy of the RISE/Precision Solar Photometric Telescope for Italy. We are now discussing collaborations with the Instituto de Astrofsica de Canarias for the construction of a 256 X 256 IR camera, with the Stockholm Observatory on active/adaptive optics systems, and with the ESA/NASA SoHO program on joint observing programs.

Jacques Beckers

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New Results on the Excitation of Solar Oscillations (1Jun95)

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New Results on the Excitation of Solar Oscillations (1Jun95)
(from NSO, NOAO Newsletter No. 42, June 1995)

A group that includes P. Goode (NJIT), T. Stebbins (JILA), L. Strous (NJIT) and T. Rimmele (NSO) is studying mechanisms that excite the solar global oscillations. Simultaneous, high-resolution observations of solar granulation

and acoustic events in the photosphere were performed at the VTT/SP using a narrow band (20mD) filter. The acoustic events observed in the photosphere arise from an impulsive action that feeds mechanical energy into the oscillations beneath, and thus are an observable by-product of the excitation of solar oscillations (Goode, Gough and Kosovichev 1992, ApJ, 387). We find that acoustic events occur preferentially in the dark intergranular lanes. This indicates that "acoustic noise" is generated in narrow downdrafting plumes of the granular convection as has been suggested by Rast (1995, ApJ, 443). At the site of a typical acoustic event, the local granulation becomes darker over several minutes leading up to the event, with a further abrupt darkening immediately preceding the peak of the event. Thus, the excitation of solar oscillations seems more closely associated with the rapid cooling occuring in the upper convection layer, rather than with the overshooting of turbulent convection, itself. We also find that the generation of acoustic noise seems to be suppressed in magnetic regions.

T. Rimmele, P. Goode, T. Stebbins, L. Strous

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Update on McMath-Pierce Solar-Stellar Cross-disperser Installation (1Jun95)

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Update on McMath-Pierce Solar-Stellar Cross-disperser Installation (1Jun95)
(from NSO, NOAO Newsletter No. 42, June 1995)

Because the mechanical system has been extensively redesigned, leading to changes in the relative positions of some of the optical components, characteristics such as pixel sampling have changed in the spectrograph system. In collaboration with an REU student, Enrique Chavez, we are working through all the possible configurations of the spectrograph. We will then produce a document showing the results of the re-characterization of the system. In addition, we have identified a problem with the original system field lens that resulted in the formation of the telescope pupil at an incorrect location (leading to vignetting of the spectral field in the new configuration). We are correcting this problem by having the lens modified. The modified lens should be in place by the time of this report.

Mark Giampapa, Dave Jaksha

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Spectral Resolution of One Million Achieved in the Visible (1Jun95)

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Spectral Resolution of One Million Achieved in the Visible (1Jun95)
(from NSO, NOAO Newsletter No. 42, June 1995)

The 632 groove/mm visible light grating is yielding practical resolving powers in excess of 10^6 at the 13.5m McMath-Pierce spectrometer. Operated double-pass, certain optical aberrations cancel, giving a theoretical resolving power of 2.6 X 10^6 at the sodium D-lines in fifth order. While we have not been able to determine the exact resolving power empirically, a comparison with FTS spectra, using I_2 absorption tube line widths, indicates that it is better than 10^6.

At the suggestion of Roger Angel (Steward) this high resolution has allowed us to measure the column amount of mesopheric Na D_2. Seen against the core of solar disk Na D_2, the hyperfine structure of this telluric component is nicely revealed (see figure). Thought to be meteoric in origin, it has long been known that this thin, 90 km high layer is variable. Jian Ge (Steward) plans continuing observations to learn how this sodium layer fluctuates at our latitudes. The result is neccessary to specify laser requirements for Adaptive Optics Guide Star systems.

[Figure not included]

Sample scan at 5 airmasses showing the D_2 profile with the tiny atmospheric absorption part in the line core. By taking the ratio of low sun to high sun profiles, and expanding the wavelength scale to 0.1 nm and the intensity by a factor of 30, the hyperfine structure is displayed (dashed lines).

William Livingston, Lloyd Wallace

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Space Grant Interns (1Jun95)

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Space Grant Interns (1Jun95)
(from NSO, NOAO Newsletter No. 42, June 1995)

During academic year 1994-1995, NSO has participated in the Space Grant Undergraduate Research Internship Program sponsored by the University of Arizona and NASA. Parrish Myers, a junior majoring in Engineering Physics at UA, worked with Doug Rabin on data from the Near Infrared Magnetograph. After mastering the multi-step data reduction process, Parrish encapsulated his experience in a "student-to-student" technical manual. David Chaney (UA junior in Optical Engineering), worked with Frank Hill on integrating GONG site data, that will in the future be collected with a hemispherical radiometer, with earlier data obtained with a tracking radiometer. Both Chaney and Myers presented their work at a statewide Space Grant Symposium held on 7-8 April at Arizona State University.

Frank Hill, Doug Rabin

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NSO Observing Proposals (1Jun95)

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NSO Observing Proposals (1Jun95)
(from NSO, NOAO Newsletter No. 42, June 1995)

Current deadlines for submitting observing proposals to the National Solar Observatory are (1) 15 July 1995 for the fourth quarter of 1995 for solar instrumentation and (2) 15 October 1995 for the spring semester (January-June) of 1996 for the NSO/KP Solar-Stellar Spectrograph. Forms, information and a Users' Manual may be obtained from the Telescope Allocation Committee at NSO/SP, P.O. Box 62, Sunspot, NM 88349, for the Sacramento Peak facilities (sp@sunspot.noao.edu) and at NSO/KP, P.O. Box 26732, Tucson, AZ 85726, for the Kitt Peak facilities (nso@noao.edu). A TeX template can be e-mailed at your request or obtained by anonymous ftp from ftp.sunspot.noao.edu

or on WWW at http://www.sunspot.noao.edu/index.html.

Dick Altrock
NSO/SP Telescope Allocation Committee

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NSO Telescope/Instrument Combinations (1Jun95)

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NSO Telescope/Instrument Combinations (1Jun95)
(from NSO, NOAO Newsletter No. 42, June 1995)

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

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

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

McMath-Pierce Solar Telescope Facility (KP):
- 160-cm Main Unobstructed Telescope
- 76-cm East Auxiliary Telescope
- 76-cm West Auxiliary Telescope
- Vertical Spectrograph: IR and visible gratings
- Infrared Imager
- 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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Global Oscillation Network Group (1Jun95)

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Global Oscillation Network Group (1Jun95)
(from GONG, NOAO Newsletter No. 42, June 1995)

[Photo not included]

"Crocodile" Hubbard on the left presenting the Australian GONG station to John Kennewell, of the IPS Radio and Space Services' Learmonth Solar Observatory.

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

Overview

This has been an exceptionally busy quarter for GONG, with the deployment of the first two stations, the accompanying availability of real data (see the "Highlight" on page 1 of this Newsletter), a Readiness Review of the Data Management and Analysis Center (DMAC), and our Annual Meeting. We have achieved first light at Teide and Learmonth. Further, as you read this the Mauna Loa station should be on-site and being integrated, and the CTIO and Udaipur stations should be on the high seas. With funding committed at the level of $2.6M, GONG should now complete deployment of all six stations by the end of September 1995.

One of the important recommendations from the DMAC review panel was to place high priority on processing a 36-day time series from the three-site mini-network and making it available for community analysis---"blemishes and all." While this will delay development of some of the required functionality for routine operations and may affect support of the deployment of the remaining stations, it will bring the resources of the entire community to bear on understanding the complexities of the GONG data expeditiously.

The Annual Meeting took place in collaboration with the helioseismology experiments on the ESA/NASA SoHO mission at a well attended (150 participants) conference held in early April at Asilomar, California. The meeting was hosted by the Stanford University group. It was the last plenary get together before network operations, and the Scientific Teams worked to develop their plans for the initial data analysis. The Scientific Teams will be holding working meetings starting this summer to carry out the initial, coordinated analysis and preparation of joint publications.

As it has now been convincingly demonstrated that solar internal structure and the p-mode frequencies vary over the solar magnetic activity cycle, we are looking at the implications of extending the observing run from the baseline of three years to an eleven-year, solar cycle run. The optical system has been designed to be capable of feeding a 1024 X 1024 array that would alleviate the undersampling of our present 256 X 256 camera. The GRASP software was also designed to accommodate larger format detectors. We will be undertaking a study to explore the feasibility of both the 11-year data run and the detector upgrade to be able to make a decision to proceed by FY 1997.

Production

The integration and certification efforts on the Udaipur, Mauna Loa, CTIO, and Tucson (prototype) stations have moved ahead essentially on schedule. The Udaipur station went into certification tests in February, Mauna Loa in March, and CTIO in April. 12 April marks the first day that all six GONG stations first took data together somewhere in the world (albeit not all of them at their final locations).

The Tucson prototype was dismantled and moved to the GONG Farm site from its previous location in January. It will be reassembled as time is available over the next few months---hopefully before the Big Bear Solar Observatory station is shipped. Once recommissioned, it will continue to

operate there for the duration of the observing run as an engineering test bed for software and hardware modifications and as a backup station for this longitude.

In parallel with these efforts, engineers from three of the GONG sites visited with the instrument group in Tucson. Sudhir Gupta (Udaipur Solar Observatory), Ricardo Venegas (CTIO), and Eric Yasukawa (Mauna Loa Solar Observatory) each spent two to three weeks assisting in the production efforts and familiarizing themselves with their instruments before they go into operation. Bill Marquette (Big Bear) will come in June.

Deployment

The Tenerife station arrived at its final home at the Observatorio del Teide of the Instituto Astrofisico des Canarias in late January. Lonnie Cole, Don Farris, Bret Goodrich, Frank Hill, Neill Mills, Guillermo Montijo, Sang Nguyen, Antonio Pimienta, Pere Palle, and Jesus Patron had the honor of reporting on 17 January that they had obtained 4 hours and 30 minutes of observations. Thus in a very real sense GONG has achieved "first light." This station continues in operation and, with the Learmonth (Western Australia) station and the Big Bear station operating in Tucson, forms a three-site mini-network that will gather science-grade engineering data while the remaining stations are being deployed.

Despite a near-miss encounter with Cyclone Bobby that pounded Western Australia for several days, the GONG station arrived at the Learmonth Solar Observatory of the IPS Radio and Space Services in late March. Jeff Carson, Lonnie Cole, Rob Hubbard, John Kennewell, Alex Liu, Duane Miller, Ed Stover, and Jeff Vernon got to turn it on, on 14 April. The installations, which have taken about five weeks on site, have gone smoothly thanks to the wonderful collaboration and support of our hosts.

The primary site preparation at Udaipur was undertaken in February. Arden Petri and Jim Kennedy worked with Arvind Bhatnagar and Sushant Tripathy and the rest of the USO staff to install the concrete pads and pier on a hill ("GONG Mountain") above the beautiful new USO headquarters building that is nearing completion at the site.

At CTIO, site preparation work has proceeded with the leveling of the land, with the pouring of the concrete pads, and preliminary installation of table and pier mounting plates. This work was carried out by Arden Petri for GONG, Oscar Saa, and other staff members at CTIO.

Essentially all of the work at Mauna Loa has been completed. A number of improvements were made to the last couple of hundred meters of the access road to the instrument site to facilitate the delivery of the instrument.

The site preparation at Big Bear is proceeding in two steps. The first job was to complete the fill in the lake before the first of last December due to a construction moratorium to protect the nesting of the Bald Eagles. This effort was successful and final preparations will proceed in May.

The Mauna Loa station was shipped from Tucson in late April and will be operational on the Big Island in mid-June. The Udaipur station began its long voyage in early May. Its schedule has been arranged to have it arrive on site just as the Indian monsoon is ending, if the monsoon cooperates! Though it is the fourth station to be shipped, it will be the last to be installed. It will go "on the air" in late September, thus completing the six-site network.

The CTIO station will leave for Chile in mid-May and will be commissioned at NSO's sister observatory in late July. The Big Bear station, which has served so faithfully in Tucson as the comparison standard for all the other stations, will make the trek to California in early July and will be operational in early August.

"Up to the minute" information on the status of the deployment is available on GONG's WWW server: http://helios.tuc.noao.edu.

Operations

With the deployment of the GONG stations on Tenerife and, more recently, Western Australia, the project is now engaged in a new activity: operating a far-flung data-gathering network. Of course, this has been an important objective of many years of work. Nevertheless, it is an interesting challenge, particularly since, for the next few months, the project must be engaged in producing, certifying, installing, and operating instruments, all at the same time.

An operations team has been assembled from a mixture of key instrument, data, and management team members (at least those who are "at home" at any given time) to implement the initial plan for interacting with the remote stations and host staffs, assessing instrument function, diagnosing problems, and servicing the equipment.

The members of the Tucson operations team and the staffs at the remote sites are connected through an e-mail exploder that has served well to keep the diverse specialties involved in the operations current on the happenings at the human level. Daily "snapshot" logins from Tucson to the remote instruments have proved useful for checking the current instrumental status.

Similarly, daily, automatic uploads from the instrument to Tucson of the engineering data files and sample images from the previous day have permitted an in-depth assessment of instrument functions. This has proved effective in quickly resolving the few anomalies that have cropped up. A number of data scanning and analysis tools will be developed over the coming months to automate these tasks further and make them more manageable with the full six-site network.

Data Management and Analysis

During the past quarter, the DMAC reduced data acquired by the production instruments at the University of Arizona farm site and by the instrument deployed at Teide. The project calibrated and produced site-day l-u spectra and 4-minute averages from 83 production test data days: Big Bear instrument: December 11, 14-21, 27, 31; January 6, 14, 18, 22, 28-31; February 1-7, 9, 11, 12, 19, 20, 23-26; March 2-7, 9, 10, 13-15, 17-20, 22, 23, 25-28; Learmonth instrument: December 14, 18-21, 27, 28, 31; January 6, 7, 14; Udaipur instrument: February 2, 23-27; March 2, 3, 9, 10, 13, 16, 24-28; and 9 network data days: Teide site: February 17, 23, 25; March 2, 4-8.

With the successful completion of the Teide deployment in late February, the project received its first data from a non-Tucson site. February 23 and 25 were common to both the Big Bear instrument in Tucson and the Teide instrument. These data were successfully combined to produce the project's first multi-site merged time series.

Two significant software additions were made to the data reduction pipeline. The software that had been developed over the past two years for refining the limb parameters of the images and for extracting the modulation transfer functions was integrated into the pipeline. Recently, this data reduction stage began routine operation. The successful merge of the Teide and Big Bear instrument (located in Tucson) data provided convincing evidence that the project's approach for merging multi-site data will work. Consequently, the DMAC has begun integrating this merge algorithm into the data reduction pipeline so that it can be used routinely when the data from the three-site network begins to arrive.

On 16 and 17 March, a DMAC Users' Committee (DUC) meeting was held in Tucson. The first day was a review of the readiness of the DMAC to reduce the data that is expected from the network in the immediate future. The second day was a normal DUC meeting. Participants in the panel included Tim Brown, Dave Hathaway (Chair), Todd Hoeksema, and Steve Tomczyk. The review covered all aspects of the DMAC. It included presentations and discussions of the merged data samples recently obtained from the Teide instrument. The committee felt that the highest priority objective for the DMAC during the next few months will be to produce merged, monthly data products from the three-site mini-network and to make these products available for analysis by the GONG community.

With four deployments to go, the initiation of full-scale operations, and community access to the first data, the next quarter promises plenty of action and probably a few surprises. Stay tuned!

John Leibacher and the GONG Team

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US Gemini Program (1Jun95)

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US Gemini Program (1Jun95)
(from USGP NOAO Newsletter No. 42, June 1995)

Gemini Project Scientist Position Open

The International Gemini Project is seeking a Project Scientist to ensure the scientific requirements and objectives are met by the Gemini telescopes and their instrumentation. The Project Scientist will be an employee of AURA and will report to the Project Director. A key aspect of the Project Scientist's qualifications will be the ability to present choices between scientific capabilities within budgetary constraints. The Project Scientist will lead the scientific commissioning of both Gemini telescopes. Therefore, a principal task will be to work with the project team in planning this phase of the project. Additionally, because these telescopes will be scheduled and operated in novel ways, with initially up to 50% of the time allocated as queued observing, the Project Scientist will work with the Director and partner scientific communities to develop a scientific operating plan. Finally, it will be important to maintain a personal research program to retain personal scientific vitality.

Interested persons are encouraged to contact the US members of the Search Committee post haste.

Jay Gallagher (Wisconsin)
Jerry Nelson (Lick Observatory)
Mike Werner (JPL)

New Observing Modes for the Next Century

We are pleased to announce an International Workshop to Consider Innovative Observing and Scheduling Strategies for Modern Large Telescopes, 6-8 July 1995. It will take place at the University of Hawaii at Hilo on the 'Big Island' of Hawaii.

The workshop is sponsored by:

The Joint Astronomy Centre
The US Gemini Program/NOAO
The Gemini 8-m Telescopes Project
The European Southern Observatory
The University of Hawaii at Hilo

Observing time with the new generation of large telescopes will be so valuable that the pressure for efficiency may exceed the level up to which the traditional operational paradigms can be developed. The cultural revolution which may be required to satify these requirements has the potential to be a similar intellectual challenge as the scientific frontiers to be explored with these new facilities.

The workshop is aimed at facility staff, program managers and the community of observers who will be affected by any changes to traditional observing practices. It is expected that all major Mauna Kea telescopes as well as other ground-based and space-based facilities will be represented. The format of the workshop will be a series of half-day sessions with invited talks, contributed talks, posters and ample time for discussion. There will be several user-interface demonstrations. Sessions will include:

New observing modes, the key issues
Queue scheduling
Quantifying observing conditions
Service mode observing
Remote observing and eavesdropping
Software user interface and data flow
Automated data reduction and archiving
Scheduling software
Time allocation strategies - key projects?

The US Gemini Program has a limited amount of funding to support the attendance (registration, travel, accommodations) of participants from US institutions.

If you are interested in attending this workshop please see the USGP World Wide Web home page (http://www.noao.edu/usgp/usgp.html) for more information and the electronic registration form or contact:

Todd Boroson (tboroson@noao.edu)
US Gemini Program
NOAO
PO Box 26732
Tucson, AZ 85726
(520) 318-8352 (voice)
(520) 318-8596 (FAX)

US Adaptive Optics Workshop

The USGP recently invited a number of US groups involved in adaptive optics to explore issues associated with a future second-generation adaptive optics system for Gemini that would succeed the low-order natural guide star system

being developed by Canada for the Gemini North telescope. The workshop participants advised the USGP on the state of the art in laser guide star adaptive optics technologies and systems, future directions in this field, areas which require attention for the successful development of adaptive optics for Gemini and the US astronomy community in general and, also, on how best to involve US groups in the development of the second-generation Gemini adaptive optics system.

Brochures, Gemini at AAS in Pittsburgh,
Gemini Newsletter

The USGP has recently printed a technically updated Gemini brochure. If you would like one mailed to you or some to distribute within your department, please let us know. They will be also be available at the Pittsburgh AAS meeting.

Be sure to stop by the Gemini display at the Pittsburgh AAS meeting to discuss your Gemini questions or concerns with us. We also invite you to see the 1/50th scale Gemini model as well as current photos of Gemini fabrication and construction progress.

More Gemini Project news is available from the June 1995 issue of the Gemini Project Newsletter. Current information, photos and the newsletter are available on the World Wide Web, URL http://www.gemini.edu.

Kathy Wood

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1995 Software Conference Update (1Jun95)

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1995 Software Conference Update (1Jun95)
(from CCS, NOAO Newsletter No. 42, June 1995)

Plans for the Fifth Annual Conference on Astronomical Data Analysis Software and Systems (ADASS) are well underway. The Conference, hosted by the National Optical Astronomy Observatories, will be held in Tucson on 23-25 October 1995. Additional sponsors for the Conference include the Infrared Processing and Analysis Center, the International Gemini 8-Meter Telescopes Project, the National Aeronautics and Space Administration, the National Radio Astronomy Observatory, the National Research Council of Canada, the National Science Foundation (tentative), the Smithsonian Astrophysical Observatory, the Space Telescope Science Institute, the University of Arizona Steward Observatory, and the Vatican Observatory. Our corporate sponsors include Research Systems, Inc. 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 Program Organizing Committee for ADASS V has the following members: Rudi Albrecht (ST-ECF/ESO), Roger Brissenden (SAO), Tim Cornwell (NRAO), Dennis Crabtree (DAO/CADC), Bob Hanisch---Chair (STScI), Rick Harnden (SAO), Gareth Hunt (NRAO), George Jacoby (NOAO), Barry Madore (IPAC), Dick Shaw (STScI), Karen Strom (U. Massachusetts), and Doug Tody (NOAO). The Local Organizing Committee is chaired by Jeannette Barnes (softconf@noao.edu).

The Conference program will include invited talks on special topics, contributed talks, poster papers, and software demonstrations. The special topics and invited speakers for ADASS '95 are listed below:

Archives for Ground-Based Data
Dennis Crabtree (DAO/CADC)
Fabio Pasian (Trieste)

Electronic Information Systems and Services
Peter Boyce (AAS)
Mark Johnston (STScI)

Real Time, Near-Real Time Systems

Bob Garwood (NRAO)
Kim Gillies (NOAO)
John McGraw (UNM)

Science Software Applications
Dick Crutcher (UIUC)
George Jacoby (NOAO/KPNO)
Tod Lauer (NOAO/KPNO)
Marc Postman (STScI)

Software Development Methods
James Coggins (UNC)
Brian Glendenning (NRAO)

Several birds-of-a-feather sessions (BOFs) are also planned. BOFs generally run 1 1/2 to 2 hours, often concurrently with other BOFs, and can be any format defined by the organizer. BOFs for ADASS V include Software System Futures (Jan Noordam), IDL (Wayne Landsman), FITS (Peter Teuben and Don Wells), and an IRAF/STSDAS/PROS/ASC/CEA Users Meeting. If anyone has a suggestion for a BOF or would like to organize one, please let us know as soon as possible so it can be included in the program (contact hanisch@stsci.edu or softconf@noao.edu).

Two tag-along workshops (before and after the Conference) are currently being discussed: an Object Oriented Software Workshop is scheduled for Sunday, 22 October, and an IRAF Developer's Workshop is planned for Thursday, 26 October.

A preliminary program that includes a call for papers, registration materials, and local hotel information will be mailed to the Conference mailing list in May. The early registration deadline along with the abstract and demo deadline is 15 August. Registrations will be accepted after that date but at a higher registration fee.

Further information about ADASS '95 is available by sending e-mail to softconf@noao.edu or by using a Web viewer to browse the Conference home page URL: http://iraf.noao.edu/ADASS/adass.html. Registration materials and other information will be made available by anonymous FTP to iraf.noao.edu in the directory iraf/conf/adass-95.

Jeannette Barnes, George Jacoby, Doug Tody

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Report of the IRAF Users Committee - 8 March 1995 (1Jun95)

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Report of the IRAF Users Committee - 8 March 1995 (1Jun95)
(from CCS, NOAO Newsletter No. 42, June 1995)

The IRAF Users Committee meeting was held on Friday, 13 January 1995, at NOAO. This year we welcomed four new members to the committee, whose membership is as follows:

Belinda Wilkes (CfA) - Chair		1991-94
	belinda@cfa.harvard.edu	
Jeff Pier (US Naval Obs.)		1993-95
	jrp@nofs.navy.mil	
Peter Eisenhardt (JPL)		1993-95
	prme@kromos.jpl.nasa.gov	
Tim Carone (EUVE)		1994-95
	tcarone@ssl.berkeley.edu	
Bill Romanishin (Oklahoma)		1994-96
	romanishin@phyast.nhn.uoknor.edu	
Bill Sparks (STScI)		1994-96
	sparks@stsci.edu	
Steve Walton (California State)		1994-96
	swalton@csun.edu	

The committee thanks all the members of the IRAF group and other support personnel for the time and effort involved in preparing for and attending the

meeting. A special vote of thanks goes to George Jacoby for the excellent overall organization.

General Remarks

As always, we were impressed by the size of the IRAF user community which has once again increased over the past year, especially internationally. There are now more than 1200 known sites worldwide covering 24 countries on all 7 continents, as well as secondary distribution sites in India and Japan. FTP usage has roughly doubled since last year with an average of 320 files being transferred daily. E-mail traffic has also increased, but with no noticeable decrease in the quality or promptness of the IRAF team's responses.

Given the importance of IRAF to a large community of astronomers throughout the world, we are gratified by the official acknowledgement it has received at executive levels in the community during recent years. For example, the Bahcall Report states: "The observational astronomy community has shown an admirable degree of coherence by developing systems like AIPS and IRAF, which have been adopted widely. These packages have saved an immense amount of time and duplicated effort." NOAO and the IRAF group should feel justly proud of their achievements to date.

We are also pleased to see that many of the concerns included in last year's report have now been addressed, in particular: the release of IRAF 2.10.3 with xgterm and imtool capabilities, the Beginner's Guide, and a number of cookbooks and tutorials.

Site Support

We continue to be impressed at the quality of user support provided by the IRAF group. They have managed to continue this high quality, despite the increase in demand, through development of standard answers to "frequently asked questions," newsgroups (such as the various ADASS groups: write to news@iraf.noao.edu), local support people, and the increase in beginners documentation mentioned above.

However we are concerned that this load will continue to increase beyond the capacity of the current IRAF group. In particular, the release of PC-IRAF may result in a disproportionate increase in user questions since a new population of users will be coming on line. We strongly support the IRAF group's plan NOT to provide support for PC hardware or non-research questions.

World Wide Web

We strongly encourage the IRAF group to take fullest advantage of the WWW. It is being used increasingly as people discover it and is a very efficient and user-friendly way to distribute information. Checking the IRAF home page, we find that progress has already been made in this area since the meeting in January. The help page availability and search capability is very good, although sometimes slow presumably due to network traffic. We recommend that documents and cookbooks also be made available this way. IRAF also has the advantage, since it is distributed software, that html versions of documents and help files can be distributed with the software for local use so that users can avoid the often slow networks. We urge that this be done for all documentation available in the next release.

Documentation

We recommend that more global help be available from inside of IRAF. Particular topics which immediately come to mind are:

wcs	the world coordinate system,
keywords	a list and description of all IRAF standard header keywords and the tasks which use them,
calibration data	for example where are the standard stars stored, which ones are available, what are the references, and so on,
package	general help on packages such as ccdproc and onedspec.

We would also like to see more documentation of the actual algorithms used in the software. In an html version of a help file, this could be at a deeper level so that only users who require such detailed knowledge need to access it.

Science Tasks

We were disappointed that none of the science priorities listed in last year's report have been addressed and that the long-term priorities presented at the meeting did not include specific science tasks. However we understand that emphasis this past year has been at the system level with the 2.10.3 release and the development of GUIs. We recommend that the following topics be considered as high priority for development once 2.11 is released (listed in no

particular priority order):

IR package
Astrometry package
Cosmic ray
Surface photometry (requires assessment of stsdas capabilities)
CCD reduction for mosaics,
Error propagation
List of changes to task parameters provided with releases
General solar astronomy tasks

General Priorities

We support the short-term priorities as presented at the meeting, namely:

PC-IRAF	port to Linux first
2.11 release	preferably by spring 1995
GUI release	preferably by fall 1995

On the longer term, Open IRAF should be the priority as this represents the "next generation" of software.

Gemini

Given the large IRAF user community and the amount of time individual astronomers already have invested in IRAF, we strongly urge that IRAF be part of the Gemini software system. Additional funding will be required in order to allow IRAF to expand in this direction. However, given its vast existing infrastructure and user base, it would appear to be a cost effective route to take. This is particularly true for the users of the Gemini telescopes, whether at the telescope or remote, who will not then need to spend a large amount of time in learning new (to them) or untried system(s).

IUC

The committee would like to increase its visibility in and usefulness to the community. Membership should be publicized in the NOAO and IRAF Newsletters and from the IRAF home page before the annual meeting, allowing users sufficient time to contact a committee member with issues to be raised.

In order to keep in touch with IRAF progress during the year, the committee would like to obtain informal quarterly updates from George Jacoby, including progress on items discussed at the IUC meeting and any new items that have surfaced in the interim.

The committee would also like to expand its role and, hopefully, its usefulness to the IRAF group itself. IUC members consider themselves as representative users and provide feedback to the IRAF group on new (and old) items, such as "The Beginner's Guide." In particular the import/export facility presented by Mike Fitzpatrick represents a major step forward in terms of the path of data from the telescope to the journal. Timely testing of this and other new capabilities by the IUC members as they become available could potentially be very useful to the IRAF development group. Several IUC members also expressed an interest in active involvement in science (and other) planning in their particular area of expertise. There also needs to be a mechanism for addressing "pet peeves" that are too detailed for discussion at the IUC meeting. The committee will work with George Jacoby to develop a plan for such involvement.

Management

The IUC commends George Jacoby highly for his efforts over the past 18 months as IRAF Project Scientist. The project has moved forward significantly during this time both in terms of its own development and its position in and acceptance by the astronomical community. Communication has improved markedly and the project is more focussed and directed.

The IUC requests, once again, the presentation at the meeting of a management plan covering at least one year ahead. Without such a plan, it is very hard for the IUC to offer practical advice on priorities since little or no information on the relative personpower load of each task is presented. We urge George Jacoby and Doug Tody to work together in drawing up such a plan for presentation at the next IUC meeting.

Funding

Given the increasing demand for IRAF and for support of its users, it is imperative that the funding level for the IRAF group should at the least remain level and preferably be increased. Given the current budgetary crisis facing NOAO, we recommend that alternate sources of funding be investigated. In particular, large projects (e.g., AXAF, STScI) which are committed to IRAF should be asked for support in terms of funds or personpower when their

requirements place additional demands upon the IRAF group.

The IRAF Users Committee

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Changes to the IRAF Users Committee (1Jun95)

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Changes to the IRAF Users Committee (1Jun95)
(from CCS, NOAO Newsletter No. 42, June 1995)

Belinda Wilkes has served on the IRAF Users Committee (IUC) since 1992
and has been the chair for the past two years. The committee report in this
issue represents her final duty before leaving the IUC. NOAO is very thankful
for the time and effort Belinda has invested to help coordinate and attend the
IUC meetings and to prepare these reports.

I am pleased to report that Jeff Pier has agreed to take over as IUC chair. I
hope he can keep the meetings running on time and as smoothly as Belinda!
Finally, I also wish to thank Tim Carone for serving an unfortunately brief
one-year tenure on the IUC. Tim has made the difficult decision to leave
astronomy. Both Tim and Belinda have been long-time supporters and users of
IRAF and we will miss their valuable input.

George Jacoby

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Non-Astronomical Usage of IRAF (1Jun95)

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Non-Astronomical Usage of IRAF (1Jun95)
(from CCS, NOAO Newsletter No. 42, June 1995)

We always are pleased to hear about astronomical progress and results made
possible through the use of IRAF. Recently, I compiled a list of the
non-astronomical uses of IRAF to assess its level of importance in more
mundane applications. Since IRAF is distributed easily electronically without
our knowledge, there may be additional users outside the field of astronomy
that we are not aware of. Please let me know if you hear of other
non-astronomical usage.

1) USC Neurosciences:
  Analyzing how the brain stores, codes, and retrieves information. IRAF
is being used to determine positions of activity centers in sectioned pieces of
brains. (See IRAF Newsletter No. 6, February 1989.)

2) Chemistry Department, University of Arizona:
  As part of the human genome project (a large multi-national, 15-year
project to decode the human genetic material), IRAF is being used for
visualization of X-ray crystallographic CID images in an attempt to image
single molecules.

3) National Air and Space Museum:
  A public Sun workstation was placed on the floor of the museum for
demonstration of image enhancements of real data.

4) National Gallery of Art:
  Using IRAF to examine IR reflectivity images of art pieces to examine what sketches lie underneath various art works. The Sun at the Space Museum (see above) was used to verify the process with IRAF.

5) Department of Biophysics, University of Maryland:
  Used IRAF for visualization of X-ray diffraction photographs.

6. Department of Civil Engineering, University of Chile:
  Using FOCAS (not originally part of IRAF, but supported by the IRAF group and uses IRAF auxiliary software) to determine centroids of particles to trace their positions as a function of time. The centroids provide a means of tracking particles in velocity flows through water channels.

7. Biomedical Computer Laboratory, Washington University:
  Used SAOimage for visualization of electron-microscopic autoradiography, positron emission tomography, optical-sectioning microscopy, and DNA mapping and sequencing.

8) Arete Associates:
  Oceanographic remote sensing and image simulations (defense related).

9) Communications Research Laboratory, Tokyo, Japan:
  Using Laser radar images and IRAF to determine the amount of aerosols in the atmosphere and to map the data.

10) National Security Agency, Washington, DC:
  Security related use of IRAF imaging and analysis.

George Jacoby

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IRAF Update (1Jun95)

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IRAF Update (1Jun95)
(from CCS, NOAO Newsletter No. 42, June 1995)

A new version of IRAF, V2.10.4, has been prepared and should be in distribution by the time this Newsletter hits the streets. V2.10.4 is the "V2.10.3 patch" referred to in previous Newsletter articles, upgraded to a full patch release including all recent bug fixes and application revisions. V2.10.4 will be available for SunOS and Solaris as well as for all new IRAF ports. The Solaris version supports Solaris 2.4 and the Version 3 Sunsoft compilers. The new ports (which were delayed a bit pending completion of IRAF V2.10.4) are for the DEC Alpha running OSF/1 and for Intel PC platforms running Linux, Solaris x86, or BSD. V2.10.4 will be released first for the DEC Alpha and the Sun platforms, with the PC distributions to follow shortly thereafter. Contact us, or check the IRAF network archives, for updated information on the availability of IRAF for any of these platforms. The next IRAF release for all platforms not mentioned here will be V2.11.

Mike Fitzpatrick and Jeannette Barnes have been upgrading our World Wide Web pages as we bring more IRAF materials online via the Web. Check our URL: http://iraf.noao.edu/ occasionally to see how this facility is developing. We will continue to add material to the Web pages as time permits. If you have suggestions for items that you would like to see about IRAF on the Web, please let us know.

In recent months Frank Valdes continued to work on a new spectroscopic analysis program called SPECTOOL. This is a comprehensive, integrated spectral analysis tool using a sophisticated graphical user interface. The line profile fitting code in the IRAF spectral tasks has been extended to add support for Lorentzian and Voigt profiles to the previously supported Gaussian profiles. Tools are under development for making bad pixel masks from flat fields or ratios of flat fields and applying these masks to data through a new version of FIXPIX based on masks rather than the existing, more limited bad region text descriptions. Finally, Frank has been writing a paper on the algorithms used by FOCAS for matching catalogs; in particular, a new algorithm identifies common objects automatically in two catalogs derived

from unregistered images.

Lindsey Davis has written a new image matching task LINMATCH.
LINMATCH matches the linear intensity scales of a list of images to a
reference image using a variety of techniques, including statistical
measurements of the intensity in one or more image sections, pixel-to-pixel
least squares fits, and previously computed photometry. LINMATCH joins the
already completed PSF matching and image registration tasks PSFMATCH and
XREGISTER to form the initial version of the IMMATCH package developed
in collaboration with Drew Phillips at Lick Observatory. Lindsey has also
completed a new task GEOEVAL for computing complex coordinate
transformations using fits computed by the GEOMAP task. Work continues on
the GUI interface for the aperture photometry package XGPHOT. Recently
added features include GUI support for object list management including
object selection, deletion, addition, marking, and editing functions.

On a final note, Suzanne Jacoby has left the IRAF programming group and has
taken up a new role as the NOAO Education Officer. Suzanne had been with
the IRAF group since its inception in the early 1980s, and has been an integral
part of the IRAF site support services. Anyone writing to iraf@noao.edu is
familiar with Suzanne's enthusiastic and efficient solutions to IRAF problems.
We wish her success in her new position---she will certainly be missed by all of
us in the IRAF community!

Doug Tody, Jeannette Barnes

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NOAO FTP Archives (1Jun95)

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NOAO FTP Archives (1Jun95)
(from CCS, NOAO Newsletter No. 42, June 1995)

The various FTP archives for the National Optical Astronomy Observatories
can be found in the following FTP directories. Please log in as anonymous
and use your e-mail address as the password. Alternate addresses are given in
parentheses.

ftp ctios1.ctio.noao.edu (139.229.2.1), cd ctio
CTIO archives - Argus and 1.5-m BME information, 4-m PF plate catalog,
TEX template for e-mail proposals, filter library, instrument manuals, standard
star fluxes.

ftp ftp.sunspot.noao.edu (146.5.2.1), cd pub
Directory containing SP software and data products - coronal maps, active
region lists, sunspot numbers, SP Workshop paper templates, information on
international meetings, SP observing schedules, NSO observing proposal
templates, Radiative Inputs of the Sun to the Earth (RISE) newsletters and SP
newsletters (The Sunspotter).

ftp ftp.noao.edu (140.252.1.24), cd to one of the following directories:

aladdin (gemini.tuc.noao.edu) - Information on the Aladdin program, which is
a collaboration between NOAO and the US Naval Observatory to develop a
1024 H 1024 InSb infrared focal plane at the Santa Barbara Research Center.

catalogs - Directory of astronomical catalogues, at this time only the Jacoby et
al. catalog, "A Library of Stellar Spectra," the "Catalogue of Principal
Galaxies," and the "Hipparcos Input Catalogue" are here.

fts (argo.tuc.noao.edu, cd pub/atlas) - Directory containing solar FTS
high-resolution spectral atlases.

gemini (gemini.tuc.noao.edu) - Information from the Gemini 8-Meter
Telescopes Project.

gong (helios.tuc.noao.edu, cd pub/gong) - Directory containing GONG
helioseismology software and data products - velocity, modulation and
intensity maps, power spectra.

iraf (iraf.noao.edu) - IRAF network archive containing the IRAF distributions,

documentation, layered software, and other IRAF related files. It is best to login to iraf.noao.edu directly to download large amounts of data, such as an IRAF distribution.

kpno (orion.tuc.noao.edu) - KPNO directory containing filter lists and data, hydra information, new LaTeX observing form templates, instrument manuals, KPNO observing and monthly support schedules, platelogs for 4-m PF, user questionnaire, reference documents (wavelength atlases), sqiid scripts for data reduction.

kpvt (argo.tuc.noao.edu) - Directory containing various KP VTT solar data products - magnetic field, He I 1083 nm equivalent width, Ca II K-line intensity.

noao (gemini.tuc.noao.edu) - Miscellaneous databases, report from Gemini WG on the high resolution optical spectrograph.

nso (orion.tuc.noao.edu) - Directory containing NSO observing forms.

preprints - NOAO preprints that are available electronically.

sn1987a - An Optical Spectrophotometric Atlas of Supernova 1987A in the LMC.

starform_project (mira.tuc.noao.edu, cd pub/sfproject) - Directory containing progress reports and information on when/where to obtain SQIID star formation project data.

tex - LaTeX utilities for the AAS/ASP.

utils - Various utilities but only contains some PostScript tools at this time.

weather (gemini.tuc.noao.edu) - weather satellite pictures.

wiyn (orion.tuc.noao.edu) - WIYN directory tree containing information relating to the WIYN telescope including information relating to the NOAO science operations on WIYN.

The following are the numerical IP addresses for the machines mentioned above:

argo.tuc.noao.edu	=	140.252.1.21
ctios1.ctio.noao.edu	=	139.229.2.1
ftp.noao.edu	=	140.252.1.24
gemini.tuc.noao.edu	=	140.252.1.11
helios.tuc.noao.edu	=	140.252.8.105
iraf.noao.edu	=	140.252.1.1
mira.tuc.noao.edu	=	140.252.3.85
orion.tuc.noao.edu	=	140.252.1.22
ftp.sunspot.noao.edu	=	146.5.2.1

Questions or problems may be directed to the following: Steve Heathcote (sheathcote@noao.edu) for the CTIO archives, Frank Hill (fhill@noao.edu) for all solar archives, and Steve Grandi (grandi@noao.edu) or Jeannette Barnes jbarnes@noao.edu) for all others (and they will direct your questions as needed).

For further information about the NOAO Observatories and projects see the World Wide Web URL:
http://www.noao.edu/.

Jeannette Barnes

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