NOAO Newsletter - March 1995 - Number 41

-

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

The Sun at 0.2" Resolution (1Mar95)

Table of Contents

```
The Sun at 0.2" Resolution (1Mar95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 41, 1 March 1995)

NSO is in the process of evaluating the optical quality of the McMath/Pierce
Facility at Kitt Peak and the Vacuum Tower Telescope at Sac Peak (see
NOAO Newsletter No. 39) with the aim of improving the image quality.
The images below demonstrate the present image quality at the Sac Peak
telescope. They were taken from a high-resolution time sequence of solar
granulation images recorded over several hours at the VTT/SP on 20 October
1994.  The rms image contrast meter of the correlation tracker was used to
trigger high-speed (8 msec) exposures with the 1024 X 1024 TIJ CCD
camera during moments of excellent seeing.  The correlation tracker
computed image contrast in a 10" X 10" FOV at a 500 Hz rate. We observed
at a wavelength of 500 nm, using an interference filter with 5 nm FWHM.
The camera's field of view was 77", and its resolution was 0.075" per pixel.

                         [Figures not included]

         High resolution images of solar granulation  observed at the
         VTT/SP. The exposure time was 8 msec. The resolution of
         both images is 0.2" and thus close to the diffraction limit of
         the VTT/SP.

The figure is a representative image from the time sequence and
demonstrates the high quality of the recorded images.  This particular
exposure was taken at approximately 11:30 local time.  Shown are two
subframes covering a field of 15" X 15" taken from the full 77" FOV.  The
rms contrast in this image is 6.5%.  In both images, structures with spatial
scales as small as 0.2" are resolved.  This demonstrates that near
diffraction-limited resolution can be achieved at the VTT/SP.  Residual
aberrations still exist, especially at the edge of the mirror (spherical
aberration).  Work is ongoing aimed at removing these aberrations in order
to further enhance the image quality.

Thomas Rimmele
```

Table of Contents

Looking for QSOs the Multicolor Way (1Mar95)

Looking for QSOs the Multicolor Way (1Mar95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 41, 1 March 1995)

Pat Osmer (Ohio State), Pat Hall (Arizona), Richard Green and the late Alain Porter (NOAO), and Steve Warren (Imperial College) have completed a survey for QSO candidates with the KPNO 4-m telescope, exploiting the unique combination of faint limiting sensitivity, areal coverage, and spectral sensitivity from 0.3 to 0.9 um that the telescope and Tek 2048 X 2048 CCD combination offers. Their motivations were 1) to investigate the space density of faint QSOs at z &gt 4 to see if the evidence for the decline observed at high luminosities continued for the larger numbers of QSOs at lower luminosity; and 2) to discriminate between QSO luminosity evolution and density evolution at redshifts near 2, where the apparent space density of QSOs reaches a peak. They also realized that the survey would return information on faint field galaxies and the halo of our galaxy. They covered six regions on the sky with |b| &gt 35 deg for a total area of 0.83 sq. deg. The 5 sigma limiting magnitude for a single exposure in B was 23.8. They used six filters (U, B, V, R, I75, and I86) (I75 and I86 are interference filters that divide the traditional I band roughly in two).

Osmer et al. used FOCAS to identify and classify objects on the data frames, and also carried out astrometric determinations for all the fields. They now have a catalog of positions, magnitudes, and error estimates in the six photometric bands for 21,375 stellar objects. Osmer et al. also have a provisional catalogue of approximately 9,200 field galaxies in the data set. QSO candidates were selected via four different multicolor approaches. Spectroscopic evaluation of the candidates was then done, using the Hydra multifiber spectrograph, whose areal coverage is well matched their fields. The goals of this stage of the work were to explore the multicolor space for the brighter objects that could be observed with Hydra, and then optimize the selection techniques so that fainter candidates would include an improved yield of true QSOs. These are observed with smaller field but higher throughput spectrographs.

[Figures not included]

Figure 1. The B-band image of the survey field.

Figure 2. A spectrum of a z = 4.3 QSO discovered in the survey.
L[alpha] is seen at ~6,800.

The multicolor techniques used to identify QSO candidates were:

1) Looking for outliers in five-dimensional multicolor space. This approach is based on that of Warren, Hewett, and Osmer (1991, 1994). It identifies objects in low-density regions (away from the main stellar locus) of multicolor space and is the most general of the 4 approaches used.

2) Identifying objects with ultraviolet excess (U-B &lt -0.3). This is the traditional and powerful method for identifying QSOs with z up to about 3.

3) Locating outliers in U-V / V-R and/or B-V / V-R diagrams. Observational results and numerical simulations show that this approach is effective for finding QSOs with redshifts between 3 and 4.

4) Selecting extremely red (B-R &gt 3) objects. This approach is effective for QSOs with redshifts larger than 4. The combination of Lyman alpha emission in the R band and the depression caused by Lyman alpha absorption along the line of sight, depresses the flux in the B band, making QSOs at such redshifts even redder than M stars.

To date, Osmer et al. have observed approximately 350 candidates with Hydra, repeating exposures to achieve a typical total of 4 hours per field. The spectra show 1) 41 confirmed QSOs, with 0.6 &lt z &lt 4.3, 2) 41 confirmed emission-line galaxies, with 0.05 &lt z &lt 0.8, and 3) 100 stars of different types, including white dwarfs, metal-poor stars, and very late type M stars.

The first results show that high redshift QSOs are being found in the survey at brighter magnitudes in approximately the numbers expected. Osmer et al. also find that the survey is turning up many kinds of unusual objects, such as compact, narrow emission-line galaxies at redshifts up to and exceeding 0.5, and a wide variety of rare stars, as might be expected from the selection of candidates that lie away from the main stellar locus in the various multicolor spaces.

There is also preliminary evidence for a larger number of high-redshift QSOs at fainter magnitudes than predicted from the results of Warren, Hewett, and Osmer (1994) and from Schmidt, Schneider, and Gunn (1991, in the Space Distribution of Quasars, ed. D. Crampton, p. 109). If confirmed, this will modify our view of the evolution of QSOs at lower luminosities. Spectroscopic observations of these candidates is now the highest priority task for this survey.

Table of Contents

Probing the Galactic Center (1Mar95)

Table of Contents

Probing the Galactic Center (1Mar95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 41, 1 March 1995)

The center of the galaxy is a complex and interesting region. It provides the only opportunity to study the processes in the nucleus of a galaxy on the scale of individual stars. The Galactic Center is, however, heavily obscured by the intervening dust lying in the plane of our galaxy, so that at visible wavelengths it is unobservable. Extinction by dust is much lower in the infrared, and, the Galactic Center is well-studied at these wavelengths.

A major outstanding question is the nature and origin of the radiation field present in the galactic center. There is sufficient ultraviolet radiation to ionize gas and to be absorbed and re-radiated by warm dust, but its origin is uncertain. One possible explanation is that it originates in an accretion disk around the massive black hole that is thought to lie at the center of the galaxy. The other possibility is that the primary source of ionizing flux is from young, massive stars. The presence of luminous M supergiants supports the idea that there is active star formation at the Galactic Center, and the detection of infrared He I and H I emission point sources without radio counterparts (which thus must be stellar or extremely compact) offers plausible candidates for young, hot stars.

The strong line emission from these objects implies that they are not hot, luminous main sequence stars; several alternatives have been suggested. One possibility is that these are post-main-sequence stars with mass loss, equivalent to the Ofpe/WN9 stars in the Large Magellanic Cloud. Another is that they are cooler stars, whose outer envelopes are ionized by external sources of radiation. A third suggestion is that they are the result of stellar collisions.

The best way to settle on the classification is by means of spectroscopy - given the high obscuration of the Galactic Center, this has to be spectroscopy in the near-infrared. Bob Blum, Darren DePoy, and Kris Sellgren (Ohio State University) have carried out a program to classify these stars, using OSIRIS on the CTIO 4-m telescope in July and September 1993 and June 1994. Spectra were taken in the K (1.9-2.4 um) band for eight Galactic Center He I sources and a number of galactic and LMC comparison stars; spectra were also taken in the H (1.45-1.85 um) band for one of the Galactic Center sources (the so-called AF or AHH source) and for the comparison stars. These spectra were all at a resolution of roughly 570 (see Figures 1-3); an additional higher-resolution spectrum of one of the brighter GC sources (IRS13) was also obtained. Blum et al. were also able to use data from the literature to supplement their comparison spectra.

[Figures not included]

Figure 1. K band spectra of He I emission line sources in the Galactic Center showing the He I 2.06 um and Brg (2.17 um) emission lines. Several sources also show He I emission at 2.11 um. The lines near 2.15 um, 2.22 um, and 2.35 um in IRS are due to [Fe III].

Figure 2. H and K ban spectra of He I emission line sources in the Galaxy showing the He I 1.70 um and 2.06 um lines and Brackett series emission lines. Reliable detections are made for Br(gamma) (2.17 um), Br9 (1.82 um), Br10

(1.74 um), Br11 (1.68 um), and Br12 (1.64 um).

Figure 3. Same as Figure 2 but for He I Emission Line Sources in the LMC. A spectrum of the Luminous Blue Variable, S Dor, which shows no He I, is shown for comparison. The lines near 1.69 um, 1.74 um, and 209 um are due to Fe II.

They caution that massive evolved stars show a range of properties in their spectra, based on observations of objects observable over a wide wavelength range. This complicates attempts to classify them based on observations in only one wavelength region. Nevertheless, they find from their spectra that the GC objects show a general similarity in their spectra to the comparison objects, in the sense that the distributions of line equivalent widths and line ratios overlap. They find that the AF source (the only one measured at H) has Brackett series line ratios that imply the lines are optically thick; they are thus almost certainly produced in an outflow and not in a more extended region. This is also the case for most of the comparison objects.

The He I emission for a subset of the sample (two GC stars and two galactic comparison stars) is extremely strong, and Blum et al. argue that this is not consistent with normal He/H abundance ratios, and that the ratio may be greater than 1 in some cases. This kind of He enhancement is consistent with models for the evolution of these stars. They also find that the He I line widths in the GC objects are wider than for the comparison objects, which may suggest higher effective temperatures. One of the sources (IRS1 W) does not have any He I emission after proper background subtraction, which indicates that this is in fact an H II region with a more normal embedded star.

Although all these results do not lead to a simple classification of the GC stars, it is possible to exclude a number of possible classifications.

The infrared spectra are quite different from those of luminous blue variables (LBV) and Wolf-Rayet stars (both types WC and WN). The emission lines are also much stronger than those of normal O and B stars. Thus, while the results strongly support the idea that the GC objects are massive, early-type, mass-losing stars, a precise classification is not yet possible. Calculations of allowable luminosities and temperatures, based on the observed lines and photometry, do show that these stars lie well above the main sequence.

Blum et al. state that the solution to the classification problem is to extend the wavelength coverage of the classification spectra, and they will be back at CTIO in June (this time with the upgraded IRS) to obtain additional spectra in the 3 um region for the brighter GC objects.

Table of Contents

Budgets, the OIR Panel Report, and Priorities (1Mar95)

Table of Contents

Budgets, the OIR Panel Report, and Priorities (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

There have been two major events since the last newsletter that will have a major impact on the long range future of NOAO. The first is the publication of the report of the NRC Panel on Ground-Based Optical and Infrared Astronomy. The second is the determination of the budget for NOAO for the fiscal year 1995.

The report on Ground-Based Astronomy was commissioned by the NSF and carried out by a committee established by the National Research Council. The purpose of the report was "to suggest and evaluate alternative strategies designed to optimize progress in the field, taking into account the funding available from various federal and nonfederal sources....[and to] give advice for strategies and priorities within optical/IR astronomy in the light of the expectation that the NSF resources available for these programs will be severely constrained in the coming decade." The committee was specifically asked to evaluate "the mission of the NOAO and define its optimal role relative to that of other government facilities and optical/infrared university observatories and research departments." In its final report, the panel did not consider the solar facilities operated by NOAO but rather only the nighttime program.

One unusual feature of this report was that the committee was required to take into account the "expectation that the NSF resources available for these programs will be severely constrained in the coming decade." A specific concern of the committee was how to provide for the operating costs of the Gemini telescopes in this decade of budget constraint.

AURA is in the process of developing its response to the OIR panel report. Here, I would like to summarize the key recommendations and indicate my own reaction to them.

In recommending overall priorities for the field, the panel considered three funding levels. In the no growth (constant level of effort) scenario, the committee recommends that NOAO absorb within its current budget the full $8M cost to the US of operating and providing instruments for the Gemini telescopes. Since the NOAO budget for nighttime astronomy is currently between $19M and $20M, transfer of $8M to this new program would reduce support for current operations by about 40 percent. (At the present time, it is NOAO's intention that the solar program not be reduced in order to support Gemini.)

In this scenario, the panel recommends the following priorities for NOAO:

1) Gemini operations
2) Continued operations at CTIO
3) Operations of WIYN
4) Continued operations of the 4-m telescope at KPNO
5) Other unique instrumentation development at Tucson
6) All other NOAO operations

In general terms, I agree with the priorities with two exceptions. I personally give higher priority to the operation of the WIYN and 4-m telescopes at KPNO than to the smaller telescopes at CTIO. I also believe that we must have identified the resources either to buy or build state of the art instrumentation for whatever telescopes we do operate.

The panel considered two other funding scenarios. The "modest growth" scenario assumes that by 2003, when Gemini operations are fully on line, the NSF will be able to augment its annual budget for OIR astronomy by $10M. Of this sum, $5.5M would be provided to the international Gemini project to support operations. (The other $2.5M for Gemini activities would come from the existing NOAO budget.) The remaining $4.5M would be used to augment the NSF budget for facility instruments at the independent observatories. In return for this funding, the panel recommends that the independent observatories provide some observing time, allocated through a national TAC, to the community.

I strongly support this concept of open access in return for NSF support of facility class instruments. In order to realize the full advantage of the new generation telescopes now in operation or under construction - Keck, Magellan 1 and 2, the Large Binocular Telescope, the MMT upgrade, etc. - it is critical that they be equipped with the best possible instrumentation. The cost of a single instrument for one of these large telescopes is likely to be in the range $3-5M; the current NSF budget for instrumentation is inadequate to support instrumentation of this scale. Private investment in excess of $300M has made these telescopes possible. An increment in federal support to realize their full scientific potential is unquestionably a good investment.

Only half of US observational astronomers have access by virtue of their institutional affiliation to the new telescopes being built by the independent observatories, and yet the independent observatories will own about eighty percent of the aperture available to the US community. Therefore, some provision for access to these new facilities by the community as a whole in return for instrumentation support is an approach that will benefit the entire community. I have been working with Peter Strittmatter, who chairs the Council of Directors of Independent American Observatories (CDIAO), to understand how to implement a program of open access in a way that serves the community while not placing excessive support burdens on the independent observatories. Based on our discussions to date, I am optimistic that such a program can be implemented.

In the intermediate case of "minimal growth," the panel recommends that first priority go to providing the $5.5M for operation of Gemini and that any augmentation above this level be used to provide facility class instruments for the independent observatories.

The OIR panel made a number of other recommendations that will be helpful in shaping the future of NOAO. The report endorses the concept of merit-based open access to telescopes and emphasizes the negative impact on the NOAO user community of further reductions in support; it endorses the idea of replacing existing (and aging) telescopes with new ones with apertures in the range 2- to 4-m; it also endorses a strong role for NOAO in managing access to, and interaction with, the international Gemini project on behalf of the US community.

While the OIR panel report provides an excellent blueprint for the evolution of ground-based astronomy in the era of 8-m class telescopes, the actual future of the field depends on the priority given to it within the NSF. Budgets have been tight for a decade and are likely to remain so. For example, from FY 1987, when I became director of NOAO, to FY 1994, the US operations of NOAO (that is, everything except CTIO and GONG) have been level-dollar funded. Inflation as measured by the consumer price index over that period of time amounted to 29 percent. So we have found ways to provide more sophisticated instrumentation (Hydra, COB, SQIID), much better detectors for both the IR and optical, improved telescope performance, particularly at CTIO, and 40 percent access to the WIYN while cutting costs by nearly 30 percent.

FY 1995 began on 1 October 1994. In early November, we were informed that even though the budget for research and related activities in the NSF as a whole had increased by over 5 percent, essentially all of that money was earmarked for research in strategic areas. The budget for astronomy was likely to be down by about 4 percent. For NOAO, the budget we finally received was $1M less than last year. At the same time the peso was re-valued upwards, increasing our costs in Chile by $350,000 per year overnight. We were therefore facing, allowing for inflation, about an 8 percent real cut for a fiscal year that was one-quarter completed. Such an abrupt cut would have necessitated a variety of short term and very disruptive decisions, including delay of the GONG deployment by one year, cancellation of the solar-stellar program, etc.

Fortunately, the NSF became aware of these problems and has provided significant budget relief - but with a restriction. In January, the NSF decided to provide $2M in addition to the budget that we were given in December. These funds are, however, not to be used for operations but rather to make investments that will allow us to lower our operating costs permanently. Some of the funds will be used to maintain the original deployment schedule for GONG; the one year delay would have cost the overall project an additional $1.7M. Other funds will be used to make the transition to a smaller program in a more ordered way. We will, for example, continue the solar-stellar observations for at least an additional six months while we determine whether there are other and more cost effective ways to carry out the program (see the article by Jacques Beckers in this Newsletter). We will also cover the cost increase in Chile that has resulted from the change in the peso/dollar exchange rate. The remainder of the increment is being held in reserve while the divisions prepare proposals for how to spend the funds in a way that would permanently lower their operating budgets. The proposals are to be completed by June 1 and will be discussed with the users' committees, AURA, and the NSF before major commitments are made.

In order to hold the base budget at the level recommended by the NSF, we have reduced staff by 27, with 23 of the reductions being made in Arizona, 2 at Sunspot, and 2 in Chile. The reductions in Arizona come at a particularly painful time, since the Tucson program is now taking on additional responsibilities for the support of the US interactions with Gemini, building major instruments for CTIO, and operating WIYN.

In the talk of budget reductions, we perhaps forget to emphasize enough our continuing commitment to provide observing opportunities to the user community. We really do believe in our mission, and the staff is dedicated to using our resources to maximize the scientific return to the community. However, the OIR panel report emphasizes the choices that must be made even given that goal. The panel itself concludes that NOAO should not attempt to serve the maximum number of astronomers that its facilities will bear nor should we attempt to satisfy all the diverse observing requirements of the nation's astronomers. The report suggests, in fact, that in order to ensure that astronomers who win time at NOAO are using the best facilities in the world we are likely to have to decrease the number of hands-on users.

I agree with the assessment of the panel in the sense that I do not believe that we can continue to operate as many facilities as we have in the past, in the style in which we have operated them, at the lower budget levels we must now project. This assessment is confirmed by consideration of operations at other observatories. During the past year, several studies have been carried out that permit a direct comparison of NOAO's operating budget with those of several international and university observatories. Those comparisons show that our costs per telescope or per area of glass are comparable to, or in some cases lower than, US university observatories and at the bottom end of the range of international observatories.

I suggest that we must look at fundamentally new ways of obtaining observations. Some of the possibilities are suggested in the OIR panel report. Others we have been considering internally. Some of these ideas have been incorporated into the operating plans for next fall as described by the directors of KPNO, CTIO, and NSO in this newsletter. Specifically, I believe we must consider some or all of the following:

1) The OIR panel endorses the concept of replacing aging telescopes. We are currently evaluating whether it would make sense to replace the existing small telescopes at CTIO and/or KPNO with a single 2.5-m telescope for wide-field imaging. The payback period in terms of lower maintenance costs could be as little as five years. In order to decide whether or not to do this, we need to examine the science that could be done with the new telescope in comparison with what is now done with the small telescopes, what the costs of construction would be, and what savings in maintenance could be achieved.

In assessing the issue of replacing the small telescopes, I believe we must focus on the characteristics that make them special - scientific capabilities, possibility of relatively large amounts of observing time to support surveys, the possibility of undertaking relatively high risk programs - and endeavor to maintain those characteristics with whatever mix of telescopes we offer in the future.

2) Is it possible to achieve the same data throughput on a smaller number of telescopes by using new modes of observing? Models by Todd Boroson show that queue observing is in principle significantly more efficient than the current scheduling approach of having the observer present for relatively short runs.

3) Should we change the way we schedule telescopes to ensure completion of high priority programs? That is, should we give observers the option of defining a completed program (number of objects, exposure times, etc.) and then once the program is accepted use flexible scheduling in the form of service, queue, and/or remote observing to guarantee that the data are actually obtained?

4) Can we rely on the community to supplement NOAO's own resources for building instruments, training observers (see the article by the Kitt Peak Director in this Newsletter), supporting service observing, etc?

5) Can we develop stronger partnerships with the independent observatories that would permit trading of telescope time, limited open access as recommended by the OIR panel, and sharing of development costs for certain types of instruments, detectors, etc?

6) Can we achieve cost savings through commonality of infrastructure between Gemini, CTIO, and KPNO? In the short run, converting existing software and hardware to a common standard is likely to cost money but in the long run may reduce maintenance.

An issue that is becoming of increasing concern to me is how in times of uncertain budgets and downsizing we maintain the continuity of access to a given observing capability to ensure that scientific programs, once initiated, can actually be completed. In the case of Kitt Peak, Caty Pilachowski evaluated all ongoing programs to ensure that they could be completed before the retirements of instruments and telescopes occurred. We will make every effort at all sites to ensure completion of ongoing programs - although it may be a little difficult to deal with studies of 20-year stellar activity cycles!

We live in times of great change, and NOAO must change, too. We need your help to ensure that the changes that we make support the science that you wish to do. Please do contact me (swolff@noao.edu) with advice and comments on the points raised above or with any other suggestions about how we might do a better job in times of constrained budgets. We are especially interested in scientific and strategic advice. Any changes in the program will have cost implications, but we can easily cost various models of a changed NOAO; what is important is to get the models right.

Of special interest would be suggestions about what mix of telescopes and observing capabilities should be offered by NSO, CTIO, and KPNO; what your comments are about the priorities in the OIR panel report; how KPNO should evolve given the higher priority placed on Gemini and CTIO by the OIR panel and the greater number of independent observatories in the northern hemisphere; how you would react to the extensive use of queue and service observing on at least some telescopes and how you believe such a program might best be carried out in order to maintain data quality; how you believe a program of access to the independent observatories might be successfully implemented; and how you believe the user community might contribute most effectively to the NOAO program.

Sidney Wolff

Table of Contents

The NOAO Instrumentation Program (1Mar95)

Table of Contents

The NOAO Instrumentation Program (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

The New Order

As you have read in previous Newsletters, NOAO is reorganizing the way in which we produce major instrumentation for the nighttime programs. This switch was necessitated by several factors. The downward pressure on the budget in the last several years has reduced the size of the instrumentation group in Tucson to about 2/3 of its previous staffing. The same pressure on CTIO has sharply limited the technical resources available for instrument development, as opposed to the upgrade and maintenance of the telescopes. At the same time, the advent of large array detectors for both the optical and infrared has led to the desire for instruments that are larger, more capable, and more complex than in earlier years. The prospect of producing instruments, detector arrays and controllers for the Gemini telescopes requires a disciplined management of schedules and budgets.

To respond to these changing conditions, we have made the organizational change of creating a single Instrumentation Program Group within the Tucson Engineering and Technical Services. It contains the personnel of the former O/UV and IR instrument groups, the various detector and other R&D programs, and the optical designers. The IPG manager is Neil Gaughan, who came to us with many years of experience as a manager of technical programs in industry, with particular expertise in electronic engineering and systems planning. Neil reports to Larry Daggert, the ETS Manager.

There are several advantages of a single technical group. We anticipate decrease in the time required to complete an instrument, after it has passed its preliminary design review. By using the pool of designers and instrument makers in a priority-driven queue schedule, we can accelerate the production of the highest priority projects. By engaging a team of optical, electrical, mechanical, and software design engineers for a full project definition, each new instrument will have a clear scope and schedule when it goes into detailed design and production. Both CTIO and KPNO retain access to their own resources for upgrades to existing instruments and the quick completion of small projects.

The scientific management of projects will proceed much as before. Each new instrument will have a Project Scientist, who will work with the Project Engineer to assure the success of the project and to guide the initial definition of scientific and technical performance requirements. The O/UV and IR scientific groups will remain active, with Taft Armandroff as O/UV Program Scientist and Ian Gatley as IR program scientist. These groups work to coordinate the staff and community input for generating new projects and to address areas of common technical interest in ongoing projects.

The recommendations for the allocation of resources and setting of priorities are made by NOAO's internal IPAC, the Instrument Projects Advisory Committee. That committee currently consists of Taft Armandroff, Jack Baldwin, Todd Boroson, Dave De Young, Jay Elias, Ian Gatley, and Richard Green (chair). They receive proposals for new projects on an annual basis, recommend scientific priorities, and provide regular oversight for the Instrument Program Group. They also advise the Directors on the impacts on schedule and budget created by changes in scientific scope or changes in relative priority.

It is the goal of IPAC and the new IPG to increase the level of scientific and technical teamwork in order to maintain the flow of facility instrumentation to both the NOAO and Gemini telescopes while managing increasing schedule and budgetary pressures. Your input to the planning process by identifying the scientific programs you would like to be able to carry out is invaluable to us. Please feel encouraged to contact your favorite member of IPAC to make your views known.

Current Status of Major Projects

The conversion of Hydra and the Bench Spectrograph for use at the WIYN telescope neared completion with the work done in the Fall Quarter of FY 95. The grating cells were completed, the gratings installed and aligned, and the cells were integrated into the spectrograph. The SITe 2048 square CCD, T2KC, was more fully integrated in its ARCON operation with the WIYN control environment. A safety lockout mechanism for the Hydra hinge was designed and nearly completed. (See the article in the KPNO section of this issue for further details.)

The second highest priority is the completion of Phoenix, the high-resolution near-IR spectrograph. The detailed mechanical design was 98% completed in the First Quarter, and the instrument makers were beginning work to fabricate the parts. Thermal cycling tests of the big grating were yielding satisfactory results. The spectrograph is on track for completion and telescope testing in early 1996.

Progress was made on the CCD Mosaic Imager. The controller architecture was reviewed, and chosen to be a system based on the replication of four ARCONs. The dewar window frame and shutter fabrication were completed, and design work was in progress on the filter wheel, dewar and chip-mount assemblies. A new package was designed for mounting the 2K X 4K CCDs. Although the detail designs will be nearly finished for this project in the coming months, fabrication will not begin in earnest until the team of instrument makers is nearing the end with the Phoenix parts.

The ALADDIN development program made significant progress with the delivery of a second hybrid array. That array had four functional quadrants and over 900K good pixels. There are still hybridization and other process issues to be resolved, but the progress in this program is very encouraging. Design work is also underway for a new generation controller, compatible with WILDFIRE and capable of reading out the full-format 1024 square array. The interface to the data storage medium and image analysis system is a critical item.

Project definition, as well as conceptual and preliminary design, have been started for GRASP, a spectrograph based on the four-color heritage of SQIID. The current plan calls for four near-IR bands to be recorded simultaneously in direct imaging or a choice of spectroscopic modes. The goal is to populate each arm with a 1024 square InSb array, with a common control system. The Preliminary Design Review is scheduled for mid-March.

Concept studies are underway for two new instruments. One is a clone of the Hydra fiber positioner for use at the R-C focus of the CTIO 4-meter telescope. Much of the design and some of the actual parts from Hydra at the Mayall can be used for this implementation. At the same time, the project would utilize a new generation of motor controllers that will be valuable for KPNO as well, since the current system in use with WIYN/Hydra is no longer produced.

The second study is for a long-slit near-IR spectrograph for CTIO and Gemini South. It will be based on a design proposed to the Gemini Project for use on the Gemini North telescope. Features could include a slit viewer and cross-dispersion to cover the entire atmospheric window at a resolution of about 8000. The design is based on the 1024 square ALADDIN InSb array.

These are the major projects occupying the Instrument Projects Group this year. Your comments and reactions to the match of the instrumentation program to your scientific needs are welcome any time.

Richard Green

Table of Contents

A Joint Statement of the CTIO and KPNO Users' Committees (1Mar95)

Table of Contents

A Joint Statement of the CTIO and KPNO Users' Committees (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

Introduction

The role of NOAO in US astronomy is in a state of transition, due to the advent of the Gemini telescopes and to steadily increasing budget pressures. Moreover, a major restructuring of the NOAO instrumentation groups has taken place, in which instrumentation efforts at CTIO and KPNO have been largely consolidated. In this unusual climate the CTIO and KPNO Users Committees decided to meet in a joint executive session, since many issues relevant to the individual observatories are now so strongly tied to the overall NOAO night-time astronomy program. Based on the deliberations of that executive session, the two UsersCommittees have produced the following joint statement.

Joint NOAO Instrumentation

Recently much of the engineering and technical services of CTIO and KPNO have been consolidated in a move towards a more concerted instrumentation approach for NOAO night-time astronomy. While some special instrumentation projects will continue to be carried out strictly with in-house technical resources at CTIO or KPNO, most major instrument development will now be carried out through a joint NOAO instrumentation group in Tucson. The Users Committees endorse this new approach, and expect it to produce a coordinated and cost-effective plan for common instrumentation at the two night-time observatories. This is especially important in the current era of increasingly complex instrumentation. In fact, the new approach appears to be working well already, and the Users Committees commend in particular Taft Armandroff and Ian Gatley (heads of the O/UV and IR groups respectively) for the effective manner in which they have conducted the joint programs in the short time that the new policy has been in place. We emphasize that this approach will succeed only if there is an equal distribution of instruments at the two night-time observatories. This could be achieved in part by sharing certain instruments between KPNO and CTIO, such as the larger IR instruments and the CCD mosaic imager. The NOAO instrumentation group has in fact proposed to share the latter instruments between the two observatory sites.

The committees would like to see a high degree of management and accountability built into the new instrumentation program. Our sense is that this is already happening, but we recognize that this has not always been the case in the past. In particular, all instrument development should include cost estimates and time tables for the completion of the instruments from the initiation of the planning process. It is difficult for review committees (such as ours) to establish priorities or comment on the timeliness of a project without having this type of information from the start.

O/UV Instrumentation

During the joint sessions of the two Users Committees Taft Armandroff presented a number of current and proposed future instrument plans for the O/UV. Projects presently in progress are the transfer of Hydra from the KPNO 4-meter to WIYN, development of a large mosaic CCD imager and prime focus corrector for the KPNO 4-meter, and development of foundry CCDs for both nighttime observatories. We recommend the following list of priorities for new O/UV instrumentation as these currently active projects are completed:

1) Production of a Hydra clone for the CTIO 4-meter. Enhancing the multi-object spectroscopic capability in the southern hemisphere for the US astronomy community is seen by the joint Users Committees as the highest priority large instrument project for the NOAO instrument group. Delivery of a Hydra clone to the CTIO 4-meter should be carried out as expeditiously as possible, but in any event should take place before commissioning of the Gemini telescopes begins.

2) Detailed studies for both high-dispersion and low-dispersion spectrographs. The joint Users Committees recommend as the next priority to pursue detailed studies for a low-to-moderate dispersion multi-slit spectrograph and for a high-dispersion fiber-fed spectrograph. These spectrographs are intended for the CTIO and KPNO 4-meter telescopes. Given the very early stages of planning for both types of spectrograph, the Users Committees are not ready at this point to place a relative priority on the low-resolution versus high-resolution capabilities.

3) Large mosaic CCD imager for CTIO 4-meter. A third priority is the development of a large (8192 X 8192 pixel) mosaic CCD imager for CTIO, i.e., a clone of the one currently under development for the KPNO 4-meter and 0.9-meter, and which will also be shared with the CTIO 4-meter until the second mosaic imager is built.

IR Instrumentation

Ian Gatley reported to the joint committee plans for the NOAO IR instrumentation program. The basic elements of the program are outlined in the September 1994 NOAO Newsletter. The joint Users Committees support this innovative program, as both observatories will benefit by continuing to have access to state-of-the-art IR detectors and instruments. We support in particular the sharing of IR instrumentation, such as COB, Phoenix, and SQIID, between the two sites, and the planned future deployment of Aladdin arrays at both observatories. We endorse the plan to upgrade SQIID to large format InSb detectors before deployment at CTIO, and urge for rapid progress on the design and construction of GRASP to replace SQIID at KPNO. We note, however, that the IR program as outlined is rather ambitious, and that, while the Joint Committee hopes NOAO is successful in meeting its IR instrumentation goals, that success should not come at the expense of delays in O/UV instrumentation.

IRAF

During the joint session George Jacoby summarized the current status of IRAF. The role played by IRAF was considered by the CTIO and KPNO Users Committees in the context of the overall mission of NOAO to provide telescope access to the user community. Clearly, access to telescopes is of limited value unless state-of-the-art data reduction facilities are readily available to the community. Thus IRAF plays a crucial role in the overall mission of NOAO. The joint Users Committees urge that the IRAF group continue to be supported at least at its current funding level, even in the worst case budget scenario. In periods of more favorable budgets we would recommend that the IRAF programming group be expanded by one or two positions.

Small Telescopes

In an era characterized by the advent of large aperture (i.e., 8-10 meter) telescopes, the role played by telescopes of smaller (i.e., 1-2 meter) aperture will remain crucial to many classes of front-line astronomical problems which are completely ill-suited to, or impossible to carry out on, large aperture telescopes. The mission of NOAO is to provide facilities with which to approach a broad range of important astronomical problems, and the scientific capabilities and user access supplied by small telescopes is critical to this mission. Thus arguments to shut down smaller facilities in an attempt to save money in times of declining budgets should be forcefully rejected. Efforts to minimize the cost of operating small telescopes, in the short run through single instrument use, queue scheduling, and performance upgrades on the existing small telescopes, and in the long run through replacements with modern 2 meter class telescopes, are strongly encouraged. In short, as NOAO evolves in the future, it must continue to provide the scientific capabilities and user access currently provided by the smaller telescopes on CTIO and KPNO.

Future of CTIO and KPNO Users Committees

There was considerable discussion at the joint Users Committee executive session concerning future directions of the Users Committees. As a result of that discussion, we are making the following recommendations:

1) The CTIO and KPNO directors should seriously consider merging the two Users Committees. Given that the instrumentation programs of the two observatories are becoming so interlinked, it is no longer productive for the CTIO and KPNO Users Committees to consider instrumentation for the two observatories in an entirely separate manner. Thus one solution would be to form a single Users Committee that considers both CTIO and KPNO. Alternatively, the two Users Committees could continue to remain distinct, but then a greater portion of the annual meeting needs to be spent in joint information and executive sessions. If the two committees are merged, it is important then that issues unique to both CTIO and KPNO still continue to receive the attention of the merged committee.

2) This year both Users Committees requested that relevant materials to the meetings be distributed to the committee members in advance of the meeting, so that less information had to be processed online and thus more careful discussion could be generated. We consider this new format to be a major improvement that would be even more useful if more materials were to be distributed in advance. As stated in Section 2 above, we consider it important to receive information on project management for each instrument program, such as timelines and personnel and materials cost estimates, and recommend that in addition to the advance materials sent to us this year, next year's packet should include such information.

3) We recommend as well that the Users Committee meeting next year begin with an extra 1/2 day in advance of the main meeting for the committee members to gather in executive session to discuss priorities and goals for the meeting. This format should further enhance the ensuing discussions. However, for the extra 1/2 day to be truly effective, is it essential for the committee members to receive the advance materials mentioned above.

Table of Contents

Report of CTIO Users Committee (1Mar95)

Table of Contents

Report of CTIO Users Committee (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

The CTIO Users Committee held its annual meeting in Tucson on 10 and 11 November 1994, and after discussions with CTIO Director Malcolm Smith and Associate Director Mark Phillips, submitted the following report:

Introduction

US astronomy is undergoing fundamental changes with the construction of several 8-10 meter class telescopes and major advances in astronomical instrumentation and adaptive optics. These exciting new developments, however, are creating financial pressures on the astronomical community at a time when the federal funding outlook is very poor. In this climate of increased financial pressures the CTIO Users Committee emphasizes the crucial nature to the US astronomical community of a strong national facility in the southern hemisphere available to all astronomers on a peer-reviewed basis. This facility must provide a full range of telescopes and instrumentation capable of efficiently addressing the widest possible variety of scientific questions from planetary astronomy to extragalactic astronomy and cosmology. CTIO has done extremely well in the past in supplying such a national facility. Moreover, under the leadership of Director Malcolm Smith, the scientific, technical, and support staff are now providing the innovation and resourcefulness necessary to advance CTIO into the new era of larger aperture ground-based telescopes and new instrumentation. The Users Committee strongly endorses the efforts being undertaken by the Director to ensure that CTIO maintains its position at the cutting edge of astronomical research in the years ahead.

Due to the bleak funding scenario envisioned for at least the near future, there was considerable discussion at the meeting devoted to long-term issues affecting CTIO, continuing the trend that was begun at the Users Committee meeting last year. Two issues of particular concern are (1) the reduction in 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 and (2) the threat posed to the smaller aperture telescopes, and the scientific capabilities they represent, by the present funding climate. These and other issues that were addressed at the CTIO Users Committee meeting are summarized below. Those issues which are related to joint CTIO/KPNO plans and/or were discussed at the joint executive session of the KPNO and CTIO Users Committees are summarized in the joint CTIO/KPNO Users Committee report.

Size of Scientific Staff

During the past few years there has been a net decline in the number of CTIO scientific staff members by three FTEs (one staff scientist position and two postdoctoral positions). This situation, brought on by declining funding levels, has been dealt with over the short term through increased attention to observatory duties by a number of staff members. In addition, some of the scientific staff have deferred their sabbatical plans in order to maintain a sufficient staff in La Serena. The consequence of this short-term solution is a loss of time for several hard-pressed staff members to carry out their scientific research programs. While the Committee applauds the hard work and sacrifice of those individuals who have devoted extra time to observatory-related issues, we recognize that it is critical now to provide relief by increasing the number of scientific staff back to the required level. We therefore urge that additional resources be allocated to CTIO to allow for the hiring of scientific staff, so that staff scientists will be able to devote sufficient time to their research programs as well as to their observatory duties.

Long-Range Planning and Small Telescopes

Considerable discussion took place over where CTIO should strive to be around the end of the decade when Gemini South has been fully commissioned. In addition to the Gemini 8-meter and the existing 4-meter telescope, it was proposed by the Director that the construction of one or two new 4-meter class telescopes, built under university/NOAO partnerships similar in nature to the WIYN/NOAO partnership, would be extremely desirable. In this scenario each of the 4-meter telescopes could be optimized for different tasks (in particular, one of them should be optimized for the IR), rather than trying to maintain several all-purpose 4-meter telescopes. Each telescope would thereby be highly efficient at its tasks and would be economical to operate. The Committee strongly endorses this scenario as a sound long-term goal for CTIO.

Along with the goals for large aperture telescopes, the Committee extensively discussed the future of research with smaller apertures. The uniqueness and importance of the scientific capabilities of the small telescopes at CTIO in the southern hemisphere is well demonstrated by their high productivity. It is absolutely critical that these capabilities be preserved. The small telescopes are remarkably cost-effective in terms of their scientific output per dollar spent, are very cheap to operate in actual dollars, and provide a unique role for highly valuable scientific projects which cannot be done on large aperture telescopes. Closing them as a cost saving measure can help alleviate the shortest term budget shortfalls, but cannot possibly make up the projected long-term deficit in the current budget picture. Thus the great loss of user access and scientific capability that would occur in closing the smaller telescopes cannot be justified. In the short term we recommend a program of upgrades to the small telescopes that is specified in a later section of this report. In the long term we encourage CTIO to aggressively investigate options to upgrade and/or replace the small telescopes with more efficient, lower maintenance telescopes of comparable or slightly larger aperture. The goal of these upgrades/replacements would be to enhance both the scientific capabilities and the telescope access that the small telescopes have traditionally provided to the user community, while at the same time easing the burden on the staff for upkeep and reducing costs in the long run.

The maintenance of small telescopes is particularly sensitive in connection with the agreement that CTIO has for operating in Chile. The agreement between AURA and the University of Chile has made possible on the one hand that Chilean astronomers have access to all telescopes at CTIO, and on the other hand that CTIO operates with special benefits and tax exemption given by the Chilean government. The University of Chile is deeply concerned that budgetary restrictions at CTIO restrict the operation of the small telescopes and thus diminish the actual fraction of available telescope time. For the first time Chile has decided to participate in an international astronomical project by contributing 5% to the construction and operation of Gemini. Hence a serious restriction of access to smaller telescopes on CTIO is likely to have a strongly negative impact on our relationship with the Chilean astronomical community during this important period.

4-Meter Upgrades

The Committee strongly commends CTIO, under the leadership of Jack Baldwin, for the major progress achieved in the last year in the ongoing program to upgrade the imaging performance of the 4-meter telescope. This program has, virtually without exception, been accomplished on time and on budget, and the rewards to be gained from this sustained effort are becoming apparent with the improved seeing characteristics now being observed at the 4-meter. Thus the Committee continues to endorse the ongoing efforts to improve the image quality at the 4-meter. Specifically, some additional work remains on the new active support system for the primary mirror. Second, completion of the image analyzer under construction is crucial to further progress, since its implementation will allow for a better understanding of the optical system. Third, the proposed improvements to the autoguiding are necessary before the intrinsic imaging capability of the telescope can be accurately determined. Finally, we endorse the work in progress to complete the f/14 secondary, which is in any case important to the proposed KPNO/CTIO/Gemini IR instrumentation plans. However, we question the advisability of launching immediately into the major tip/tilt implementation of the f/14 secondary, and consider other priorities (e.g., delivery of CCDs to all telescopes, upgrades to the small telescopes) to be more pressing at present. Specifically, we recommend waiting for further information regarding the status of the UNC-Brazil-NOAO SOAR 4-meter project (which is designed to have tip/tilt control of its secondary mirror) and for results from the image analyzer tests and the improved autoguiding system before committing full-scale to the f/14 tip/tilt program.

In addition to endorsing the image quality improvements inherent in the above plans, we applaud the efforts being made to upgrade the 4-meter telescope control system (TCS) and drives. Not only will these upgrades greatly reduce the risk of major telescope down time due to failure of aging and hard-to-replace components, but they will result in a CTIO TCS and drives that are similar to those recently implemented on the KPNO 4-meter.

Instrumentation

CCDs

Last year some concern was expressed by the Users Committee that new CCDs were not making their way onto telescopes at a sufficient rate. Consequently, we are pleased to see that new CCDs are being implemented at CTIO, although still at a slower rate than we would prefer. We recognize that the reduced staff makes this a difficult task, but we urge that the highest priority among instrumentation projects in the short term be given to finishing the implementation of the three new CCDs that were in progress at the time of the Users Committee meeting in November (and scheduled for rapid completion).

IR Detectors

We are very pleased with the rapid implementation (on schedule) of the two new 256 X 256 IR arrays, one for imaging and one for spectroscopy, that were brought on line in 1994. We note also the close cooperation between KPNO and CTIO instrumentation groups that was required to achieve such a successful end to this IR detector upgrade. This collaborative arrangement between CTIO and KPNO instrumentation groups should serve as a model for the new regime of joint major instrumentation projects. As is described in the joint CTIO/KPNO Users Committee report, we have endorsed an ambitious program to deliver the next generation of 1024 X 1024 IR detectors to NOAO telescopes. The CTIO Users Committee was also briefly presented with a Rice/University of North Carolina plan to develop an IR Fabry-Perot for the CTIO 4-meter. The Committee endorses this project and repeats its encouragement from last year of cooperative agreements between universities and CTIO that will provide new capabilities for CTIO telescopes (such as the successful Ohio State OSIRIS program).

Hydra Clone

As is further described in the joint Users Committee report, the KPNO and CTIO Users Committee has advised that the highest priority project for the NOAO O/UV instrumentation group be the development of a Hydra clone for the CTIO 4-meter. While Argus has been a valuable workhorse instrument for many years, it is now crucial to expand the multifiber capability at the 4-meter. The most economical means of achieving this goal is to clone the highly successful Hydra positioner and bench spectrograph for the CTIO 4-meter.

Small Telescope Upgrades

CTIO has entered into an agreement with the MACHO project to allocate 15% of the time on the 0.9-meter telescope in exchange for funds which will be used to upgrade the smaller telescopes. In particular, the funds should be sufficient to hire a mechanical engineer and a mechanical technician whose main projects will center on upgrades to the small telescopes. As a result of discussions at the November meeting, the Users Committee recommends the following prioritized program of upgrades to the small telescopes:

1) Upgrades to the 0.9-meter TCS. The present aging TCS is potentially vulnerable to a major failure that could take the telescope off-line for a considerable time period. Removing this vulnerability of the 0.9-meter to a catastrophic failure is considered the highest priority by the Committee.

2) Upgrades to the Curtis Schmidt CCD camera. A relatively modest ($2K) upgrade to the CCD camera system on the Curtis will result in a large unvignetted field of view on the 2048 X 2048 CCD that is expected on the telescope in the next few months. Such a wide-field imaging capability is a high priority for the small telescopes.

3) Optics and guiding upgrades to the 0.9-meter and 1.5-meter telescopes. The recent successes in improving the imaging performance of the 4-meter underscore the advantages to be obtained from comparable improvements to the optics and guiding of the smaller telescopes.

In general these improvements are being made in the spirit of increasing the reliability and efficiency of the smaller telescopes.

Light Pollution

The Committee was pleased to learn that a careful and serious effort is being mounted to protect both Cerro Tololo and Cerro Pachon against potential sources of light pollution. The success of this effort is clearly critical to maintaining Tololo and Pachon as premier southern hemisphere observing sites.

Other Issues

TAC Procedures

In response to the Users Committee report submitted last year, the CTIO TAC will now automatically send written comments to astronomers who have had their observing proposals rejected on the 4-meter and 1.5-meter telescopes. This extra work on the part of the TAC will be much appreciated by proposers who wish to evaluate how to strengthen their observing proposals in subsequent semesters.

Computer Resources

A number of DAT drives have been purchased with end of the year funds. In addition, a workstation has been purchased that is intended for visitors who do not have access to any of the workstations at the telescopes (e.g., a visitor on the mountain between observing runs or arriving early for a run). We are happy to hear of these purchases and urge that they be installed as soon as possible.

New 1.5-meter Control Room

Several Committee members have either used the new 1.5-meter control room themselves or heard from colleagues who have done so. All comments concerning the new control room have been very favorable.

CTIO Users Committee:

Suzanne Hawley, Michigan State
(slh@pillan.pa.msu.edu)

Karen Meech, Hawaii
(meech@pavo.ifa.hawaii.edu)

Joe Patterson, Columbia
(jop@carmen.phys.columbia.edu)

Marc Postman, STScI
(postman@stsci.edu)

Jim Rose (Chair), North Carolina
(jim@wrath.physics.unc.edu)

Monica Rubio, Chile
(monica@das.uchile.cl)

Kris Sellgren, Ohio State
(sellgren@cannon.mps.ohio-state.edu)

George Wallerstein, Washington
(wall@gibbs.phys.washington.edu)

Table of Contents

KPNO Users Committee Report (1Mar95)

Table of Contents

KPNO Users Committee Report (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

Introduction

The KPNO Users Committee met in Tucson on 10-11 November 1994. Committee members present were William Keel (Alabama), David Koo (UC Santa Cruz), Elizabeth Lada (U. Maryland), Gus Oemler (Yale), John Salzer (Wesleyan), Verne Smith (Texas), and Rosemary Wyse (Johns Hopkins). Seth Tuttle (NSF - NOAO Program manager) and Jim Hesser (DAO and Chair of the AURA Observatories Visiting Committee) also attended the sessions.

The format of this years' meeting represented a modest break in tradition relative to recent meetings. To facilitate better communications between the committee and observatory staff, formal presentation of reports was kept to a minimum. The KPNO staff had prepared written summaries of their reports which were distributed to the committee one week before the meeting, which freed up time for direct discussion of the important issues facing KPNO. In addition, a much larger fraction of the meeting was spent in joint sessions with the CTIO Users Committee than has been the case in previous years. The chairs of both committees had felt that there were a number of important topics that were of mutual interest to both observatories. A separate report presenting the suggestions made by the joint CTIO/KPNO committees is appended to this report.

The committee read reports from Caty Pilachowski (KPNO Interim Director) on the state of KPNO; from Richard Green on the overall NOAO instrumentation program; from George Jacoby on IRAF; from Todd Boroson on the US Gemini program; from Bruce Bohannan on mountain operations; from Taft Armandroff on optical instrumentation progress and plans; from Ian Gatley on IR instrumentation progress and plans; and from Sidney Wolff on the status of the Gemini program and the budget picture for FY 1995. All of these staff members lead discussions of their reports during the meeting sessions. Other members of the observatory staff participating in the group discussions included Sam Barden, Dave DeYoung, Tom Kinman, Mike Merrill, Ron Probst and Richard Wolff.

It should be noted that the committee had not seen the report written by the McCray Committee on its deliberations regarding the role of NOAO in the future of ground-based optical and IR astronomy at the time of our meeting. This report will therefore not include any discussion of the McCray report.

NOAO 2000 - A Plan for the Future

The committee gives general endorsement to the plan for the future of KPNO as presented by Caty Pilachowski and contained in the NOAO 2000 planning document. We are impressed with the forward thinking presented in this plan, as well as the optimistic but still realistic view of the future. We encourage the observatory to move forward with vigor in putting the plan into action and securing a future for ground-based optical-IR astronomy that is available to all US scientists.

Some of the aspects of the plan that the committee found most appealing:

The plan for KPNO stresses "capabilities" rather than specific instruments or telescopes. The staff has prioritized the capabilities that they see as being vital for the scientific integrity of the national observatory (i.e., what US astronomers need most to carry out forefront research), and have focused on preserving these capabilities rather than on saving specific instruments or telescopes.

The future of KPNO takes into account the existence of the Gemini telescopes. It is recognized that the NOAO-wide capabilities must be considered, and not simply those of KPNO. The future of KPNO is better ensured if it is operated in a way that complements rather than competes with Gemini.

A unified NOAO instrumentation program rather than separate programs at the various nighttime facilities makes sense and is long overdue. The pooling of engineering and instrument building resources within NOAO is more cost effective and will eventually lead to better instrumentation being available at CTIO as well as KPNO.

The instrumentation program is vital to the mission of NOAO in general and KPNO specifically. It is the state-of-the-art instruments and detectors that make KPNO telescopes so much in demand.

The telescopes at KPNO are aging, and not necessarily gracefully. The committee is enthused by the current initiatives to build new modern telescopes at KPNO to replace the capabilities of the aging smaller ones. We view the continued access to telescopes and state-of-the-art instrumentation for the US astronomical community to be the single most important job of KPNO. Replacing the many small telescopes, which are prone to breakdowns, with one or two modern telescopes will maintain the current high level of capabilities at KPNO while hopefully reducing operations costs. We endorse the current plan to build a replica of the 3.5-meter WIYN telescope to enhance and replace some of the capabilities of the Coude feed, 2.1-meter, and 0.9-meter telescopes.

The first step into the future for KPNO already looks bright due to the success of the WIYN telescope. The addition of WIYN to the existing KPNO telescopes will be a major enhancement in the science capability for the US community.

A number of points about the NOAO 2000 plan raised concerns with the committee. We summarize them here:

The plan as it is currently presented appears to place too much emphasis on KPNO as a support facility for Gemini, while playing down its important role of continuing to providing access to telescopes and modern instrumentation to the US astronomy community. We can not make the point too strongly that 50% of Gemini North can not come even close to replacing the capabilities of the existing KPNO telescopes, particularly with the first-light instrumentation currently planned. Although we strongly support the concept of KPNO working in tandem with Gemini to enhance the scientific capabilities of the latter, we stress that NOAO must also remain committed to maintaining access to northern hemisphere telescopes for the general community. Future plans for NOAO must provide a good balance between Gemini support and the traditional KPNO user.

All of the capabilities provided by the existing suite of small telescopes at KPNO are not replaced under the current plan, which is to replace all of the small telescopes (0.9 m, 1.3 m, 2.1 m, coude feed, schmidt) with a single WIYN clone. First of all, this plan only preserves capabilities IF the WIYN Twin is built AND is instrumented properly (e.g., high throughput low dispersion spectrograph, high dispersion echelle spectrograph, wide-field imaging). Second, this plan does not replace the capability of the Schmidt, which with its wide-field CCD and fast optics is a unique instrument for survey work (including potential Gemini support observations). Third, many projects would be difficult or impossible to carry out if all of the small telescope observing were taken up by a single, multi-purpose telescope (which would presumably be operated in a queue-scheduled mode much of the time). These include a large class of variability monitoring programs, photometric calibration studies, and projects with special calibration needs. Fourth, the closing of the smaller telescopes would likely have a negative impact on the training of graduate students. KPNO must carefully investigate these issues before committing to any plan that would ultimately close telescopes. Ideally, a second new telescope (2 meter class) should be built as well to maintain some of these current capabilities, particularly student access, monitoring programs and wide-field IR imaging that was lost with the closure of the 1.3-meter telescope.

Getting the Most from KPNO

The current budget situation offers little hope that the financial climate will improve significantly in the near future. NOAO continues to suffer budget shortfalls which can only be made up for by reducing staff and, consequently, closing telescopes. The situation for the current fiscal year has in fact reached this crisis state, with the outcome being the planned closure of the 1.3-meter telescope (see article in December 1994 Newsletter). Although the committee recognizes the extreme situation facing the observatory, and appreciates the efforts made to minimize the impact of the loss of this telescope, we are very upset to see yet another KPNO telescope get closed. This closure will curtail or eliminate the over 40 scientific programs scheduled there each year, including a number of graduate thesis projects. It also eliminates important observational capabilities, including wide-field IR imaging and photoelectric photometry. Given the available options imposed by the gloomy budget situation, the majority of the committee agrees with the decision by KPNO management to close the 1.3-meter telescope. However, we stress that this is not to be taken as an endorsement for future telescope closings. With the current budget picture, the pessimistic viewpoint would see another small telescope closing in each of the next three years. In our view, this scenario would be nothing short of disaster for KPNO and the US astronomical community it serves.

The NOAO 2000 plan recognizes that the aging smaller telescopes need to be replaced with modern, more efficient (and hopefully cheaper to operate) telescopes. However, it will be several years before any new telescopes will be in service at KPNO, even taking the optimistic view that it will be possible to build them in the first place. In the mean time, we feel that KPNO must give top priority to continuing to operate the remaining small telescopes.

It appears safe to assume that budget shortfalls will be part of the landscape for the foreseeable future. This will mean additional staff reductions. However, KPNO needs to divorce itself from the idea that fewer staff means fewer telescopes. The observatory should look into ways to reorganize the mountain support staff away from its traditional mode of operation and into a more "bare bones" operation (it's already "lean"). Although these suggestions are obviously not desirable, if the alternative is to close more telescopes, we feel the choice is clear. Specific ideas raised at the meeting:

Since reductions in the support staff appear inevitable, PLAN for them now rather than dealing with them on a crisis-by-crisis basis.

Run the 2.1-meter telescope with no operator in the future (this was already planned).

Operate the small telescopes with less start-up assistance. Many of the small telescopes are used by an experienced base of KPNO users who could get by with a minimum of support (e.g., the Coude Feed). KPNO should give more responsibility to the visiting observers to help themselves. The support provided by KPNO staff is both excellent and much appreciated, but perhaps it is a luxury that can no longer be maintained?

One specific mode of providing support would be to operate all the small telescopes (2.1-meter and smaller) in a fashion similar to MDM or Steward: have a very small staff for day-to-day operations, with a maximum of two on duty at any one time. Provide no night time technical support. This small group of staff members would perform both instrument changes (which are minimal on these telescopes except for the 2.1-meter) as well as any necessary start-up support.

Consider reducing or removing many of the other mountaintop "necessities." This might include closing the cafeteria, operating with reduced housekeeping, and doing without some of the on-site blue collar staff. We feel that KPNO users would rather change their own sheets and eat microwave dinners than lose access to more telescopes.

At the same time that KPNO is striving to preserve its scientific capabilities while reducing operations costs, it must continue to experiment with ways to improve itself by providing enhanced services and opportunities to the community. Ways in which this is already happening include the highly successful save-the-bits program and the pioneering experiments with queue scheduling. The next phase of experimentation with queue scheduling, when the WIYN telescope becomes operational in the Spring 1995 semester, will be an important test of this promising and efficient observing mode. The initiation of the key projects program offers improved capabilities for large-scope projects to be carried out. The committee gives high marks to the staff for all of these programs.

KPNO should continue to see itself as playing an important role in the training of young astronomers. Efforts should be made to ensure that access to telescopes by graduate students is not curtailed, and new ways to allow students access should be considered. Two ideas discussed by the committee: (1) Give larger than normal blocks of time on selected smaller telescopes (e.g., 0.9 meter) to thesis students; (2) institute a graduate internship program where students could come for 3-6 month periods to work at the observatory (perhaps participating in queue observing programs by assisting with the data acquisition) in return for time to carry out their own thesis observations (not to mention gaining valuable experience).

Instrumentation

As mentioned above, the committee approves of the plan to consolidate the nighttime instrumentation program for all NOAO facilities into a single, Tucson-based operation. A prioritization of future optical instruments for the combined CTIO/KPNO program is given in the statement issued by the joint Users Committee. We applaud the efforts of the group leaders (Taft Armandroff for O/UV and Ian Gatley for IR) as well as the scientific and instrumentation staffs at both observatories for pulling together to make the joint program a possibility. We hope that this spirit of cooperation will continue and spread to other areas of NOAO operations.

O/UV Instrumentation

The work on the conversion of HYDRA from the 4-meter to WIYN was well along at the time of our meeting, and appears to be heading for a successful conclusion early in the first semester of 1995. This has been a major effort of the O/UV group. Other ongoing projects are the CCD development program (in collaboration with Steward Observatory) and work on the large 8192 X 8192 mosaic camera. The committee continues to endorse these projects, although it expresses serious concern over the lack of return from the CCD foundry run which was aimed at populating the mini-mosaic with science-grade chips. The prognosis for the full mosaic CCDs is more positive.

The committee continues to place high priority on the design and construction of new camera optics for the GoldCam spectrograph. This project has been given top priority by the committee for the past two years and we were less than enthused by the lack of progress in the past year. We would like to see the O/UV group make a commitment to having this new camera ready for installation by the fall 1995 semester.

Another small project that should be given priority is the procurement of a low dispersion blue grating for WIYN. The lack of an efficient blue grating for this powerful instrument is a significant limitation that should be corrected as soon as possible. We are encouraged by the current efforts to acquire such a grating.

IR Instrumentation

The overall instrumentation development plan for the IR group is well thought out and promises to keep NOAO in a leadership position in this area for years to come. The details of the plan are given in the September 1994 NOAO Newsletter. The committee gives strong endorsement to this plan, which includes the completion of the Phoenix high-resolution spectrometer in 1995, and the design and construction of the GRASP multichannel imager/spectrometer to commence immediately after the completion of Phoenix. We are also excited about the progress of the ALADDIN Array project and the recently demonstrated capabilities of COB for doing diffraction limited imaging. We give high priority to the design and construction of GRASP in order to replace and enhance the capabilities lost when SQIID is sent to CTIO.

The committee did not endorse the plan to decommission IRIM and give it on loan to the Starfire Optical Range. We feel that this move would be premature, and deprive KPNO users of the workhorse IR imager. We hope that KPNO will continue to support IRIM as an observatory instrument in the fall 1995 semester and beyond, at least until GRASP has been commissioned.

The Future: Replacements and Retirements

NOAO should look to the community and attempt to develop collaborative instrumentation projects with university and private groups to expand their local range of expertise. In the same way that collaborative effort brought about the successful construction of the WIYN telescope, so too could joint efforts result in the timely development of new instruments. An example of this type of effort is the CCD development program with Steward Observatory.

The committee feels that a particularly pressing need at both KPNO and CTIO is a new, high throughput moderate-to-low dispersion spectrograph for the 4-meter telescopes (or the WIYN Twin at KPNO if it gets built). The O/UV group has already started to explore designs for such an instrument; we encourage them to continue and perhaps seek collaborative participation from interested groups outside of NOAO.

The committee gave consideration to the proposed instrument retirements and in most cases agreed with the list drawn up by the observatory staff. However we stress that the observatory must continue to strive to make these retirements as painless as possible to the user groups affected. Whenever possible, they should attempt to give plenty of advanced notice and get sufficient user input (from both the Users Committee and a cross section of affected users) earlier in the decision-making process. Of particular concern to the committee was the proposed loss of 4-meter prime-focus photography, which would jeopardize a number of programs requiring multi-epoch plates. We applaud the efforts of the observatory to allow these ongoing programs the opportunity to complete their observations before discontinuing the service, perhaps by having one or more of the groups take over responsibility for maintaining the equipment.

We note with some sadness the departure of photoelectric photometry from KPNO. Although the future directions of photometric observations have clearly been moving away from PEP for some time, it is hard to witness the end of an era that included KPNO as a major player in the development of this important subfield over the past 35+ years. As proponents of photoelectric photometry rightly point out, the departure of PEP from KPNO carries with it some modest loss in capabilities, particularly U-band photometry and some calibration work.

Finally as KPNO looks to the future, the committee would encourage the staff to stay abreast with the advances in adaptive optics, and be prepared to acquire "off-the-shelf" systems and implement them in existing telescopes (e.g. WIYN and the 4-meter) when appropriate.

Directorship of KPNO

The committee would like to thank Caty Pilachowski for her excellent work as Interim Director of KPNO. She has taken over the reigns of the observatory during a particularly active and generally difficult period, and served the community in her usual unselfish and professional manner. Likewise, many members of the KPNO staff are to be commended for taking on new roles during this period. It is only through the dedicated efforts of the staff that KPNO remains a truly world class facility.

We are pleased that there is currently a search underway for a full time director for KPNO. The committee feels that such an appointment is overdue. We encourage the search committee to seek an individual who will serve as a strong advocate of KPNO specifically and NOAO in general. It is assumed that the next director of KPNO will be both well known and well respected by both the outside user community and by the KPNO/NOAO staff. The observatory needs someone who can build bridges between KPNO and the rest of the community, someone who can listen to the constituents of KPNO as well as speak forcefully for it in the broader scientific community. We consider this appointment to be extremely important for KPNO, and encourage the entire user community to contribute input to the search committee (chaired by Robert O'Connell).

Concluding Remarks

Regardless of the outcome of the McCray Committee report, the next few years will bring major changes to KPNO. We are especially pleased by the major self-examination by the entire NOAO staff that has resulted in the NOAO 2000 planning document. To include the overall community in its planning efforts in a meaningful way, NOAO management should be encouraged to continue to find ways to reach out and listen to the needs of their constituents. Especially important are decisions concerning major changes in observatory operations, such as the closing of the 1.3-meter telescope. These decisions should be made with maximum feedback from the observers. Involving the Users Committee is only one way to accomplish this; a better, more consistent dialog needs to exist between the observatories and the community they serve. With improved efforts for community feedback and public relations, NOAO should enjoy much needed support during these difficult times.

Likewise, the users of NOAO need to redouble their efforts to speak out, both as advocates for their facilities and as a source of suggestions or improvements to NOAO. As always, the Users Committee members encourage your input. We represent a direct link between the individual NOAO users and the management of the observatories. Your input is always welcomed. The names and e-mail addresses of continuing members of the committee are listed below.

KPNO Users Committee:

David Koo (UC, Santa Cruz)
koo@lick.ucsc.edu

Elizabeth Lada (Maryland)
lada@astro.umd.edu

Gus Oemler (Yale)
oemler@sparx.astro.yale.edu

John Salzer (Wesleyan)
slaz@parcha.astro.wesleyan.edu

Verne Smith (Texas)
verne@astro.as.utexas.edu

John Salzer, Chair

Table of Contents

Report of the NSO Users' Committee (1Mar95)

Table of Contents

Report of the NSO Users' Committee (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

The Users' Committee held a 1-1/2 day meeting in Tucson 14-15 November 1994 with the following committee members present: Jacques Beckers (NSO Director), Drake Deming, Bruce Lites, David Rust (chair), Steve Saar, Rita Sagalyn, Robin (Tuck) Stebbins, and Seth Tuttle.

The principal topics were budget and operating philosophy, GONG status, the image quality improvement program, new projects and the future direction of the NSO.

NSO may face a 5% cut in after-inflation dollars this fiscal year, and Beckers has been asked to consider what the observatory would do if, as some expect, each year of the next five requires a similar cut. Beckers believes that "belt tightening" has reached the point of strangulation, so he asked the committee for alternative suggestions. There was a consensus that answers have to be found in the context of the Future Directions Plan (FDP) and that the old paradigm of keeping all the telescopes operating will have to be abandoned.

In other words, the long term has priority over the short term. However, solar astronomy within NOAO is in a unique position. In contrast to the NOAO nighttime astronomy program, it contains most of the nation's ground-based solar facilities with each of the solar facilities having a unique capability, largely unduplicated by any of the others. The closing of any of NSO's facilities therefore implies the elimination of a unique observing capability (e.g. IR coverage, coronal studies, high angular resolution observations). In this sense NSO has more in common with the NRAO program. Before undertaking such drastic steps as closing a facility, and hence a national capability, the US solar community should be consulted and advised of the reasons.

The FDP describes four goals: (1) Understanding the solar cycle; (2) Understanding the coupling to solar surface behavior and the origin of solar irradiance changes; (3) Understanding the coupling of solar surface behavior to the solar envelope and the origin of solar flares and coronal mass ejections; and (4) Remaining open to new discovery prospects. Thus, NSO plans to devote its resources to achieving stated scientific goals rather than just providing facilities for its staff and outside users. The committee endorses the new paradigm, but feels that such a fundamental change in direction presents both an opportunity and an obligation to engage the widest possible constituency. Although the entire NSO scientific staff participated in the plan's design, it should now be circulated in the solar community.

Previous meetings of the Users' Committee dwelt at length on the issue of base funding vs. projects. When projects such as GONG and the Advanced Stokes Polarimeter are taken into account, overall funding and scientific capability have increased during the past decade. But base funding has been trimmed to the point where such internal projects as adaptive optics are stagnating or having to be postponed or dropped. The newest telescope is over 20 years old, and most of the facilities date from the 60's. Modernization of the CCD cameras at the VTT has not been realized, despite the high priority that users place on it. Beckers did report that NSO is collaborating with the Kiepenheuer Institute (KIS) to make 1024 X 1024 CCD cameras. It will have a 0.1 to 0.2 sec readout time and frame cadence, depending on the data recording device.

If the FDP or any other plan is to succeed, either base funding must be increased or project funding must be accepted. The problem with the project approach is that funding may fluctuate considerably from year to year. Witness RISE, which is likely to receive decreased funding this year rather than the increased funding needed. Project funding also has to be newly justified every few years. It is obviously unwise to operate the nation's principal solar facility on project funding, so the justification for its continuance and even its growth as a facility must be developed thoughtfully, and its case must be persuasively stated. The committee feels strongly that the NSO can have a vital role to play in addressing such scientifically important and practical problems as climate change and space hazards prediction and avoidance. With the FDP, which relies greatly on anticipated progress resulting from one or two solar cycles of GONG operations, NSO can also make dramatic progress in fundamental solar research.

Rust suggested that NSO's plan for the future state more explicitly how NSO and its traditional partners will work together. In particular, although NSO has facilities to address goal (3), few of the staff are currently working in the relevant areas of research. Now is the time to cement relationships with AFGL and others to pursue common goals. Rust also suggested that NSO and the NSF grants program work together to encourage users to apply for grants under the Space Weather Initiative and to carry out their work at NSO. NSF's plan to encourage proposals that will use the GONG data is a nice example of the synergy that is possible. We should be clear that NSO probably will not have the resources to redirect its own research programs into all of these FDP areas; it is better not to spread the currently small research staff's efforts even wider. But it may be a rather simple matter to encourage communication and cooperation with other institutions on some of these issues. The plan to involve dynamo modelers with the helioseismology is a good example. Involving vector field measurements with both coronal observations and the seismological studies is another.

Beckers emphasized that he intends to do whatever is necessary and possible to get diffraction-limited images at the VTT. The committee strongly applauds this because, of all ground-based solar telescopes, the VTT is capable of giving the highest resolution solar images. Excellent images are being obtained at La Palma, but it was pointed out that a single user group may be assigned two months time there and that may be what is required to get one day with diffraction-limited images. The committee was assured that the TAC at SP can accommodate long runs when requested to do so.

Progress has been made on the AO program. The wavefront reconstructor, which looked like a lost cause at our last meeting, is back on track. A major task remaining is the development of the wavefront sensor. Sagalyn emphasized that AFGL is still very interested in AO. Tuttle said that NSF is very interested in AO. Beckers noted that NSO is advertising for an instrumentalist for the AO program to work specifically on solar wavefront sensing techniques.

Beckers introduced the results of a pre-phase-A study of a 4-meter solar-stellar coronagraph, called CLEAR: Coronagraph and Low Emissivity Astronomical Reflector. He will request NSF funds for a full phase-A engineering study of the concept. The committee feels that the observatory should show how the new telescope fits in with the goals of the FDP. A specific scientific justification would help. Tuttle described NSF's MPS interdisciplinary fund, and the committee feels it should be approached for the CLEAR study funds. When CLEAR is built, it could replace the NSO McMath Pierce, the VTT and the Evans Facility. If CLEAR can provide better images, greater wavelength coverage, better coronal sensitivity and more efficient usage of the staff's time, then it may sell well. It will do the work for which LEST was intended, but to avoid the fate of LEST, it will have to involve more of the user community. The committee briefly discussed whether there should be opportunities for users to supply focal plane instrumentation. There are certainly very good examples where collaborations between the user community and NSO have resulted in superb user-qualified instrumentation in the past. These productive cooperations between the users and NSO should continue also when CLEAR becomes a reality.

David M. Rust, Users Committee Chair

Table of Contents

NOAO Scientists Receive IDEA Grant (1Mar95)

Table of Contents

NOAO Scientists Receive IDEA Grant (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

Several NOAO scientists have received funding through the NASA/STScI IDEA (Initiatives to Develop Education Through Astronomy) Program to develop "Active Learning Exercises in Planetary and Solar Astronomy for K-3 Students." Working with educators at the Satori School in Tucson, we plan to develop a unique, creative, hands-on active learning curriculum to teach eight basic solar and planetary astronomical subjects to K-3 students and teachers. The planetary group includes Michael Belton, Elizabeth Alvarez, Nalin Samarasinha, and Beatrice Muller. Topics include "The Living Solar System," "Build Your Own Comet," "Crashes and Hazards," and "Space Resources." Solar astronomers Frank Hill, Doug Rabin, and Bill Livingston will present "The Natural Sun," "The Sun as a Clock," "Sunspots and Solar Rotation," and "Solar Music (helioseismology)." These concepts will be presented via student-created experiments and multi-media presentations by the astronomers. Planning sessions with the Satori staff have already begun to insure the learning exercises are developed and presented in a developmentally appropriate manner. Classroom presentations will take place during the 1995 spring and fall semesters for a total of 12 weeks. In addition to the classroom activities, students will participate in a tour of Kitt Peak and also create a tile mosaic of the solar system for display at the Kitt Peak Visitor Center. Lesson modules will be disseminated at the completion of the project, both on paper and electronically through the World Wide Web.

Suzanne Jacoby, Project Coordinator

Table of Contents

NOAO Changes Phone Numbers! (1Mar95)

Table of Contents

NOAO Changes Phone Numbers! (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

Effective 1 April 1995, both the NOAO Tucson Headquarters and Kitt Peak direct-in-dial phone numbers, including Kitt Peak extensions, will change. Additionally, the area code for both Arizona sites will change from 602 to 520. The implementation of these changes may cause some delays and inconvenience to you, so please have patience.

For the NOAO Tucson Headquarters, the Main Switchboard number will be changed to (520) 318-8000. All other extension numbers can be reached by calling the new Direct In Dial (DID) prefix: 318-8xxx and adding the last three numbers of the existing extension series 100 to 599. For example, the Switchboard Fax number will be changed from (602) 325-9360 to (520) 318-8360.

For Kitt Peak, the Mountain Switchboard number will be changed to (520) 318-8600. All mountain extension numbers are also changing: Extensions 300 to 399 will become 600-699; and extensions 400-499 will become 700-799. The new DID prefix is the same as the Tucson Headquarters: 318-8xxx. So, for example, the Mountain Fax number will be changed from (602) 322-3424 to (520) 318-8724. The 4-meter console room will change from (602) 322-3320 to (520) 318-8620.

Now, if all this has thoroughly confused you, a summary of popular phone numbers follows. If you have trouble reaching someone, please call the NOAO Headquarters or Mountain Switchboard numbers during regular business hours. U.S. West will be placing a recording on the original numbers to alert you to the changes; however, the recording will not give out specific extension numbers. When coming to Kitt Peak to observe, be sure to give your family the new telescope phone numbers as it will otherwise be difficult to reach you at night on Kitt Peak after-hours.

	Old (602)	New (520)
NOAO Headquarters		
Tucson Switchboard	327-5511	318-8000
Switchboard Fax	325-9360	318-8360
Kitt Peak		
Mountain Switchboard	322-3300	318-8600
Mountain Fax	322-3424	318-8724
Dining Room	322-3386	318-8686
4-Meter Console	322-3320	318-8620
2.1-Meter Console	322-3330	318-8630
Coude Feed	322-3333	318-8633
1.3-Meter Console	322-3334	318-8634
0.9-Meter Console	322-3337	318-8637
McMath-Pierce Tel.	322-3340	318-8640
McMath-Pierce FTS	322-3344	318-8644
Vacuum Telescope	322-3346	318-8646
WIYN Telescope	322-3460	318-8760
CWRU Burrell Schmidt	322-3339	318-8639
MDM Observatory	322-3360	318-8660
MIT Facility	322-3380	318-8680
NRAO 12-Meter	322-3370	318-8670
SARA Telescope	322-3463	318-8763
Steward Obs. 36"	322-3393	318-8693
Steward Obs. 90"	322-3390	318-8690

John Dunlop, Pat Patterson

Table of Contents

Engineering and Technical Services: Aladdin 1024 X 1024 InSb FPA Development Program Status (1Mar95)

Engineering and Technical Services: (1Mar95)
ALADDIN - 1024 X 1024 InSb FPA Development Program Status
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

The collaboration between USNO and NOAO to develop a low background 1024 X 1024 Focal Plane Array (FPA) with SBRC has recently passed a major milestone. We now have a SCA (sensor chip assembly) which has over 900K good pixels. We have met all the design specifications goals with the exception of read noise. A readnoise of less than 25e rms is achieved using Fowler Sampling and 8 sample pairs. We still have a few engineering problems related to hybridization that need to be resolved. As one can see from the picture earlier in the newsletter on ALADDIN, the corners are not bonding as well as we want, and there are voids in the epoxy bonding the detector material to the readout. We expect these problems to be resolved in the first quarter of FY 1995. This is only the second SCA to be made so we are quite happy with its performance. The design specifications are given below for those not familiar with the project.

ALADDIN 1024 X 1024 InSb Focal Plane Characteristics

SCA Specifications

Number of Pixels:	1024 (H) X 1024 (V) 1,048,576 elements
Architecture:	4-Independent 512 X 512 Quadrants
Pixel Size:	27 um square
Effective Fill Factor:	100%
Readout Type:	PMOS SFD Unit Cell CMOS Shift-registers Control Logic PMOS or NMOS Output Drivers
Number of Outputs:	32 (8 per quadrant)
Frame Rate:	50 ms
Reset Options:	Destructive and non-destructive by rows
IR Detector:	Thinned InSb
Full Well:	250 X 10^3 e- at 1.0v bias
Wavelength Range:	0.6 -5.5 um with special AR coatings
Operating Temperature:	35 deg K
Dark Current:	&lt 0.1 e-/sec
Noise:	&lt 25 e rms with Fowler Sampling
Quantum Efficiency:	&gt 80% 0.9 to 5 um
Defective Pixels:	&lt 0.5% No Bad Rows or Columns

An unretouched quasi-flat-field image taken with this SCA is available in the ALADDIN anonymous ftp area via instructions elsewhere in the Newsletter. We have measured the read noise, using a narrow band filter (~60KHz) and Fowler 1 sampling, at 46 e- rms. The read noise is improved by using more pairs, and we have gotten less than 20e- rms using 16 sample pairs. Design changes and another lot run of readouts are in the works to further improve the noise. The dark current was less than we could measure due to lab temperature controller errors but is certainly much less than 0.2 e- per second at 400 mv reverse bias. We are able to get a full well capacity equivalent to the applied bias in the ALADDIN design unlike its 256 X 256 predecessor (CRC463), where several hundred millivolts of the applied bias were lost. So the full well capacity (i.e. where it saturates) was around 170K electrons at 400 mv bias. Although we have not as yet measured the QE, it looks to be equivalent to the CRC463 device. Although the design allows for either PMOS or NMOS output drivers, all data taken so far is with the PMOS output drivers. There is no significant evidence of any LED effects, but it is quite sensitive to thermal changes. At this time we have not attempted to operate the device at the 20 Hz frame rate, but a study of the output waveforms indicates that it should meet this specification. Further details and testing information can be obtained by contacting the author. We only received the device in late December 1994 and have not completed all the testing one would like at this time, but from the data we have so far it is safe to say that the Aladdin device is real and will be a very successful array.

A.M. Fowler (afowler@noao.edu)

NOAO Preprint Series (1Mar95)

Table of Contents

NOAO Preprint Series (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

The following preprints were submitted during the period 1 November 1994 to 31 January 1995. Please direct all requests for copies of preprints to the NOAO author marked with an asterisk.

628 *Sarajedini, A. Forrester, W.L., "CCD Photometry for the Galactic Globular Cluster NGC 6584"

629 *Beckers, J.M., "Prospects for High Spatial Resolution Astronomy"

630 *Beckers, J.M., "CLEAR: A Concept for a Coronagraph and Low Emissivity Astronomical Reflector"

631 *Sarajedini, A., A Photometric Study of the Globular Cluster M53 and the Sagittarius Dwarf Galaxy: Evidence for Three Distinct Populations"

632 *Veilleux, S., Cecil, G., Bland-Hawthorn, J., "The Interstellar Disk - Halo Connection in the Spiral Galaxy"

633 *Keller, C.U., Johannesson, A., "Speckle Spectrography of Extended Objects"

634 *Corbin, M.R., "QSO Broad Emission Line Asymmetries: Evidence of Gravitational Redshift?"

635 *De Young, D.S., "On the Origin of Blue Lobes in Central Cooling Flow Galaxies"

636 *Komm, R.W., "Wavelet Analysis of a Magnetogram"

637 *Neidig, D.F., Smartt, R.N., Kim, I.S., Koutchmy, S., "Near-Infrared Coronagraphic Detection of Space Debris"

638 *Keller, C.U., "Properties of Solar Magnetic Fields from Speckle Polarimetry"

639 *Penn, M.J., Kuhn, J.R., "Imaging Spectro-Polarimetry of the He I 1083 nm Line in a Flaring Solar Active Region"

640 *November, L.J., Wilkins, L.M., "The Liquid Crystal Polarimeter a Solid-State Imager for Solar Vector Magnetic Fields"

641 *Kinman, T.D., "Stars in the Galactic Halo"

642 *D'Silva, S., "Flux Retraction and Recycling: Negative Buoyancy Induced Oscillations as an Alternative to Parker's Thermal Relaxation Oscillations"

643 *Komm, R.W., Howard, R.F., Harvey, J.W., "Characteristic Size and Diffusion of Quiet Sun Magnetic Patterns"

644 Airapetian, V.S., *Smartt, R.N., "Role of Loop-Loop Encounters in Coronal Heating"

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

646 *Massey, P., Armandroff, T.E., "The Massive Star Content, Reddening, and Distance of the Nearby Irregular Galaxy IC 10"

Table of Contents

Other NOAO Papers (1Mar95)

[Table of Contents](#)

Other NOAO Papers (1Mar95)
(from Director's Office, NOAO Newsletter No. 41, 1 March 1995)

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

*Abt. H.A., "Changing Sources of Published Information"

*Abt, H.A., Morrell, N.I., "The Relation Between Rotational Velocities and Spectral Pecularities Among A-Type Stars"

*Balasubramaniam, K.S., Petry, C.E., "Magneto-Optic Effects on FeI 1.56 Micron Line"

*Eggen, O.J., "A Photometric Discriminate for GK Dwarfs of Disk Populations"

*Eggen, O.J., "Blue Stragglers in the Solar Vicinity: Newborn or Reborn?"

Fleming, T., Schmitt, J.H., *Giampapa, M.S., "Correlations of Coronal X-Ray Emission With Activity, Mass, and Age of the Nearby K and M Dwarfs"

Gary, G.A. *Rabin, D.M., "Line-of-Sight Magnetic Flux Imbalances Caused by Electric Currents"

Hunter, D.A., Shaya, E.J., Holtzman, J.A., Light, R.M., *O'Neill, Jr., E.J., Lynds, R., "The Intermediate Stellar Mass Population in R136 Determined from HST Planetary Camera2 Images"

Kim, D.-C., Sanders, D.B., *Veilleux, S., Mazzarella, J.M., Soifer, B.T., "Optical Spectroscopy of Luminous Infrared Galaxies I. Nuclear Data"

Korista, K.T., et al., "Steps toward Determination of the Size and Structure of the Broad-line Region in Active Galactic Nuclei. VII. An intensive HST, IUE, and Ground-Based Study of NGC 5548"

Laor, A., Bahcall, J.N., Jannuzi, B.T., Schneider, D.P., *Green, R.F., "The Ultraviolet Emission Properties of 13 Quasars"

*Livingston, W.C., "Energy Input to the Earth, II"

*Livingston, W.C., "Solar Eclipses"

*Radick, R.R., Lockwood, G.W., Skiff, B.A., Thompson, D.T., "A Twelve-Year Photometric Study of Lower Main-Sequence Hyades Stars"

Ruedi, I., Solanki, S.K., *Livingston, W.C., "Infrared Lines as Probes of Solar Magnetic Features. X. He I 10830 as a Diagnostic of Chromospheric Magnetic Fields"

Ruedi, I., Solanki, S.K., *Livingston, W.C., "Infrared Lines as Probes of Solar Magnetic Features. XI. Structure of a Sunspot Umbra with a Light Bridge"

Ruedi, I., Solanki, S.K., *Livingston, W.C., Harvey, J.W., "Interesting Lines in the Infrared Solar Spectrum. III. A Polarimetric Survey Between 1.05 and 2.50 um"

Ruedi, I., Solanki, S.K., *Livingston, W.C., Harvey, J.W., "FTS Polarimetric Survey of the Infrared Solar Spectrum Between 1.0 and 2.5um"

Schmitt, J.H., Fleming, T.A., *Giampapa, M.S., "The X-Ray View of the Low Mass Stars in the Solar Neighborhood"

Veilleux, S., Kim, D.-C., Sanders, D.B., Mazzarella, J.M., Soifer, B.T., "Optical Spectroscopy of Luminous Infrared Galaxies II. Analysis of the Nuclear and Long-Slit Data"

*Walker, A.R., "CCD Photometry - Present and Future"

Walker, A.R., "The NOAO CCD Controller - ARCON"

*Walker, A.R., "CCD Photometry of a Sequence near NGC 300"

Zepf, S., Ashman, K., *Geisler, D., "Constraining Models of Galaxy
Formation Using the Colors of Globular Clusters Around Elliptical Galaxies:
NGC 3923, a Case Study"

Ann Barringer, John Cornett, Elaine Mac-Auliffe,
Jane Marsalla, Shirley Phipps, Cathy Van Atta

Table of Contents

A Message from the Director (1Mar95)

Table of Contents

A Message from the Director (1Mar95)
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

In the March 1994 NOAO Newsletter No. 37, I emphasised the need for change at CTIO - in spite of the obvious successes over the last 20 years. This change is driven not only by the natural wish of the CTIO users and staff scientists to continue to progress (see, e.g. science highlights in recent Newsletters). Other driving factors include: (1) the impact of internal and external reviews of NOAO, (2) the forthcoming integration with operations of Gemini, (3) the budget for activities at CTIO and (4) the success of new initiatives to bring new telescopes to CTIO.

This note is a status report only and will be divided into three major areas:

A. Program Priorities at CTIO
B. People
C. Pesos and Dollars (the budget)

A special AURA/NOAO workshop is being arranged for March which will map out NOAO's detailed priorities for the next five years or so, taking into account the inputs from many different sources. The following, current CTIO priorities will have to be folded into the overall NOAO priorities and resources at the workshop.

A. Current Program Priorities at CTIO

The following table summarizes activities being planned at CTIO - in rough priority order:

1) Preparation for Gemini Operations:
  (a) Site preparation on Cerro Pachon
  (b) Light pollution campaign

2) CTIO 4-m Imaging Upgrades:
  (a) Thermal and optics upgrades -/&gt subarcsecond images
  (b) Tip-tilt f/14 secondary
  (c) Control system

3) Tololo/Gemini instrumentation:
  (a) Joint ARCON development and production
  (b) IR instruments for Gemini North and Tololo/Gemini South

4) New initiatives:
  (a) SOAR (Pachon)
  (b) New 2.5-m wide-field telescope to replace smaller telescopes (Tololo)

5) Operations (including minor upgrades) of remaining Tololo telescopes and instruments.

6) New user-funded telescopes on Tololo
  (a) GONG
  (b) 2MASS

Preparation for Gemini Operations

CTIO has been giving highest priority throughout the last year to preparation for Gemini operations. Two key areas of this initial effort have been site preparation and combatting light pollution. In addition, CTIO scientists have been contributing to a wide variety of Gemini planning committees.

The beginning of site preparation work for Gemini South was reported, along with a photograph, in the September 1994 Newsletter No. 39, p.12. The summit has been levelled to the 2715m level. Work continues to advance on preparations and widening of the access roads to Cerro Pachon. Power has now reached the summit area. The simple, yet colorful ceremony for laying the foundation stone for Gemini South took place last October amid wide and positive international media coverage. Concrete foundations are well advanced for the 20-unit dormitory, which is being moved over from Cerro Tololo to Cerro Pachon.

A wide-ranging attack on the problem of potential light pollution at Cerro Tololo and Cerro Pachon is under way. A committee consisting of Mark Phillips (chair), Mario Hamuy, and Ricardo Schmidt has succeeded in setting up a program in which the Universidad Catolica de Valparaiso is providing advice to the Municipality of Vicuna in the design of an "astronomy friendly" lighting system for the town. AURA is funding the advisory phase of this program. Chilean energy officials at a national level have recognised the wasteful aspects of mercury-vapor lighting installations and, as a result, are providing loans to municipalities throughout the country to switch to sodium fixtures. Unfortunately there is only a single supplier of low-pressure sodium fixtures within Chile, so most of the new street lights will be high-pressure sodium. It is therefore vital that we emphasise the advantages of avoiding costly waste by sending this light down to the street, not into the sky. We are in discussions with municipal officials in La Serena about a similar lighting program. We are still hopeful that the managers of two new, multimillion-dollar, open-pit mines being opened up in Andacollo can be persuaded to use low-pressure sodium fixtures; initial contacts have been encouraging in this regard. We are also seeking to have the concept of light as a potential secondary pollutant introduced into Chilean national and regional environmental legislation. Environmental concerns and legislation seem to be gaining support in Chile.

Imaging Upgrades at the CTIO 4-m

The status of this successful program is outlined in a separate article by Jack Baldwin in this issue of the Newsletter. Since October, the median seeing at the Cassegrain focus near the zenith has improved to subarcsecond levels - an improvement of about a third of a second of arc. Our target for the 4-m is to deliver performance that does not significantly degrade the median site seeing. The next two major phases of this program involve installation of an f/14 tip-tilt secondary for the 4-m telescope and improvements to the control system for the 4-m. Apart from essential work in support of future Gemini operations, we are protecting the 4-m image-upgrade program, as significant work on this program is likely to cease once the ramp-up to Gemini commissioning and operations begins in earnest three years or so from now.

Tololo/Gemini Shared Instrumentation Projects

The Gemini CCD controller workpackage has been tentatively assigned to Chile with the understanding that CTIO will be heavily involved in managing the design and manufacture of these controllers, based on the highly successful CTIO ARCON. Chilean scientists and engineers will be involved to the maximum extent possible in the production of these ARCONs. Because the ARCONs will also be used in the CCD mosaic being built for the NOAO 4-m telescopes, meetings were held in Chile in January between: (1) representatives from the Gemini (international) project, (2) a group of scientists and engineers selected by CONICYT (the Chilean equivalent of the NSF), (3) representatives of NOAO from Tucson and (4) members of the CTIO scientific and engineering staff - to work out a way to manufacture ARCONs for all four of these interested parties.

During at least the early phases of Gemini operations, CTIO is expected to provide infrared instrumentation on loan to Gemini. Brooke Gregory, Jay Elias and Richard Elston played a leading role during the latter part of last year in designing an infrared spectrometer for Gemini North which could then be copied or adapted later by NOAO for deployment at CTIO. The international Gemini project office is now negotiating with NOAO to provide this spectrograph on Gemini North.

Additional major IR instruments will come from the NOAO Instrumentation Group in Tucson. Plans are still being worked out, but we expect to have an imager (probably the Cryogenic Optical Bench, COB) permanently assigned to the south, and to have other major instruments (such as the Phoenix high-resolution spectrograph) spending equal amounts of time available to users at southern and northern sites.

New Initiatives at CTIO

SOAR

Included in the roles for CTIO envisioned in the McCray report (p.36/37) is the development of a new technology 3-4 meter class telescope. Following the withdrawal from the SOAR project by Columbia University towards the end of 1993, meetings have been held in Chapel Hill, North Carolina, Sao Paulo and Itajuba (Brazil). The astronomers present agreed to seek funds for a partnership - between the University of North Carolina (UNC), Brazil and NOAO - in a 4-m class alt-az, dual-Nasmyth telescope with the following main features: excellent imaging; facilities for rapid switching between instruments; tip-tilt secondary. It is presumed that SOAR, the existing 4-m at CTIO and their associated instruments will develop so as to complement each other and Gemini, and that the user communities would seek to share the time on these telescopes so as to maximise mutual benefit. A site is being reserved on Cerro Pachon for SOAR for a fixed time period. A draft MOU has been drawn up for signature by UNC, Brazil and NOAO.

New 2.5-m Telescope

Various ideas are being explored to try to find ways to replace some of the small telescopes on Cerro Tololo with a wide-field 2.5-m telescope - perhaps equipped with a permanently mounted pair of cameras (optical and infrared) and made available to users on a queue scheduled basis. An alternative would be to build a copy of the Sloan Digital Survey telescope (including its roll-off shed) with a dedicated optical imager - perhaps in some form of partnership.

We need a telescope that will take over much of the mix of wide-field surveys, photometry, and synoptic observing programs now being carried out on the 1.5-m, 1-m, 0.9-m and Schmidt telescopes. Our goal is a field size of &gt 25 ', with pixels &lt 0.3". A 2.5-m, f/6 telescope, with a NOAO mosaic imager gives this at about 0.21"/pixel (8192 pixels of 15 um). A 40'-45' field obtained with coarser sampling would also be acceptable; this is the appropriate (fiber) field for the 4-m present and future spectrographs.

While many of these programs can be carried out on the 4-m PF/LFCCD, the amount of time needed is large. For many broadband (UBV, etc) studies, the smaller apertures compete favorably with the 4-m, because the exposures are quickly sky limited (in a few minutes).

We envision that this telescope will be run on Cerro Tololo in a queue scheduled mode, with a dedicated observer. This has clear cost savings for the support staff (although it will take some scientific staff supervision). This also should allow the telescope to be run very efficiently, permit several synoptic programs every clear night, and allow photometric observations to be scheduled under the best observing conditions.

By having a modern telescope with one, or at most two, fixed instruments, we expect to achieve a very low maintenance overhead. Personnel to run this telescope could be found by closing an appropriate number of the existing small telescopes on Cerro Tololo.

Operations of the Smaller Telescopes on Cerro Tololo

Consistent with the McCray report (p.12), all the telescopes with apertures of 1-m or less have very restricted instrumentation to provide for efficient operation. Continuing budget pressures combined with the high priority of the items listed above are producing considerable difficulties for the operation of the smaller telescopes (1.5-m and below) on Tololo. We are of course striving to make the cutbacks in a manner that minimises the impact for our users.

The 1.5-m telescope has been operated during the year with a wide suite of instrumentation; from August 1995 all the other small telescopes will be operated with only one user instrument each (single-channel photometer on the 1-m, single 2048 X 2048 CCDs on the 0.9-m and the Schmidt). Pressure is mounting on our ability to support a full suite of instrumentation (and detectors) at the 1.5-m.

As part of an attempt to respond to these mounting pressures, CTIO has negotiated an arrangement with the MACHO research team in California . In return for nightly access to the 0.9-m telescope and its 2048 X 2048 CCD camera (a total of 15% of the available 0.9-m time goes to this program), Tololo is provided temporarily with new resources, which will enable the 0.9-m and perhaps some of the other smaller telescopes to be upgraded or at least maintained in a more satisfactory manner until replacement becomes possible. Further details were given in the December 1994 NOAO Newsletter, No 40, p.26. We welcome other such proposals of high scientific merit from the community.

New User-funded Telescopes on Cerro Tololo

GONG

Installation on Cerro Tololo of one of the six GONG stations is scheduled to take place in June of this year, (see the GONG section in this Newsletter).

2MASS

2MASS is a project of the University of Massachusetts to survey the whole sky at 2 um. This will involve building and operating a pair of 1.2-m class infrared telescopes - one in the northern hemisphere, the other at Cerro Tololo. With the recent appointment of Rae Steining as project manager for 2MASS, we are now expecting that site work for the southern 2MASS 1.2-m IR telescope will probably begin on Cerro Tololo in late 1996 or early 1997.

B. People at Cerro Tololo

The Scientific Staff

Discussions were held at the last Users' committee meeting concerning the critical shortage of scientific staff at CTIO - see the more detailed remarks in the article by the committee chairman, Jim Rose. Given the backlog of untaken sabbaticals, the committee recommended providing relief by increasing the numbers of scientific staff. AURA's Observatories' Visiting Committee also noted (p.8 of their report), that the theme "underscores the importance of considering fewer projects and/or transferring resources in such a manner that more staff scientists can be appointed at CTIO." Given the expectations of the McCray report and our user community and the resulting timescales for action on the corresponding priority list, there is little room over the next few years for considering fewer projects at Cerro Tololo.

The Engineering and Technical Services (ETS) Divisions

The McCray panel (p.32) notes that in order for CTIO to fulfill its obligations, the observatory should maintain an adequate engineering staff. "With subcritical staffing, it will be impossible for CTIO to maintain their current instruments, let alone even assist in the development of further instruments." The ETS division of CTIO currently spends about 60% of its effort in direct support of operations on Tololo. The complexity of modern instrumentation has increased to the point where the remaining staff can no longer form a team large enough to build complete facility-class instruments; they have had to struggle to find the resources needed to develop the ARCON CCD controller.

The Administrative and Operations Divisions

The McCray panel (p.32) notes that "because of its remoteness, CTIO needs to be more self sufficient than observatories in the North." This includes the ability to handle reliably, in Chile, a wide variety of activities from importation to road maintenance. CTIO has to be able to provide the kinds of services equivalent to those provided and supported on a larger scale by the Mauna Kea Support Services or the Tucson/Kitt Peak Central Facilities. Such services become most effective when one has the advantages of economy of scale. The Gemini agreement suggests maximising the degree of integration between the Gemini operations teams and the existing infrastructure at the Gemini sites (such as provided by the business and operations divisions of CTIO). It is clearly important for the future of Gemini operations in Chile that CTIO retain a strong, locally-experienced and cost-effective administrative core.

C. Pesos and Dollars - The Budget

The long-term planning for CTIO is intimately related to projections for the observatory budget. At least three factors are squeezing on the level of available resources: (1) The exchange rate between the peso and the dollar: the peso is gaining in strength against the US dollar; it is currently NOAO policy to cover unfavorable changes in the exchange rate off the top of the NOAO budget. (2) The NSF budget for astronomy and for the NOAO may well continue to decline in real purchasing power over the next five years. (3) The complexity of tasks to be covered by NOAO staff is increasing steadily. Along with the othere divisions of NOAO, CTIO is preparing a contingency plan for level dollar funding for the next five years. Meanwhile, Chilean professional salaries are expected to reach values similar to those in Tucson by the end of the decade. Even with substantial improvements in efficiency, the overall impact of decreasing long-range budgets for CTIO will inevitably force cuts in the projects at the bottom of the priority list given above.

Malcolm Smith

Table of Contents

4-m Image Quality Improvements (1Mar95)

Table of Contents

4-m Image Quality Improvements (1Mar95)
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

After several years of work on a whole suite of upgrades to the CTIO 4-m telescope, we are now starting to see substantial improvements in the image quality there, and the telescope is now regularly delivering sub-arcsecond images. Figure 1 shows the improvement in image quality over the past two years. The solid curves are results measured at zenith using the seeing monitor at the f/8 focus. These are compared in each panel to the site seeing data taken several years ago in the free air at ground level (dashed curves). Obviously, something is still systematically limiting the performance at the 0.7" level. However, since the time of the commissioning of the active optics system on 21 October 1994, the median seeing has been 0.96" (lower panel), an improvement of about 0.3" over the case two years earlier (upper panel). This means that background-limited objects can be observed in approximately 70% less time. We attribute this improvement to the combined effects of the whole package of upgrades to the optics and thermal environment that has been carried out over the past several years.

[Figures not included]

The last major project in the 4-m active optics upgrade, the image analyzer for the 4-m Cassegrain focus, is now being worked on at high priority. It consists of installing a Shack-Hartmann lenslet array and a CCD on a spare port in the Cassegrain offset guider system. Engineering tests on the telescope are taking place as this is written. Once it is finished, the image analyzer will be used to regularly check the collimation of the f/8 secondary (especially after top-end flips) and to update the maps of active optics corrections a few times per year. It will also be available to tune up the active optics in real time for critical observations.

Also a CCD-TV camera has been installed on the autoguider at the 4-m Cassegrain focus. This is a standard CTIO camera using autoguiding software written by Steve Shectman. The result is a great improvement in the accuracy of the guiding; during tests in 0.8" FWHM seeing, there was no difference between the image diameters obtained in 30 second unguided exposures and 30 minute guided exposures. In the f/8 configuration, the guider works reliably on stars in the magnitude range 14 &lt V &lt 16. We are grateful to Steve Shectman for providing us with his elegant software.

J. Baldwin

Table of Contents

CTIO Instrumentation News (1Mar95)

Table of Contents

CTIO Instrumentation News (1Mar95)
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

While the budget cuts described above are forcing us to retire a number of less-used instruments (see accompanying article), we are continuing to push forward to provide state-of-the-art instrumentation for the telescopes on Cerro Tololo.

The CTIO Infrared Spectrometer (IRS) was re-commissioned in July with a 256 X 256 InSb detector, and has now been used for several successful observing runs. The detector is run with a Wildfire controller system installed by the NOAO Instrumentation Group in Tucson. The useful slit length is ~16" on the 4-m telescope. A new 75 l/mm grating has been bought, which provides for high efficiency observing of faint objects at resolution R~600 in the I,J,H and K bands. We are preparing to test a cross-dispersing system in the IRS, which will produce an echellette format with five orders. Further information is provided below, as well as in NOAO Newsletter No. 39.

The CTIO IR Imager (CIRIM) has now seen extensive use, mainly on the 1.5-m telescope. Preliminary information on performance was given in NOAO Newsletter No. 40, with additional results provided below.

Other projects completed over the past three months include a new filterwheel for the Cassegrain CCD systems, which will take five 4 X 4 inch filters, the conversion of the 4-m Telescope Control System to the VxWorks operating system, and fabrication of the mechanical parts for two Arcon boxes for KPNO.

See the "CCD News" article for the latest in our adventures with the installation of the Loral 3K X 1K CCD in the Air Schmidt camera for the 4-m spectrographs, as well as the progress toward a new CCD camera and filter bolt system at the Curtis Schmidt.

J. Baldwin

Table of Contents

Changes in Available Instrumentation (1Mar95)

Table of Contents

Changes in Available Instrumentation (1Mar95)
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

The continued cuts in the CTIO budget - described in more detail elsewhere - have forced us to make further restrictions in the instrumentation offered on the various telescopes. We need to provide adequate support for the instruments we do offer, while retaining some resources for upgrading the 4-m telescope, with its associated instrumentation, in order for it to remain competitive over the next decade. We recognize that at this point we are decommissioning instruments that still are scientifically productive, but we simply do not have the resources to support them adequately.

4-m Telescope

ASCAP

We will no longer support use of the ASCAP on the 4-m telescope. It works reliably on the 1.5-m and 1-m telescopes, where we continue to offer it, but our experience on the 4-m is that it has been used infrequently, and that when it is used there it has persistent electrical noise and other problems that we do not have the resources to track down and solve.

We recognize that for certain programs - fast time-series photometry of faint objects - there is no alternative instrument available. For this reason, we will allow use of equivalent visitor instrumentation, with the clear understanding that we can provide only extremely limited assistance in set-up and trouble-shooting.

Photographic Plates

We will continue to support use of photograpic plates at prime focus, but observers must be prepared to supply all their own plates, unless we happen to have suitable plates left over in stock. We will not restock plates as they are used up or age. Observers wishing to use plates must provide a strong justification for using plates as opposed to PFCCD. Note that the 4-m darkrooms are closed (because of the heat they generate), so all plate developing must be done in the Schmidt darkroom. Plate loading may be done in the ex-darkroom, since the old plate-loading room has been eliminated.

CS/CCD + Blue Air Schmidt

Continued problems with our Loral 3K chip imply that the Blue Air Schmidt will continue to be offered with the Reticon chip for an uncertain period. We hope to have a working 3K chip by second semester, but this cannot be guaranteed.

1.5-m Telescope

CS/CCD

The implementation date of the Loral 1200 X 800 chip on the 1.5-m spectrograph is uncertain. We will bring this chip up as resources permit, but since we have not yet even progressed to the point of doing lab testing, we can provide no guarantees as to availability or performance. Plausibly, it will be available by second semester with "typical" Loral performance.

1-m Telescope

CS/2DF

The 2D-Frutti decommissioning has been accelerated. The instrument was not scheduled for first semester, and the spectrograph will be removed from the telescope in March. The only instrument available on the telescope will be ASCAP, plus appropriate visitor instrumentation (see following).

CIRIM

We have authorized use of the IR Imager (CIRIM) on the 1-m for a limited program intended to help calibrate faint standard stars suitable for use on the 4-m telescope (and larger). This will be carried out in such a way as to minimize the support burden. Based on experience with this program, we will decide whether it is feasible to offer CIRIM for general use on the 1-m in future, that is in 1996. This may be in the form of a limited service observing program. Some improvements to the 1-m telescope would be required (i.e., a decent focus encoder), so this depends in part on whether they can be carried out this year, as well as whether the FY 1996 budget permits us to provide the appropriate observer support. We regret that we are not in a position to support it for visitor use any sooner.

Schmidt Telescope

Plates

Scientific use of plates on the telescope is discontinued. The only instrument available for use will be CCD direct. Note that the darkroom will be retained, both for possible use by 4-m observers (see above) as well as for engineering tests and plate testing.

Visitor Instruments

We continue to welcome visitor instruments on the two larger telescopes, as well as on the 1-m. We caution, however, that we can provide only limited support, and that observers with visiting instruments must expect to use the telescopes "as is." This caution applies especially strongly to the 1-m, which may well be unsuitable for some instruments because of their weight or electrical requirements.

J. Elias, J. Baldwin, M. Smith

Table of Contents

CCD News (1Mar95)

Table of Contents

CCD News (1Mar95)
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

As reported previously (NOAO Newsletter No. 40, p.25) we encountered unexpected problems with the installation of a Loral 3K X 1K CCD in the Blue Air Schmidt camera, to be used with the 4-m spectrographs. The science grade detector exhibited many bright columns and its performance was only marginally acceptable. We have since obtained a replacement CCD and hope to install and test it soon. This CCD has a two-component AR coating and should have better red QE and lower fringing than our first Loral. In the meantime we have taken the opportunity to make minor mechanical modifications to the adjustable CCD mount in order to simplify alignment procedures. Until the commissioning of the new CCD is completed we will continue to offer the Reticon CCD plus Air Schmidt camera and the Tektronix 1024 CCD plus Folded Schmidt camera. We definitely plan to have the Loral available during first semester 1995, but the date is still uncertain. Users should contact Steve Heathcote or Bob Schommer for information on the availability of the Loral, or for details of the characteristics of our other CCD/Camera combinations.

Work on testing the STIS 2048 CCD, destined for the Schmidt telescope, has proceeded slowly due to pressure from other projects. An engineering grade CCD has been tested and it is hoped that the science grade CCD will be installed in its dewar in late January. The new filter bolt and shutter assembly, under construction at the University of Michigan, has suffered some delays and telescope tests will not occur before March.

Tektronix 2048 #3 CCD, normally dedicated to direct imaging at the 0.9-m telescope, has had a disconnected bond wire successfully re-attached by Mike Lesser at the University of Arizona. At the moment we are still reading the CCD through two channels, but plan to implement quad readout as soon as the telescope schedule allows sufficient time for the necessary engineering work.

Alistair Walker

Table of Contents

IR News (1Mar95)

Table of Contents

IR News (1Mar95)
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

CIRIM Update

Since the December 1994 Newsletter No. 40 we have conducted additional engineering tests with the CTIO IR Imager on the 4-m, 1.5-m, and 1-m telescopes. A table summarizing the performance on the different telescopes is given below. It should be noted, though, that the values presented are representative, particularly the background values, which can vary by factors of 2 depending on airglow (below 2.2 um) and temperature (2 um and above).

CIRIM Performance

	ADU/sec on 15th mag star		Background (mag/sq arcsec)	
Filter	1.5-m f/7.5	4-m f/7.75	1.5-m f/7.5	4-m f/7.75
J	871	135	16.5	16.1
H	887	136	14.5	14.2
K	608	94	12.8	12.4

Notes: The 1.5-m measurements were made on a colder night (8 deg C) than the 4-m measurements (15 deg C). Signals in the KS filter are slightly less than those in K, while backgrounds are approximately a factor of 2 lower. The gain of the instrument is 9 e-/ADU.

Which telescope/focus should I use?

Users who want to propose to use CIRIM obviously need to decide which telescope to use; it is also useful (and, in some cases, necessary) to decide which focal ratio will be used as well. The following rules should be helpful. They are intended for broadband (JHK or JHKS) work; prospective users of narrowband filters can use the rule of thumb that both signal and background in a 1% filter are about 1/20 those in the corresponding broadband filter.

On the 1.5-m telescope, a practical limit for stellar photometry corresponds to a 1-sigma limit somewhat fainter than K=20, for about an hour elapsed time on the telescope. That is, if you just want to detect something (20% photometry), you can work down to at least K=18, but if you want reasonably precise photometry, you are limited to about K=16. This rule applies to aperture photometry in the case where the image is not badly under-sampled - i.e. the limits at f/7.5 on the 1.5-m will be several tenths of a magnitude brighter. If you have a field where you can do point-spread fitting and then calibrate the data using a brighter star, you can probably gain as much as a magnitude, although this has not been demonstrated as yet.

On the 1.5-m, the choice of focal ratio depends on the program. For observations where field is important, or where the objects are reasonably resolved (galaxies, for example), the f/7.5 focus is preferable. The f/13.5 focus provides a better scale for stellar work, and may be better for extended objects which are significantly smaller than the field of view, because of the better scale. The pixel scale at this focal ratio still under-samples the telescope images - typical measured image FWHM is &lt 2 pixels - but for most aperture photometry this is not critical.

For very precise photometry, it is probably desirable to illuminate individual pixels more uniformly, and for PSF fitting, it is necessary to have better sampling. In both of these cases, use of the f/30 focus is preferred in principle. The field of view is, of course, quite small (75") and the secondary is significantly undersized (it was originally intended to chop 20'), with consequently lower signal levels, and the background is presently somewhat higher because we don't have a precision Lyot stop with central obstruction for f/30. We therefore recommend use of the f/30 only for precise photometry (better than 2%) and for work in crowded fields. For other stellar photometry, we would recommend f/13.5, except for survey work, where f/7.5 is usually preferable. Note that it is possible to switch between f/13.5 and f/7.5 on the 1.5-m in ~20 minutes, while the f/30 top end must be scheduled in advance. Therefore, if you think you may need to use the f/30 focus but are not certain, it is desirable to consult with one of the local staff before submitting your proposal.

On the 4-m telescope, there is not at present much advantage to use of the f/30 secondary. Our tests show that the image improvements made on the telescope have resulted in f/8 images that are very nearly as good - if not just as good - as those produced at f/30, which is to say &lt 0.8" FWHM. While this means that the images are somewhat under-sampled (usually 1.5-2 pixels), this is adequate for aperture photometry. In addition - and this is important - the automatic guider on the 4-m only works well at f/8; the available field of view of the guider and the field of view and scale of the guide probe are such that finding guide stars at f/30 is problematical, and guiding on them is difficult. Finally, relative to the f/8 focus, the f/30 focus shows higher background and lower signal levels (due to the small Lyot stop and undersized secondary respectively), just as on the 1.5-m. As a result, we recommend use of the f/8 focus for all 4-m programs; anyone who thinks his or her program may be one of the rare exceptions is advised to consult with us before submitting a proposal.

IRS News

New Gratings

We have received and tested the new cross dispersed grating for the IRS. The grating has survived several thermal cycles in the lab and appears to be working as expected. The cross dispersed grating will offer full spectral coverage from 0.9 to 2.4 um in 5 orders in a single setting. The slit length available with the cross dispersed grating will be slightly reduced to avoid overlap between orders. The resolution is similar to that of the old 12 l/mm grating and will presumably replace that grating for all applications. Since it does not have to use a blocking filter and you get all the light from both orders it should be more efficient than using a normal grating. The cross dispersed grating will be tested on the telescope in early February so look to this space in the future for actual performance measurements.

We have been able to test the 1.9-um blaze 75 l/mm grating and find it to work well. The true blaze wavelength appears to be somewhat shorter than the nominal value, with the result that it is recommended for use in first order rather than second order in the J band. We expect that for most programs at "low" spectral resolution, the grating of choice will be the cross-dispersed grating and not the 1.9-um 75 l/mm grating, but the latter does offer slightly higher resolution. Given the performance of both gratings, and the absence of a long slit in the IRS, we will no longer offer the 12 l/mm grating; its performance beyond 3 um is limited by high count rates and a higher resolution grating will, in general, give higher overall efficiency.

Popular Gratings

Since the IRS can have only two gratings installed at once, and since grating changes require warming up the instrument, opening it, and then cooling it down again, we try to block-schedule particular grating combinations, and in some cases we have to modify individuals' requests in order to schedule time for them. Based on our experience to date, the most popular gratings are the cross-dispersed grating, the 4.5-um 75 l/mm grating, and the 210 l/mm grating. The first offers a complete 1-2.5 um spectrum at low resolution; the second provides a resolution that is suitable for classification work without requiring multiple grating settings; the third provides higher resolution and is a good choice for the long wavelength windows.

In particular, users who request the 1.9-um 75 l/mm grating should clearly state why the cross-dispersed grating is not useful to them; if the reason is inadequate spectral resolution they should also indicate why the higher resolution 75 l/mm grating (4.5-um blaze) is not preferable. Similarly, although the 632 l/mm grating does offer the highest possible spectral resolution, it is incompatible with 3 and 5 m programs and thus harder to schedule; users who request it should indicate whether the 210 l/mm grating is acceptable or, if not, why.

We will, of course, try to schedule whatever is requested and justified, but CTIO's block-scheduling policy does imply that an unusual IRS configuration with a TAC grade near cut-off will lose out in the scheduling process to a proposal that does not require an extra instrument set-up.

J. Elias, R. Elston, B. Gregory

Table of Contents

The REU Program Comes to CTIO (1Mar95)

Table of Contents

The REU Program Comes to CTIO (1Mar95)
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

Beginning in mid-January, visitors to CTIO will see some new, young faces in La Serena and on the mountain. The popular and productive NSF-funded Research Experiences for Undergraduates program will bring 4 US college students to CTIO for a period of 11 weeks, where they will work with staff astronomers on a variety of research projects. They will be joined by a master's student from the University of Chile for the month of February.

Students will live on the La Serena compound, but an important part of their experience will be opportunities to observe, so don't be surprised to see them on the mountain. Their program also includes weekly seminars by staff to introduce them to observational techniques and the science done at CTIO. The five students inaugurating the program are:

Howard Beckley (New Mexico Institute of Mining and Technology) is working with Jack Baldwin, Richard Elston, and Brooke Gregory on a suite of instrumentation projects.

Ive Kohnenkamp (University of Chile) is working with Mark Phillips and Mario Hamuy on the CTIO supernova survey.

Marc Kassis (Willamette University) is working with Eileen Friel on deep CCD photometry of old open clusters in the outer Galactic disk.

Maritza Tavarez (Hunter College of CUNY) is working with Richard Elston on IR properties of supernova remnants in the Large Magellanic Cloud.

Sarah Tuttle (University of California, Santa Cruz) is working with Malcolm Smith on a search for QSOs at very high redshift.

We are pleased to have these students with us, and look forward to a productive future for the REU student program at CTIO. Keep us in mind next fall when we hope to offer this program for undergraduate students again.

Eileen Friel

Table of Contents

CTIO Telescope/Instrument Combinations (1Mar95)

Table of Contents

```
CTIO Telescope/Instrument Combinations (1Mar95)
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

4-m Telescope:
     ARGUS Fiber-Fed Spectrograph + Blue Air Schmidt Camera + Loral 3K/Reticon
                                                               CCD^e[40,41]
     ARGUS Echelle FF. Spect.     + Blue Air Schmidt Camera + Loral 3K/Reticon
                                                               CCD^e[40,41]
     R-C Spectrograph             + Blue Air Schmidt Camera + Loral 3K/Reticon
                                                               CCD^e[40,41]
           "                      + Folded Schmidt Camera   + Tek 1K CCD [25,26]
     Echelle Spectrograph         + Blue Air Schmidt Camera + Loral 3K/Reticon
                                     CCD^e[40,41]
           "                      + Folded Schmidt          + Tek 1K CCD
                                                               [22,23,25,26]
           "                      + Long Cameras            + Tek 2K CCD
                                                               [23,25,26,39]
     Prime Focus Camera     + Tek^b CCD [36,39]
           "                + Photographic Plates^c [23,38,41]
     Cass Direct            + Tek^b CCD [39]
     Rutgers Imaging Fabry-Perot + Tek^b CCD [25,26]
     CTIO IR Imager + 256^2 HgCdTe [40,41]
     CTIO IR Spectrometer + 256^2 InSb [37,39,41]

1.5-m Telescope:
     Cass Spectrograph + Loral 1200 X 800 CCD/GEC^a
     Bench-Mounted Echelle Spectrograph + Long Cameras + Tek 2K CCD [22,23,39]
     Cass Direct + Tek^b CCD [39]
     Rutgers Imaging Fabry-Perot + Tek^b CCD [25]
     ASCAP Photometer [24,25,28 ]
     CTIO IR Imager + 256^2 HgCdTe [40,41]
     CTIO IR Spectrometer + 256^2 InSb [37,39,41]

1-m Telescope:
     ASCAP Photometer [24,25,28]

0.9-m Telescope:
     Cass Direct + Tek 2K CCD [39]

0.6-m Telescope:
     ASCAP Photometer [24,25,28]

Curtis Schmidt:
     STIS 2K CCD (Direct or Prism)^d

* Numbers in boldface following an instrument indicate the most recent
Newsletter(s) containing relevant articles.  If there is no number, the 1990
edition of the Facilities Manual fully up to date.  The most recent general
summary of CCD characteristics is in 33; see also 26 and 28. Information on
telescope control guiders is in 21, 22, 24, 32.

a Loral 1200 X 800 expected for first semester 1995.  See issue [41] for
details.  GEC available until then.

b Tek CCDs available on 4-m and 1.5-m telescopes: Arcon-run only:  Tek
1K#2, 24 um pixels, Tek 2K#4, 24 um pixels. [33,34,39].

c User must supply plates.  See [41].

d STIS 20482 should be available on Schmidt in early 1995.  QE similar to
Thomson, but FOV of 68' (2.0" pixels).

e Reticon CCD will be used in Blue Air Schmidt until Loral 3K is installed
and works satisfactorily.
```

Table of Contents

Requests for CTIO Telescope Time 1 February-31July 1995 (1Mar95)

Table of Contents

Requests for CTIO Telescope Time...(1Mar95)
1 February - 31 July 1995
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

Telescope		Nights Req.	Nights Sched.	Reqd./ Sched.	Vistr. Nights	%Vistr. Nights	Staff Nights	%Staff Nights	Eng. & Maint.
4-m	Dark	178	106	1.7	84	79	22	20	9
	Bright	143	56	2.6	41	73	15	26	19
1.5-m	Dark	123	105	1.2	90	85	15	14	4
	Bright	149	64	2.3	64	100	0	0	8
1-m	Dark	72	99	0.7	91	91	8	8	7
	Bright	79	41	1.9	31	75	10	24	12
0.9-m	Dark	185	109*	1.7*	90	82	19	17	1
	Bright	96	65*	1.5*	64	98	1	1	6
Schmidt		86	87	1.0	66	75	21	24	5

* Statistics for time scheduled on 0.9-m do not include a correction for 13% of time allocated to MACHO Project each night.

Table of Contents

New Camera on 1.5-m Bench-Mounted Echelle Gives Resolution of 98,000 (1Mar95)

Table of Contents

New Camera on 1.5-m Bench-Mounted Echelle...(1Mar95)
Gives Resolution of 98,000
(from CTIO, NOAO Newsletter No. 41, 1 March 1995)

A new 750mm folded Schmidt camera has been permanently installed on the 1.5-m bench-mounted echelle spectrograph (BME). The 750mm camera has quartz optics with broad-band anti-reflection coatings and offers excellent transmission and image quality from the atmospheric UV cutoff to one micron. 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 micron pixels. The full free spectral range is imaged onto the CCD out to about 9500 .

In its first use, with a 30 micron slit on the fiber tail, the BME produced excellent images on an 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 surface of 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 micron slit. Higher resolutions will await the availability of a CCD with smaller pixels. An 800 X 1200 Loral CCD with 15 micron 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 for the latest information.

T. Ingerson, N. Suntzeff

Table of Contents

A Year of Change for KPNO (1Mar95)

Table of Contents

A Year of Change for KPNO (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

1995 is a year of fundamental change for KPNO, bringing a new philosophy of operations for our telescopes that we hope will provide new science opportunities for our user community. The changes we describe here in this Newsletter are driven by many factors: input from you, our users, the realities of life in the Gemini era, the recommendations of the OIR Panel chaired by Richard McCray, and the constant pressure of the budget. The Panel Report advocates both the importance of competitive access to national telescopes and identifies the role of KPNO to support visitors at KPNO telescopes, to operate and optimize the performance of several telescopes - especially WIYN, and to develop first-class instruments. The members of the KPNO Users Committee, chaired by John Salzer, has played a key role in the development of new models for KPNO, and we are grateful for their help and advice.

The vision of KPNO that guides our planning is one that maintains access to competitive facilities while allowing us to focus more resources on upgrading and modernizing our facilities for the future. The goal of the changes is to increase the scientific productivity of our telescopes.

Many of you have written of the difficulty of completing your programs due to short observing runs, bad weather, and the changing TAC competition level each semester. We are proposing new operations modes on both the large (4-m, WIYN) telescopes and the small (2.1-m, Coude Feed, 0.9-m, and Burrell Schmidt) telescopes to help observers complete programs within a single observing season.

Budget pressure over many years has led us to increase run lengths on all our telescopes. This change has forced an unnatural uniformity in the scope of projects proposed for KPNO telescopes. New procedures will encourage a broad range of programs to be undertaken on Kitt Peak.

While traditional observing runs are the bread and butter of optical ground-based observers, we have learned from our space astronomy colleagues the value of service and queue-scheduled observing. Expanded opportunities provided by queue and service observing at Kitt Peak should enrich all areas of astronomy.

Instrumentation changes so quickly today and is so complex that some users have difficulty taking full advantage of the scientific capabilities we offer. The new styles of operations described here should assist our users in obtaining the most science from the state-of-the-art instrumentation provided by the NOAO Instrumentation Program.

Our users have also spoken eloquently of the need for small telescopes. To preserve these capabilities in the face of serious budget constraints, we are placing more reliance on our users for operations of the small telescopes. In the longer term, we hope to shift the model for the use of small telescopes from the traditional observing runs to one of "experiments" on dedicated facilities carried out in collaboration with universities and other institutions. The closing of the 1.3-m telescope is our first opportunity to try this approach, and we welcome proposals from our user community to support this telescope for major programs.

The 3.5-m WIYN telescope is the first new large telescope for KPNO since the Mayall 4-m telescope was dedicated in 1973. The WIYN project has demonstrated the value of modern technology as well as the true quality of the Kitt Peak site in obtaining outstanding image quality and good performance. The WIYN telescope should be only the first step in our program to modernize KPNO facilities. One obvious next step is to build a twin of the WIYN telescope; this new telescope would allow KPNO to specialize each of the three 4-m class telescopes on Kitt Peak to lower operating costs while still providing the broad range of scientific capabilities needed to support ground-based optical astronomy. For example, with three 4-m class telescopes, we could dedicate the Mayall 4-m to infrared astronomy at the Cassegrain focus and wide field-CCD imaging at the prime focus. The WIYN telescope could continue to offer multi-fiber spectroscopy and deep imaging. The WIYN-Twin could be specialized for low resolution slitlet spectroscopy, fiber-fed high resolution spectroscopy, and more deep imaging. We are actively pursuing funding opportunities to build the WIYN-Twin. The modernization of observing facilities on Kitt Peak must remain a high priority if we are to continue to meet the needs of you, our users. We appreciate very much the OIR Panel recommendation in support of this goal.

In the following articles we describe in detail the new style of operations for Kitt Peak telescopes and offer strategies for success in writing telescope proposals.

Caty Pilachowski

Table of Contents

KPNO Operations in 1995 (1Mar95)

Table of Contents

KPNO Operations in 1995 (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

This year's budget for KPNO operations represents a 9% cut in level of effort compared to FY 1994. During the period 1987-1994, level funding had already reduced KPNO's resources some 29% as inflation eroded the base budget. In spite of these cuts, major new instrumentation has arrived on Kitt Peak (Hydra, SQIID, COB, 2048 2048 CCDs, etc.) bringing increasing complexity and raising support requirements. During FY 1995, a major new facility, the WIYN telescope, is coming on line and will start science operations within a few months.

In past years KPNO has struggled mightily to minimize the impact of budget cuts on our users. Telescopes are now operated with a "leaner and meaner" staff while training has been postponed; facility maintenance has been deferred in the hope of better budgets in future years; the balance of our engineering effort has shifted from projects and upgrades to telescope maintenance, endangering our program of telescope improvements to achieve better image quality; the scientific staff has absorbed a heavier and heavier burden of visitor support at the cost of new programs within the observatory. As one lean year followed another, our situation has become more and more serious. Our effort on the mountain has become diffused by trying to run too many telescopes, instruments, and programs with too few people. The purpose of the changes described below is to shift the resources we have to focus on the larger telescopes, to improve training, and to invest in modernization so that we can both continue to provide access and lower our operating costs. By making these changes now rather than next year or the year after when times are even tougher, I hope we can provide a better overall program to the community for the longer term.

The level of operations and support provided by KPNO for the last 5 years can no longer be sustained with our present budget. Radical changes are needed in the style of operations at Kitt Peak to reach a level which can be maintained with the current budget.

The Big Telescopes

Our highest priority for operations in FY 1995 is the new 3.5-m WIYN telescope, for which KPNO receives a 40% share of observing time. This year we will assume responsibility for WIYN operations and begin to carry out scientific programs for the community through queue scheduling. Both the Hydra Multi Object Spectrograph and the WIYN CCD Imager will be available for observations.

Our second priority will be continued operation of the Mayall 4-m telescope. Increased block scheduling and further restriction of the number of instruments offered will be necessary to reduce instrument changes. During dark time, the prime focus CCD imager and either the R-C Spectrograph or the Cryogenic Camera will be available. Only one instrument will be mounted at Cassegrain during each bright run. The selection of instrument offered during each half lunation will be determined by those proposals of highest scientific rank based on TAC review. The remaining time during each bright or dark run will be allocated to other programs approved by the TAC; time that cannot be scheduled in this manner will be allocated to the KPNO staff to carry out service observing for the community. Opportunities for service observations will be announced in the Newsletter and over the World Wide Web.

The Small Telescopes

More fundamental changes will take place for the 2.1-m, the 0.9-m, the Coude Feed, and the Burrell Schmidt.

Instrument changes on the 2.1-m will be limited to no more than one per month; instrumentation available on the 2.1-m telescope will be limited to GoldCam and a selection of IR instruments. Note that this restriction will blur the distinction between bright and dark time somewhat.

Run lengths on the small telescopes will be increased, and observers will be asked to use up to 25% of their clear time for service observations for shorter observing programs. We will no longer require minimum run lengths, but encourage proposals ranging from a few hours through many nights on all our telescopes.

We will no longer be able to provide personnel for observing starts on small telescopes. Technical assistance will be available during the day to install filters or gratings and to provide safety briefings. Observers must take the initiative to come prepared for their observing runs.

All observing teams at the small telescopes must include at least one observer who has used the telescope within the previous four semesters. Lists of recent users of each telescope are available over the World Wide Web via the NOAO/KPNO home page http://www.noao.edu (or give us a call and we'll send you a copy). If you or someone on your team has not used the telescope recently you must arrive a night or two early for your observing run to "observe" the previous observer, or make arrangements to come along on someone else's observing run. All small telescope observers are encouraged to be on the mountain a night early to become familiar with any new features or "bugs" at the telescope.

Telescope operators will no longer be available at the 2.1-m telescope starting with the fall 1995 semester. Observatory staff will be available at the beginning and end of the night to open and stow the telescope. At least two observers must be present for each observing run for safety reasons.

Nighttime technical staff will be reduced; technical problems which cannot be resolved easily by the staff available at night will be addressed the following day, if possible. Priority for technical assistance will be given to WIYN, the 4-m, and the smaller telescopes by aperture.

We believe these changes are in the spirit of the recommendations of both the OIR Panel and the KPNO Users Committee. We hope that our users will bear with us in the transition to this new style of operations on Kitt Peak. At the current budget level, the alternative to these changes is to close one or more small telescopes.

Caty Pilachowski

Table of Contents

Instrument Scientists and Scientific Capabilities (1Mar95)

Instrument Scientists and Scientific Capabilities (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

As part of our effort to streamline operations within KPNO, we are switching scientific staff responsibilities from the one instrument-one scientist model to the concept of Capability Scientists. Scientific capabilities include a class of instrumentation and telescopes appropriate to particular types of scientific programs, such as CCD imaging or IR spectroscopy. Scientific capabilities are listed at the end of the article with the responsible staff contacts, and associated instrumentation and telescopes.

We hope that by providing contacts for capabilities rather than instruments, we can better assist our users to understand the tradeoffs associated with different instruments and telescopes for their own scientific programs. If you have questions about KPNO instruments and capabilities, or would like advice on the use or selection of any KPNO instruments, please contact the appropriate Capability Scientist. The first name listed for each capability is the primary contact for questions about KPNO instrumentation.

We are also in the process of rearranging our user manuals to reflect this new philosophy. Thus, rather than have separate instrument manuals for the CCD camera at the 4-m, WIYN, 0.9-m, and Burrell Schmidt telescopes, there is now a single "Direct Imaging at Kitt Peak" manual which provides simple comparisons between the characteristics of the various imaging facilities. We are planning to update our manuals in other areas similarly. We believe that this will make life easier both for the user in deciding what is the best match of the instrument to the science, and in having to maintain only a few manuals! A complete listing of the available KPNO manuals appears elsewhere in this Newsletter.

CCD Imaging

Ata Sarajedini, George Jacoby, Phil Massey
- 4-m Prime Focus CCD
- WIYN Imager
- 0.9-m CCD Direct
- CCDPHOT
- Burrell Schmidt CCD

Low-to-Moderate Resolution Optical Spectroscopy

Buell Januzzi, Taft Armandroff, Phil Massey
- 4-m R-C Spectrograph
- 4-m CryoCam
- 2.1-m GoldCam

Multi-Fiber Spectroscopy

Sam Barden, Taft Armandroff
- WIYN Hydra

High Resolution Optical Spectroscopy

Sam Barden, Daryl Willmarth
- 4-m Echelle Spectrograph
- Coude Spectrograph

IR Imaging

Ron Probst, Mike Merrill
- 4-m and 2.1-m IRIM
- 4-m and 2.1-m COB

IR Spectroscopy

Dick Joyce
- 4-m and 2.1-m CRSP
- 4-m and 2.1-m COB

Caty Pilachowski

Successful Strategies for the "New" Kitt Peak (1Mar95)

Table of Contents

Successful Strategies for the "New" Kitt Peak (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

While the new operations plan for KPNO offers many new opportunities, it also requires new strategies in applying for telescope time. Some proposals will be assigned telescope time directly, and some will be assigned to be done as service observing during other programs. How should you prepare your proposal for telescope time to optimize your chances for success?

The most important factor is, of course, the scientific justification. Be sure the justification explains carefully what your scientific goals are, how the proposed observations will lead to that goal, how the scientific problem you are addressing fits into the context of your field, and why the problem is important in your field. Consider also the best choice of instrumentation for your program. Here, a call or e-mail to the staff astronomer associated with the instrumentation you need can provide valuable advice. Staff contacts for each scientific capability (IR imaging, faint object spectroscopy, and so forth) are listed in the previous article.

Determine how much clear time (in hours or nights) you need to complete your program for the semester you are proposing for time. Include calibrations, acquisition, overhead, etc. but don't pad it for weather - we will do that. Again, a call to the capability scientist can be helpful. We encourage short programs as well as long ones.

Note that to achieve savings in operations, we will blur somewhat the distinction between bright and dark instruments, especially on the 2.1-m telescope. IR instruments will be available during dark time, and the GoldCam CCD spectrograph will be on the telescope during some bright time.

For telescope time on the small telescopes (2.1-m, Coude Feed, 0.9-m, and Burrell Schmidt), check the list of recent observers for each telescope (available over the World Wide Web via the NOAO/KPNO Home Page, or give us a call). If your project team does not include a recent observer, you can become one by coming early for your run to learn from the previous observer, or coming to learn to use the telescope during someone else's run. Alternatively, you can request that your program be carried out via service observing, as long as it is relatively short.

Submit your proposal via e-mail or on paper (we strongly encourage electronic submission, as described in an accompanying article). The Telescope Allocation Committee will review all proposals and rank them in order of scientific merit. After the review process is complete, KPNO staff will prepare the telescope schedule. We will define instrument blocks based on the scientifically highest ranked proposals, assign telescope time to proposals which request large amounts of time, and assign shorter proposals to be done as service observing during longer programs.

Caty Pilachowski

Table of Contents

Electronic Proposal Submission Continues (1Mar95)

Table of Contents

Electronic Proposal Submission Continues (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

A year ago we began the experiment of accepting telescope proposals (including figures!) electronically. This has proven very successful, with

77% of our proposals being submitted via e-mail last semester including some 108 figures! We are continuing the process this semester, with no changes in the form or the procedure. Minor changes have been made in the instructions, which are given below:

1) Obtain the observing proposal package by e-mailing kpnoprop-request@noao.edu. You will have to fill out the LaTeX observing proposal template. Alternatively, these forms are available via anonymous ftp to ftp.noao.edu in the subdirectory kpno/kpnoforms/. You can similarly obtain the files via the World Wide Web from the NOAO home page http://www.noao.edu.

2) Fill out the LaTeX observing proposal template with a scientifically exciting, well-reasoned, and clear program. Include whatever figures are needed to make your case in the form of encapsulated PostScript files. (See the example provided as part of the package.) If you are applying for WIYN time you will also need to fill out the queue-observing form which specifies all the parameters necessary to carry out the observations (analogous to HST's Phase II proposal).

3) Run LaTeX on the files and fiddle with them until they are letter-perfect or at least in exactly the form you want the TAC to see them. If you have questions along the way, e-mail kpnoprop-help@noao.edu, or give Judy Prosser or Marlene Saltzman a call at the Kitt Peak Observing Support Office (602-325-9279 or 602-323-4135).

4) Submit the observing form to kpnoprop-submit@noao.edu. You should immediately receive an acknowledgement message assigning you a proposal ID. (If you don't, send e-mail to kpnoprop-help@noao.edu or give Judy or Marlene a call.) Included will be instructions for submitting the figures and/or queue observing form. You should also receive acknowledgements for those.

Electronic submission of observing proposals has made our lives easier as well, and we encourage everyone to submit their proposals in this way. Suggestions for improvements to the process can be directed to kpnoprop-help or (pmassey@noao.edu).

Phil Massey

Table of Contents

Some Reminders from the TAC (1Mar95)

Table of Contents

Some Reminders from the TAC (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

During the last series of telescope Time Allocation Committee meetings it became clear that some individuals may have forgotten some of the guidelines that should be followed in submitting observing proposals to KPNO. As the next proposal submission cycle is approaching, now is an appropriate time to point out some of these guidelines.

Long Term Status

The rules under which a proposal may be considered by the TAC for long term status are fairly simple and well defined. In order to qualify for long term status, a proposal must successfully argue that all of the data must be obtained before the basic scientific question being posed can be answered. Simply enlarging a sample for the sake of completeness or better statistics is not sufficient. Put another way, a long term status project is one in which no conclusions will be able to be drawn if, say, only half the observations are made. In its simplest form it is an all or nothing criterion.

Other Facilities

This is often a confusing issue. Having access to other facilities does NOT preclude proposing to KPNO or jeopardize its discussion by the TAC. Many successful KPNO observers also have access to other facilities. What the TAC very much wants to see is the reason why observations are also needed with KPNO telescopes. Such factors could be unique or complementary instrumentation, darker site, coordinated observations involving other sites, etc. Problems arise when it is known that the principal investigators or co-investigators are affiliated with an organization that has access to other facilities and yet there is no explanation given as to why there is also a need to use KPNO telescopes. If such an affiliation exists but is not real, due to internal organizational structure, this should be explained, as the TAC is usually unaware of these internal restrictions.

Length

The guideline for the length of the scientific justification is one page of text plus figures. This criterion is often violated, sometimes flagrantly. Violation of the length guideline may not be beneficial, as it can serve to reduce the degree of benevolence with which a given TAC member may view a proposal. Repeated offenses are often remembered. If a scientific program is well defined and well thought out, a convincing justification can easily be made to fit on one page and within the print size requirements.

Form

Please be sure to use the current proposal submission form; we are still receiving the occasional proposal on obsolete forms. Electronic submission, which is described in an accompanying Newsletter article, works well and is strongly encouraged.

David De Young

Table of Contents

Instruments Available on Kitt Peak Telescopes: Fall 1995 (1Mar95)

Table of Contents

Instruments Available on Kitt Peak Telescopes: Fall 1995 (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

The instruments listed below will be available for visitor use on KPNO telescopes during the August 1995 - January 1996 observing semester. Proposals for this period are due 31 March 1995. Visitor instrumentation is welcome at KPNO and can be scheduled if the instrument: a) is unique; b) is required for a project of very high scientific merit; c) conforms to block scheduling; and d) has small impact on KPNO operational and engineering resources.

4-m Telescope:	R-C Spectrograph + CCD (T2KB) Echelle + UVFast, Red Long, or Blue Long Camera + CCD (T2KB) PF Camera + direct CCD (T2KB) IR Cryogenic Spectrometer (CRSP) Cryogenic Optical Bench (COB) IR Imager (IRIM) CryoCam (with 800 X 1200 Loral chip)
WIYN Telescope:	Hydra + Bench Spectrograph (T2KC) CCD Imager (S2KB)
2.1-m Telescope:	GoldCam CCD Spectrometer (F3KA) Cryogenic Optical Bench (COB) IR Cryogenic Spectrometer (CRSP) IR Imager (IRIM)
Coude Feed:	Coude Spectrograph + Camera (5 or 6) + CCD (F3KB) NICMASS Array (Shared Risk)
0.9-m Telescope:	CCD Direct Camera + CCD (T2KA) CCD Photometer (CCDPHOT) (T5HA)
Burrell Schmidt:	Direct or Objective Prism + CCD (S2KA)

Caty Pilachowski

Table of Contents

WIYN Project Summary (1Mar95)

Table of Contents

WIYN Project Summary (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

Since the last Newsletter, activity at the WIYN has centered primarily on commissioning the WIYN telescope itself and its auxiliary facilities. As this Newsletter reaches you, Project attention will have turned primarily to instrument commissioning.

The WIYN Observatory continues to have the best delivered image quality (DIQ) on Kitt Peak. DIQ measurements accumulated since 1 September reveal a median image size of 0.7-0.8" FWHM in the R-band for 10s exposures. These exposures are taken under open-loop telescope and Nasmyth instrument rotator tracking. Subsecond images have been seen in longer (10-60s) exposure times but open-loop tracking errors generally degrade image quality for exposure times longer than 10 seconds.

Numerous facility-level tasks were completed since the last update, including installation of thermocouples and flat-field lamps on the telescope structure and installation of a dome flat-field screen (i.e., the WIYN "Great White Spot"). Work on the WIYN control system by the University of Wisconsin Controls Group (UWCG) has gradually tapered off during this period as control system delivery has been substantially completed. Major outstanding tasks include completed implementation of closed-loop guiding and completed delivery of documentation and spares. UWCG continues to support "bug" fixes, both major and minor, in hardware and software. However, responsibility for control system maintenance is being slowly transferred from the UWCG to the NOAO/KPNO WIYN operations staff.
The Project is currently finishing a series of control system performance and acceptance tests. Completion of these tests have been hampered by a combination of bad weather, closed-loop guiding tests, and the installation of the Wide-Field Corrector.

Work on the WIYN control system graphical user interface (GUI) is proceeding smoothly and an alpha version is currently being tested at the telescope. A beta version of the GUI should be released to the telescope operators by 1 February.

The most exciting advance at WIYN in recent months was the successful installation of the Wide-Field Corrector (WFC) on the MOS Nasmyth port. The WFC was installed in mid-December under the direction of Dan Blanco, WIYN Project Engineer, after being assembled and tested in the NOAO optics shop. The WFC was designed to produce good, site-limited images over the 1 deg field that MOS/Hydra can position fibers. Initial testing of the WFC in situ with a CCD demonstrated that it could produce at least 0.8" images on axis. The Lockheed Camera was then mounted on the MOS port to allow the acquisition of 14-inch photographic plates. The initial plates were obtained in mid-January and look excellent. While plate analysis is just beginning at this time (late January), the images appear to be sub-arcsecond, circular, and uniform in size over the entire 53 53 arcmin plate field-of-view.

These long exposure (20 min) plates were hand-guided. The resulting high quality plates suggest that closed-loop guiding should work quite well. Furthermore, the stellar images across the plate field-of-view show no indication of smearing due to inaccurate field derotation suggesting that the MOS Nasmyth Instrument Rotator (NIR) is functioning well under open-loop derotation.

The primary reason for acquiring these plates, however, is to determine empirically the WFC optical distortion pattern. Accurate fiber positioning by MOS/Hydra requires accounting for this pattern in the positioning algorithm. Thus, acquisition of these plates initiates MOS/Hydra commissioning. Given the planned MOS/Hydra commisioning tasks, it seems unlikely at this time (late January) that MOS/Hydra will be available for general shared risk use before 1 June 1995.

Work on the WIYN Imager also continues. The heart of the Imager, the STIS 2048 2048 CCD designated S2KB (described in the last Newsletter), is now in regular use at WIYN under Harcon control. The Indiana University Imager group led by Kent Honeycutt has recently upgraded the Filter/Shutter Assembly (FSA) to correct a filter wheel imbalance problem. The initial WIYN Imager filters, a 4 4 inch Harris filter set identical to the other KPNO 4 4 inch Harris filter sets, has been completed and installed. At this time, photometric and flat-field property characterization is about to begin. These parts of the Imager should be completed and commissioned by 1 March 1995.

Unfortunately, progress on the Instrument Adaptor Sub-system (IAS), the WIYN guider and acquisition "box," has been slowed in recent months as resources have been diverted to complete the WFC installation and testing. The Project is now working towards completing initial IAS commissioning by early May. This delay in the IAS schedule means that the Imager will not be available for general shared risk use before 15 May 1995.

As the advent of science operations nears, assuring a smooth transition from the construction/commissioning team to the operations staff has grown in importance. To facilitate this process, a series of WIYN Workshops has been organized by Dave Sawyer, WIYN Site Manager, who is currently part of the commissioning team but will have overall responsibility for WIYN operations once commissioning is completed. Each Workshop addresses a specific major WIYN sub-system (e.g., the control system, the primary mirror system, the enclosure) and is given by Project members who were involved the construction and commissioning of that sub-system. In turn, Workshop attendees are NOAO/KPNO staff who will be operating and maintaining these sub-systems during WIYN science operations.

WIYN is currently being operated every weeknight except NOAO holidays. Continuous night-time operation will be initiated as instrument commissioning warrants but is unlikely to begin before April.

Upcoming anticipated major Project milestones include: (1) completion of closed-loop guiding implementation in mid-February; (2) completion of control system commissioning and acceptance testing in early March; (3) MOS/Hydra commissioning completion in late May; (4) IAS/Imager commissioning completion in early June; (5) start of shared risk science operations in late May or early June.

Dave Silva

Table of Contents

A Report on WIYN Image Quality (1Mar95)

Table of Contents

A Report on WIYN Image Quality (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

Since June 1994, the WIYN Project staff has been making fairly regular delivered image quality (DIQ) measurements. Most of these measurements were made by our observing technicians, Alex Macdonald and Bridget Watts, but Dave Sawyer, the WIYN Site Manager, and Nick Roddier, the NOAO engineer with primary responsibility for the WIYN active optics control, also significantly contributed to this effort. A histogram of these measurements is presented below.

[Figure not included]

As the figure illustrates, the median WIYN DIQ between June 1994 and January 1995 was 0.7" FHWM. This is true whether all measurements are considered or only those with exposure times equal to or greater than 10 seconds (i.e., the hatched measurements). Furthermore, 24% (18/74) of the total dataset values and 18% (6/34) of the reduced dataset values are 0.6" FWHM or better.

All measurements were made with a cooled science grade CCD with 0.2" pixels in the R-band. The fields imaged were typically at airmasses less than

1.05 (i.e., at zenith distances less than 25 degrees). For ease of use, image sizes were measured using the IRAF task IMEXAMINE. The measured FWHM was rounded up to the nearest tenth of an arcsec before being included in the figure. The WIYN DIQ was usually measured immediately after making a delivered wavefront measurement and tuning the WIYN active optics system, if the measured wavefront indicated that the latter was necessary. These measurements were not guided. In fact, many of the longer exposure images show evidence for slight tracking errors and small deviations from ideal focus. When tracking and focus is brought under better control, the median DIQ will probably be reduced, perhaps by as much as 0.1" FWHM.

Qualitatively, the typical WIYN stellar image does not look purely Gaussian. Rather, it has a tighter core sitting on top of slightly broader wings, reminiscent of a Moffat function. This raises the interesting question: how does one quantify DIQ? Different measurement techniques give different answers. For example, the FWHM calculated by the IRAF task PSFMEASURE, now is typically 0.1" larger than the FWHM calculated by IMEXAMINE. On the other hand, a fitted Moffat function can have a FWHM which is 0.1" or smaller than the IMEXAMINE FWHM. This is demonstrated by the image published in the September 1994 NOAO Newsletter (p. 3). A Moffat function kindly fitted by Peter Stetson (DAO) had a mean FWHM of 0.45", which is the image size reported in the Newsletter. The PSF FWHM measured by IMEXAMINE, however, was 0.6". The WIYN Project will continue to use IMEXAMINE since it is easy to use and appears to deliver a conservative DIQ estimate.

Over the next six months, the Project intends to study in detail how DIQ is affected by such things as primary mirror temperature and shape, dome venting, and telescope zenith distance.

Dave Silva

Table of Contents

Cryogenic Camera News (1Mar95)

Table of Contents

Cryogenic Camera News (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

The Cryogenic Camera (aka "CryoCam") is a low-to-moderate resolution (8-15 A) CCD spectrometer on the 4-m telescope. It was designed for high efficiency, with transmission gratings acting as the dispersive element.The detector is a dedicated Loral 800 X 1200 CCD with 6-8 e- read noise and good cosmetics. The thinned instrument is used either with a 5' slit, or with "multi-slit" masks, which allow a dozen or so objects within a 5' field to be observed simultaneously.

During the early fall 1994 observing season, we noticed that the actual read-noise achieved on the telescope was typically much worse than the laboratory value. Subsequent tests have revealed a grounding problem with the electronics, and we are in the process of correcting the problem. Users of CryoCam during the current scheduling period will be pleased to find the read-noise is as advertised.

Grism	Resolution(A)	(lambda)(A)	A/pixel	Filter	CoveragA)
650	12	4950	3.2	BG-38	3800-6800
770	15	5970	4.3	GG420	4300-8500
730	15	8010	4.3	OG530	5500-10000
780-II	8	4850	2.2	BG-38	3800-6100

Note that in the case of multislit masks, the central wavelength may differ by up to 15% of the full wavelength coverage, depending upon the location of the object in the field.

We have also completed measuring the overall (telescope + instrument) quantum efficiency of the system. Without a slit, the overall throughput peaks at 20%. We show these efficiency curves in the accompanying figures. For planning purposes, we also show the actual number of photons/sec- detected for the standard star G191B2B with one of the grisms, along with the magnitude of the standard star as a function of wavelength. This figure can be used with the former to predict the expected count rate for any grism combination. For instance, at 6000 grism 770 has an efficiency roughly twice that of grism 650. We obtained 130 photons/sec- with grism 650 of the standard star (m = 12.0 at 6000 A) and thus we would expect to get about 260 photons/sec- with grism 770 of m = 12.0 object. At a resolution of 15 A we are actually then obtaining 3900 photons per sec per spectral - resolution - element at m = 12.0. At m = 17.0, we thus expect to obtain a SNR of 50 (2500 photons) per spectral resolution element in about a minute. (We have assumed the sky to be negligible in this example!)

[Figures not included]

Phil Massey, Jim DeVeny,
Taft Armandroff, Todd Boroson

Table of Contents

Direct Imaging Manual Revision (1Mar95)

Table of Contents

Direct Imaging Manual Revision (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

The Direct Imaging Manual is being revised to reflect the changes in available CCD cameras; i.e., the replacement of direct imaging at the 2.1-m with a superior capability at the 3.5-m WIYN. In addition, the focus differences between popular interference filters are being included. The revised manual will become available via anonymous ftp to the node ftp.noao.edu in the file kpno/manuals/direct.ps.Z. Be sure to execute bin before the ftp transfer since this is a binary file. See the file kpno/manuals/README for further information.

We are also in the process of making this manual available via the World Wide Web. Follow the NOAO home page http://www.noao.edu to Kitt Peak to see what is available.

Phil Massey

Table of Contents

Photography at the Burrell Schmidt (1Mar95)

Table of Contents

Photography at the Burrell Schmidt (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

As of 1 August 1995, we will discontinue the availability of photographic observing at the Burrell Schmidt. This will apply both to the time scheduled for Kitt Peak observers and the time for CWRU observers. This measure is prompted both by the need to economize and by the decreasing use of the Burrell Schmidt as a photographic telescope. We also wish to improve the performance of the telescope for CCD use by removing the plateholder and its support structure.

Earle Luck, Bill Schoening, Tom Kinman

Table of Contents

Free Kitt Peak Instrument Manuals (1Mar95)

Table of Contents

Free Kitt Peak Instrument Manuals (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

Along with the telescope and instrumentation, the associated documentation is a significant element in providing capability for scientific research. In all fields of experimental science, understanding the capabilities and operation of the instrumentation is critical to success. Particularly in an era of increasingly complex instruments and budgetary constraints, such knowledge is important to all aspects of a Kitt Peak observing program, from writing a good proposal, through efficient use of observing time, to analysis of the data. As mentioned elsewhere in this Newsletter, many of the Kitt Peak manuals are being upgraded or generalized within the context of scientific capabilities. A list of the manuals available via anonymous ftp from the subdirectory kpno/manuals is given below. All of these are in compressed PostScript (.ps.Z) format, and one must set the binary flag within ftp before retrieving the files.

Writing manuals is a largely unheralded but nonetheless important service to the users of Kitt Peak, and credit is due to the authors for the significant effort involved. In addition, many excellent suggestions for improvements to the manuals come from users. We continue to encourage comments or suggestions on the Observing Run Evaluation Form.

Dick Joyce

0.9m.ps.Z	"0.9 Meter Telescope Manual," P. Massey, W. Schoening, G. Jacoby
4mechspec.ps.Z	"Echelle Spectrograph," D. Willmarth
ccdlogs2.ps.Z	"Automatic Observing Logs," T. Lauer
ccdphot.ps.Z	"CCDPhot Users Manual," L. Davis, E. Carder, A. Sarajadeni, T. Kinman
coudespec.ps.Z	"Coude Spectrograph," D. Willmarth
crsp.6.ps.Z	"Cryogenic Spectrometer User Manual," R. Joyce
direct.ps.Z	"Direct Imaging Manual for Kitt Peak," P. Massey, T. Armandroff, C. Harmer, G. Jacoby, W. Schoening, D. Silva
gcam0.ps.Z	"Revised Gold Camera Users Manual," J. DeVeny, E. Carder, D. Harmer
hydramanual.ps.Z	"Hydra Users Manual," S. Barden, T. Armandroff, P. Massey
ice.ps.Z	"An Observer's Guide to Taking CCD Data with ICE," P. Massey, T. Armandroff, J. Barnes, B. Bohannan, T. Boroson, G. Jacoby, S. Rooke, R. Seaman, D. Silva, D. Tody
ice.xnotes.ps.Z	"Notes for Using X Windows on Kitt Peak," R. Seaman
mountman.ps.Z	"Using the Mountain Computers on Kitt Peak," L. Wells
multislits.ps.Z	"Multislits at Kitt Peak," J. DeVeny, P. Massey, V. Sarajadeni
rcspx.ps.Z	"The R-C Spectrograph for the Mayall 4-meter Telescope," J. DeVeny
schmidt.ps.Z	"Operations Manual for the Burrell Schmidt Telescope," P. Massey, W. Schoening, T. Armandroff

Table of Contents

IR Imaging Capabilities 1995-1996 (1Mar95)

Table of Contents

IR Imaging Capabilities 1995-1996 (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

There will be significant changes in instrumentation for infrared imaging at the National Observatories over the next year, involving reconfiguring, upgrading, and relocation of the present suite of IR cameras. This will immediately affect the kinds of IR imaging science that can be done at KPNO. We are expanding our capabilities in high spatial resolution imaging but retrenching, at least temporarily, in the area of wide spatial coverage.

SQIID will not be available in fall 1995 - spring 1996. With the closure of the 1.3-m, SQIID's advantage for rapid multiband coverage of large fields with moderate sensitivity is lost, and it has no compelling advantage over our other IR cameras on the larger telescopes. We are looking to the ALADDIN detector development program to revive SQIID with a bang, using large format, high QE InSb arrays.

IRIM will remain available on the 4-m and 2.1-m telescopes in its present configuration. Its principal use will remain deep JHK imaging, with 0.6"/pixel and 150" field of view on the 4-m, 1.1"/pixel and 280" field on the 2.1-m. A limited set of narrowband filters is also provided, but there is no capability for more exotic modes such as polarimetry or coronagraphic imaging.

COB will be reconfigured into the high spatial resolution mode used so successfully in an experiment last fall and reported in the December Newsletter. In this mode it is referred to as DLIRIM (Diffraction Limited InfraRed IMager). DLIRIM will give 0.1"/pixel and a 25" field of view on the 4-m. Operation with high speed data acquisition and real time shift and add processing will permit diffraction limited imaging at 3.3-4.1 um with no loss of sensitivity. A special observing opportunity is being made available to maximize the scientific return from this configuration (see the accompanying article).

To retain as much of COB's present capability as possible, COB/DLIRIM will also be available on the 2.1-m (0.2"/pixel, 50" field of view). It will retain its full complement of broad and narrow band filters, coronagraph stops, polarimetric capability, and grisms. This will be the telescope of choice for general use of these instrumental functions, although the smaller pixels make the narrowband capabilities perhaps less attractive than previously. The 2.1-m has delivered time averaged images with 0.6-0.8 arcsec FWHM at 2.2 um, so there is some advantage to be gained here as well from the higher spatial resolution.

Our program plan calls for COB to be the first IR imager to benefit from a detector upgrade out of the development program, notionally in Summer 1996. This will buy back the field of view advantage. It will then be sent to CTIO as a permanent facility instrument.

Persons wishing to propose for use of IRIM and/or COB/DLIRIM in fall 1995 may contact rprobst@noao.edu for detailed information on capabilities and performance.

Ron Probst for the Infrared Group

Table of Contents

Special Opportunity for High Spatial Resolution IR Imaging Programs (1Mar95)

Table of Contents

Special Opportunity for High Spatial Resolution...(1Mar95)
IR Imaging Programs
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

We will conduct a special observing program during the fall 1995 and spring 1996 semesters using COB/DLIRIM on the 4-m telescope for high resolution imaging at 3.3-4.1 um. Observations will be obtained by KPNO staff in a service observing, queue-scheduled mode, in such a manner as to obtain as much data as possible for all approved programs. To provide an opportunity to see this unique capability in action, visiting observers will be welcome to participate during the observing sessions. However, these may not be totally dedicated to a visitor's particular program under these rules.

The DLIRIM configuration provides 0.1"/pixel and a 25" field of view. It critically samples the Airy disc in the L and L' bands (3.3-4.1 um) and slightly undersamples at K. In an experiment conducted last fall, high speed data acquisition followed by shift and add postprocessing gave images at L' with diffraction limited cores and highly uniform PSF over this field. Due to the high thermal background of the sky longward of 3 m, very short integrations remain background limited. There is no loss of sensitivity in this mode at these wavelengths. This experiment was reported in the December 1994 NOAO Newsletter.

A large part of the spatial resolution advantage is retained at K in the high speed mode, but the data are no longer background limited, so a severe penalty is paid in sensitivity. The PSF is also more sensitive to atmospheric conditions and more likely to vary across the field of view. For these reasons we are emphasizing programs at 3.3-4.1 m in this opportunity. For other programs, the 2.1-m telescope offers larger field (50") while retaining some advantage of higher resolution (0.2"/pixels, 0.6"-0.8" FWHM images at K).

If you are interested in proposing for observations with COB/DLIRIM on the 4-m telescope, please submit the standard KPNO proposal form. COB/DLIRIM proposals will be reviewed by the TAC as part of this special observing opportunity. Note that the longer term plan for the instrument calls for its permanent relocation to CTIO, nominally in fall 1996, so this is an opportunity of limited duration. Please contact rprobst@noao.edu for details on modes of use, sensitivity, etc., of COB/DLIRIM prior to proposing.

Ron Probst, Caty Pilachowski

Table of Contents

High Resolution Infrared Spectroscopy (1Mar95)

Table of Contents

High Resolution Infrared Spectroscopy (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

The Rise of Phoenix...

Phoenix, the high resolution infrared spectrograph, is progressing rapidly toward first light next winter. The drawings required to construct the instrument have been completed and the large mechanical parts have either been fabricated or contracts let for their construction. There are several hundred small parts being fabricated, and our shop will be busy with these this spring. All the optics have arrived and are ready to be installed. We expect to start assembling the instrument in late summer with laboratory testing going on into the fall. In the echelle mode, Phoenix will offer resolutions 100,000 (2 pixel sampling) or 66,000 (3 pixel sampling) for spectroscopy in the 1-5 um region. The detector will be an InSb array. As a result of the rapid increase in background radiation from 2-5 um and the large free spectral range imposed by the available echelle rulings, Phoenix is not cross dispersed. The intent is to offer Phoenix initially on the Kitt Peak 2.1-m and 4-m telescopes. Future plans call for shared use with CTIO and Gemini.

[Photo not included]

Photo caption: Senior instrument makers Mark Gougeon (left) and Martin Robertson (right) with the sections of the Phoenix collimator they have fabricated.

The Future of the FTS

Due to the large effort involved in the assembly of Phoenix, we will not offer the FTS on the 4-m in the fall semester. A number of electronic components as well as the control computer for the FTS are old, and over the past year we have experienced a number of problems with A/D components made by a manufacturer no longer in business. Due to budget constraints we can not replace components and as a result the observatory will ultimately be forced to withdraw the FTS from service. Phoenix, CRSP, NICMASS at the Feed (see following article), and the next generation infrared spectrographs now in the conceptual design stage will cover many of the FTS capabilities with greatly enhanced sensitivity. If you feel that you require FTS observations you are urged to contact the undersigned as soon as possible.

Ken Hinkle

Table of Contents

NICMASS at the Feed (1Mar95)

Table of Contents

NICMASS at the Feed (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

In collaboration with Mike Skrutskie and Mike Meyer (U. of Massachusetts), we have investigated the performance of the Coude Feed Spectrograph to a wavelength of 1.8 um, using a 256 x 256 HgCdTe NICMOS3 array camera installed at the Camera 5 focus.

The NICMASS camera is a stand-alone system consisting of a cryostat/controller, power supply, and a 486-33 PC host computer. The dewar is mounted on a special fixture at the same location as the CCD used for optical work. The system contains no cold foreoptics except for filters used for order separation and background rejection. The filters and array are operated by the host PC, which is located in the observer's room adjacent to the normal observer's workstation (Indigo). The user interface is a menu operating in a DOS environment, with the images being stored on the PC hard drive; at the end of the night, the image files are transferred to Indigo via ethernet for conversion into FITS files and IRAF images. The PC has a primitive quick-look capability for evaluating data. A comprehensive description of the system may be found on the World Wide Web at http://scruffy.phast.umass.edu/Irlab/NICMASS/nicuser.html.

We have evaluated the performance of this system in two configurations: grating B / long collimator and echelle / short collimator. With grating B, one operates in 1st order, and the broadband I, J, and H filters are sufficient for background rejection (although the H filter does admit some thermal background). The high orders (m~56/l m) used for echelle operation require narrowband filters for order separation. Efficient operation beyond 1.8 m is precluded by the large ambient thermal background.

[Figure not included]

Spectra of four carbon stars obtained with NICMASS using Grating B, clearly showing the Ballik-Ramsey 0-0 bandhead of C2.

The following table gives estimates of the characteristics and performance of the NICMASS setup based on our evaluation tests. A number of points should be emphasized: 1) Because the quantum efficiency of the NICMASS detector falls with decreasing wavelength, the throughput will be roughly half that listed in the J band, and about a third in the I band; 2) Since grating B is used in 1st order, the dispersion will be constant and the resolution will decrease proportionally with wavelength; 3) The echelle observations employed a 1.644 m filter with significant thermal leakage, resulting in additional background shot noise.

Grating:	B	echelle
Collimator:	long	short
Pixel Scale:	2.6"	1.8"
Wavelength (um):	1.6080; m=1	1.6475; m=34
Resolution:	7000	43000
Throughput:	0.11	0.034
S/N (est)*:	H=9 mag	H=5 mag

*estimates for S/N=10 in 600s

We are offering to support the use of NICMASS at the Coude Feed Spectrograph for a limited amount of shared-risk observing beginning in the fall 1995 semester. Prospective users should plan on becoming familiar with the operation of the system by referencing the description available on the World Wide Web; our resources are unlikely to permit upgrading the existing PC control environment. The NICMASS system is also used at other facilities and may not be available for the entire semester. We are purchasing a well-blocked narrowband filter centered at 1.56 m for use with the echelle; the other narrowband filters in the cryostat have poor rejection of thermal background and are less suitable for high-resolution spectroscopy. Prospective users should contact either of the undersigned (rjoyce@noao.edu; khinkle@noao.edu) for information specific to their intended program.

We wish to acknowledge Mike Skrutskie and his collaborators at the University of Massachusetts for offering the use of NICMASS to the community and for their efforts with the instrumental setup at the Coude Feed.

Dick Joyce, Ken Hinkle

Table of Contents

KPNO Improvement Projects (1Mar95)

Table of Contents

KPNO Improvement Projects (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

In line with the overarching emphasis on efficiently maintaining core observing capabilities while preparing for new observing opportunities, we have adopted new procedures for KPNO Improvement Projects that will fold our long term goals into the planning process directly, and should allow us to focus much (but not all) of our KPNO technical resources onto those major projects most critical to our future. Mike Merrill has agreed to serve as Project Manager for KPNO Improvement Projects. In addition to maintaining a tighter focus on large projects, we hope to provide a simple, direct path for small projects, with frequent opportunities for KPNO staff to suggest and complete small projects which enhance the scientific capabilities KPNO provides to the user community.

Two major projects for 1995 are: 1) 4-m image quality improvements (cooling the primary mirror, ventilating the dome); 2) conversion of the 2.1-m to observer operation (with technical assistance at the start and end of the night). Given the magnitude of these efforts, careful systems engineering will be done prior to any hardware implementation. Along these lines, Dave de Young is modeling dome flushing for a number of dome ventilation options. New concepts for cooling the 4-m primary mirror are currently under investigation, drawing on the experience of CTIO, WIYN, and the CFHT.

Highlights of activity during the past quarter include:

At the 4-m, the major effort to update/replace the telescope servo control and position encoder systems is virtually complete. Guided by operational experience, refinements have been made to the telescope bearing oil cooling system as part of the seeing improvement project.

At the WIYN, KPNO personnel are being trained to support routine WIYN operations, and have provided assistance in modifying and installing the azimuth encoder.

At the 1.3-m, the original re-furbished fixed-axis secondary, suitably equipped with a low emissivity cone and alignment lights, was mounted and successfully used for routine day-time and night-time IR observations during the past few months. Image quality is superb, verifying that a "real" optical mirror support for IR secondaries can match the optical performance of modern IR instrumentation using large format arrays.

At the 0.9-m, the new f/8 secondary mirror cell and support system was installed and aligned. Reports indicate that the resultant images are "the best ever produced at this telescope."

At the Coude Feed, power and control cabling was provided along with mechanical modifications to the dewar mounting plate to support installation of the near-IR NICMASS camera system (discussed elsewhere in this issue) at the CF spectrograph. An adaptor plate to mount a large format CCD was copied from an existing design to permit simultaneous operation of large arrays at both the CF and the Echelle long focal camera.

At the Burrell Schmidt telescope, hardware is on order for upgrading the CCD dewar mount focus mechanism.

At the McMath-Pierce and Vacuum telescopes, assorted servo control systems have been updated and/or designed to improve operations.

In addition, it is noteworthy that KPNO engineering has provided mechanical designer support for the development of technical specifications for the CHARA interferometric array project.

Michael Merrill

Table of Contents

Help Find Our Missing Library Books (1Mar95)

Table of Contents

Help Find Our Missing Library Books (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

Upon completing an inventory of our mountain library last month I discovered that thirty books had disappeared during the past year. This is both a reminder and a request. The reminder is to return all books to the library. A book not actually on the shelf is a "lost" book even though it may have just been left at another location on the mountain. The request is to send back any books you may have inadvertently packed up and taken. We cannot afford to replace any of these missing books, and we cannot afford to continue buying books for the mountain library if they are going to disappear.

Thank you for your help in this matter.

Cathy Van Atta

Table of Contents

New Online Library Catalog (1Mar95)

Table of Contents

New Online Library Catalog (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

The NOAO/KPNO library has just launched its new online catalog with information on the holdings of the Tucson and Mountain libraries. The initial catalog holds about 4000 titles, representing all the new books and journals received in the last 14 years as well as a few records of older books. Additional older records will be added as quickly as possible. I am first adding the books at the Mountain library so we can retire the print card catalog there. Next will be the remainder of the Tucson books that are presently signed out, so we can incorporate the circulation feature of our system. This is a work in progress with more records being added weekly, so while new books will appear only in the online catalog, library users will still have to check the printed card catalog for older books. Visitors can stop by the library office for more information on how to access this or may send me a message at library@noao.edu.

Cathy Van Atta

Table of Contents

Opportunities for Graduate Students (1Mar95)

Table of Contents

Opportunities for Graduate Students (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

KPNO has for many years provided opportunities for graduate students to learn the trade of observational astronomy through access to telescopes. The participation by graduate students in observing runs on Kitt Peak has become an important part of the training of new observational astronomers: KPNO supports thesis observations for dozens of graduate students from more than 20 institutions each year. Since only about 100 PhD degrees are granted in all fields of astronomy each year in the US, KPNO is thus supporting a large fraction of all theses in optical and IR astronomy.

Most thesis observations taken at KPNO are carried out on our small telescopes, and we are concerned that under the new operations plan, thesis students' hands-on access to telescopes will decrease. To address this concern, we encourage students to plan extended visits to Kitt Peak to participate in and assist with observatory related service. Thesis students who wish to take advantage of this opportunity should contact the KPNO Director's Office. We can support travel expenses and room and board on the mountain for a limited number of students each semester who wish to gain experience in hands-on observing with optical telescopes.

The advantages for graduate students participating in this program are not only to gain observing experience but also to learn about instrumentation and to meet astronomers outside their own institutions.

Caty Pilachowski

Table of Contents

KPNO Filter Loan and Filter Tracing Service (1Mar95)

Table of Contents

KPNO Filter Loan and Filter Tracing Service (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

In our attempt to refocus staff resources to maintain KPNO's primary mission, we are forced to cease the service of loaning filters for use at non-NOAO facilities. Although this service appears to be a minimal impact per loan request, the total combination of all loans does require substantial effort, which we feel should now be redirected elsewhere.

As of 1 June we will no longer provide this service. We regret any inconvenience this may place on users and hope that you understand and support this decision. We will continue to support filter loans for use at other NOAO facilities (CTIO, NSO). We will also consider loans to the Burrell Schmidt for currently ongoing projects, and we may also be able to provide limited loans to current ongoing projects at other observatories which would not be able to continue without our filters.

We will continue to trace non-NOAO filters on request, but must charge full cost recovery for this service effective immediately. A minimum charge will apply to small work orders. We again regret any inconvenience this may cause; our resources must be redirected toward other observatory needs more consistent with the central mission of KPNO.

Thanks for your cooperation.

Sam Barden, Jim De Veny, Ed Carder

Table of Contents

Nine-Track Tapes The Last Warning! (1Mar95)

Table of Contents

Nine-Track Tapes The Last Warning! (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

15 April looms on the horizon! Not only is this the last day to file your income tax returns but it is also the last day for non-NOAO observers to reclaim any data that may be stored on nine-track tapes that are being held in the Central Computer Department tape archives!

On 15 April, all nine-track tapes stored in the various tape cabinets and storage areas in the CCS department (including T-tapes used on the mountain) that belong to non-NOAO staff members will be recycled or discarded. There will be NO warnings or e-mail reminders! If you have any data stored at NOAO that you are concerned about please contact Jeannette Barnes (jbarnes@noao.edu) immediately so arrangements can be made for acquiring the data. We have no resources for copying tapes so please take this into consideration if you have data stored at NOAO that you need to preserve.

On 15 April, CCS officially brings to an end the last phase of the backup service that it provided to the astronomical community through the nine-track tape media. As a reminder, on 15 August 1994, the nine-track T-tapes were discontinued as a backup medium on the mountain, and backup tapes in general are no longer held for visitors at the downtown offices. We can not stress enough to observers to make their own backup copies of their data - the safety of the data is the observer's responsibility!

The "Save-the-Bits" project will continue to record raw data automatically at the telescopes for archival purposes, and will replace the functionality provided by the now-old nine-track tape technology.

Jeannette Barnes, Bruce Bohannan, Steve Grandi

Table of Contents

Don't Be Late to Dinner! (1Mar95)

Table of Contents

Don't Be Late to Dinner! (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

Since we know that an observatory runs best on well fed astronomers, we are announcing that the new hours for the evening meal in the Kitt Peak Dining Hall are 4:00 to 5:45 pm.

B. Bohannan, B. Infuso

Table of Contents

Shuttle Time Changes To/From Kitt Peak (1Mar95)

Table of Contents

Shuttle Time Changes To/From Kitt Peak (1Mar95)
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

Due to a reduction in the number of vehicles in our shuttle fleet, beginning 3 April 1995, there will be some changes in the regularly scheduled vehicles to and from Kitt Peak. To Kitt Peak, the 10:30 am U-drive car will depart at 11:00 from Tucson, and the 12:00 car will be eliminated. Returning to Tucson, the 10:30 am car will depart from the mountain at 11:00 am, and the 1:00 pm car will depart from the mountain at 2:00 pm. The 2:30 pm U-drive car will be eliminated.

As a reminder, the last U-drive car scheduled to Kitt Peak is at 6:00 pm daily. For reasons of safety, we do not schedule NOAO vehicles to the mountain past this time.

The revised shuttle schedule (which includes weekdays, weekends, and holidays) follows. Please keep these times in mind when planning your trip to Kitt Peak and filling out your Observing Run Preparation Form.

Shuttle Schedule

	Tucson Departure	Estimated Kitt Peak Arrival
S	6:40 am*	8:00 am
U	8:30 am	10:00 am
U	11:00 am	12:30 pm
S	2:00 pm*	3:30 pm
U	4:00 pm	5:30 pm
U	6:00 pm	7:30 pm

	Kitt Peak Departure	Estimated Tucson Arrival
S	8:30 am*	10:00 am
U	11:00 am	12:30 pm
U	2:00 pm	3:30 pm
S	4:00 pm*	5:30 pm
U	6:00 pm	7:30 pm
U	8:00 pm	9:30 pm
U	10:00 pm**	

* Driver provided on weekdays

** Departure time varies. At 10:00 pm, departure to be negotiated depending on requirements of instrument assistants.

Pat Patterson

Table of Contents

Requests for Telescope Time 1 February - 31 July 1995 (1Mar95)

Table of Contents

Requests for Telescope Time...(1Mar95)
1 February - 31 July 1995
(from KPNO, NOAO Newsletter No. 41, 1 March 1995)

Telescope		Nights Req.	Nights Sched.	Reqd./ Sched.	No. of Props.	Number Sched.	Total#/ Sched.	Staff Nights	%Staff Nights
4-m	Dark	159	73	2.2	44	23	1.9	5	7
	Bright	113	67	1.7	28	16	1.8	17	25
WIYN					45	tbd			
2.1-m	Dark	156	53	2.9	33	14	2.4	10	19
	Bright	124	85	1.5	25	19	1.3	11	13
Coude Feed		132	122	1.1	16	15	1.1	29	22
1.3-m		70	44	1.6	11	4	2.8	12	27
0.9-m	Dark	170	84	2.0	26	16	1.6	4	5
	Bright	67	53	1.3	10	8	1.3	10	19
Schmidt		75	48	1.6	13	10	1.3	5	10

KPNO received 225 proposals from visitors and staff combined. Of these, 17 were long-term proposals; two were granted long-term status and one was granted key project status. Three proposals which had previously been granted long-term status were also scheduled. Some proposals received for the 1.3-m were moved to other telescopes.

Table of Contents

From the NSO Director's Office (1Mar95)

Table of Contents

From the NSO Director's Office (1Mar95)
(from NSO, NOAO Newsletter No. 41, 1 March 1995)

A number of important events occurred in the period covered by this Newsletter which I will summarize below under different subheadings.

Horst A. Mauter

On 27 January, Horst Mauter, the former Chief Observer at the Big Dome and the Vacuum Tower Telescope died in Alamogordo at the age of 69. He joined the Sacramento Peak Observatory in 1958 and stayed with the observatory until his retirement in 1988. Horst was a most remarkable individual. It is hard to think of anyone more capable in working with complex opto-mechanical telescopes and instruments to arrive at the best possible observations. Mauter was the most competent telescope operator whom I had the pleasure to work with at the many solar and nighttime observatories where I had the opportunity to observe. The many messages of condolences from all over the world make the scope of his impact on solar astronomy clear. His exceptional skills, his always present can-do attitude to help the user achieve the best data possible, and his ability to make everybody feel at home and welcome at the observatory made him many friends. His departure is being felt as a big loss by everyone at the observatory and by the many users who had the opportunity to work with Horst Mauter over the thirty years during which he was an essential part of the Sacramento Peak Observatory. A memorial service was held on 18 February at the observatory.

Matching NSO's Program to the 1995 Budget

Following a 5% cut in funding in the last fiscal year, NSO (as well as the other NOAO observatories) is faced with another 5% reduction in real support this year. It is abundantly clear that the times where belt-tightening could solve budget problems of this size are over. In the past, cuts were absorbed in the scientific or initiatives program of NSO, leaving the telescope operations unaffected. As a result the scientific staff supporting NSO's operations has dwindled, and the instrumentation program is reduced to a level which makes university efforts appear large in comparison. After discussion of the long term directions of NSO with NSO's Users' Committee (see report in this Newsletter), it was therefore decided to abandon the old paradigm of keeping all telescopes operating in the face of budget cuts like the present one. The proposed reduction in operational support consisted of reducing the amount of operator-assisted observing time at the J. Evans Solar Facility at Sac Peak to 50%, with the remainder of the time available to astronomers trained in the operation of the telescope, and the termination of the solar-stellar program at the McMath-Pierce facility at Kitt Peak. Especially the latter action has a major impact on our user community, effectively disenfranchising a large part of it. Many strong objections were raised to this action by the community affected, many of them pointing out the large impact of a relatively minor budget reduction (about 50 K$). It is indeed true that such a cut on the margin of a program has consequences which far exceed in value the budget savings achieved.

It is well known that major savings can only be achieved by far more draconian measures, like closing an entire observing site. At NSO that is an unacceptable option since both sites have unique capabilities, unduplicated elsewhere, so that the closing of one of its sites not just reduces services to our users community but also results in the elimination of, for example, the capability of doing infrared solar observations at all wavelengths with the collecting area and angular resolution needed as can now be done with the Kitt Peak McMath-Pierce facility. No other facility exists anywhere else in the world with comparable capabilities. Similar statements can be made for the high angular resolution and coronal capabilities at Sac Peak. The proposed termination of the solar-stellar program, and the resulting reactions, therefore highlights an unavoidable coming crisis in NSO, as budgets are likely to continue to decrease over the coming years and as it will be necessary to downsize NSO as a result. I invite expressions of your views on how to best prepare for this crisis.

Relief for NSO's Solar-Stellar Program

I am pleased to announce that, since my announcement at the Tucson AAS meeting of the proposed termination of NSO's Solar-Stellar program, NOAO has received some additional funds from the National Science Foundation to smooth the transition to a lower operating budget. A portion of these funds will be used to maintain the solar-stellar program at least to the end of this fiscal year (31 September 1995). That allows the solar-stellar community some time to formulate a program for its research needs and to advocate this program. I have asked Mark Giampapa on our staff to take the lead in doing this. Initial discussions with Sidney Wolff and Mark aimed at formulating an outline of this activity focus on : (1) defining the areas of nighttime astronomy which are part of solar-stellar astronomy (eg. stellar activity cycles, stellar coronae/envelopes, asteroseismology, rotation of sun-like stars, starspots), (2) identifying research programs in this area and (3) arriving at the resulting needs in terms of telescopes, instruments, and synoptic and regular observing time. We would like this program to be not just focussed on the McMath-Pierce facility, but to also include larger telescopes (even 8-meter class) including both national and non-public facilities. As this initiative develops Mark will give you more details. Given the budget time scale, we aim at getting at least a preliminary report by early summer this year.

Thomas Rimmele Joins NSO/SP Staff

Thomas Rimmele has accepted an offer to join the scientific staff at NSO/SP filling the vacancy created by the departure last year by Jim Moore, NSO/SP's engineering manager. Thomas has been a visiting scientist to NSO/SP from the New Jersey Institute of Technology. Before that he worked at the Kiepenheuer Institut fr Sonnenphysik (KIS). Thomas has a strong background both in solar research and in hands-on instrumentation development. Among other instrumental efforts, he was responsible for the building of the solar correlation tracker at NSO/SP and the KIS. Presently he is engaged in the construction of the Mark II version of this correlation tracker and in the deployment of a state-of-the-art 1024 1024 high speed (6 frames/second) CCD system. In his new position Rimmele will be working on real time solar wavefront sensing techniques, using extensions of his correlation tracking device, and he will work with Dick Dunn in the integration of these techniques in the NSO adaptive optics system. He is also actively engaged in the improvement of the image quality at NSO's telescopes at Sac Peak and Kitt Peak (see article at the beginning of this Newsletter). He will encourage cooperative programs in this and other areas with research groups in the US and abroad. Welcome aboard Thomas!

Jacques Beckers

Table of Contents

Cross-Disperser for the McMath-Pierce Solar-Stellar Spectrograph Completed! (1Mar95)

Table of Contents

Cross-Disperser for the McMath-Pierce...(1Mar95)
Solar-Stellar Spectrograph Completed!
(from NSO, NOAO Newsletter No. 41, 1 March 1995)

The cross-disperser was installed at the solar-stellar spectrograph following laboratory tests of the optical elements. The quality of the prism elements exceeded specs, and visual inspection of the output from an incandescent source showed sharp images with order separation ranging from very good in the red to excellent in the blue. The new cross-dispersed system is intended to yield simultaneous wavelength coverage extending from the K-line to about 700.0 nm with the 105 mm transfer lens and a large-format (1024 3072) CCD array. A paper describing the optical system in more detail appears in the Kona, HI, SPIE Proceedings, Instrumentation in Astronomy VIII", SPIE vol. 2198, p. 302 (1994). We will initially operate it in conjunction with our current TI 800 800 CCD while the rectangular array development and testing continues. Testing and characterization of the system at the telescope has begun. We will keep the user community advised of progress.

The successful construction of the cross-disperser is due to the dedicated efforts and productive blending of individual talents in the areas of optical design, mechanical design and fabrication, and the specification of science goals and trade-offs. Congratulations!

[Figure not included]

The assembly above the solar-stellar spectrograph. The three prisms that serve as the cross-dispersing elements for the echelle grating are shown. Each successive prism is slightly larger than the preceding one, in order to avoid vignetting. The third (and largest) prism can be removed in order to enhance transmittance in the blue. The dot is a laser beam passing through the assembly.

Mark Giampapa, Dave Jaksha, Ed Perkins,
Jorge Simmons, Trudy Tilleman, Russ Cole

Table of Contents

Surplus Equipment from the Department of Energy (1Mar95)

Table of Contents

Surplus Equipment from the Department of Energy (1Mar95)
(from NSO, NOAO Newsletter No. 41, 1 March 1995)

In view of the current budget climate, the National Solar Observatory/Sacramento Peak has been aggressively pursuing surplus property from various governmental agencies including the Department of Defense and the Department of Energy. Recently, several members of NSO's staff have screened optical property at Los Alamos National Laboratory. This property became available with the cancellation of the Antares and Aurora projects. The Antares 10.6 m IR Co2 laser uses diamond-turned optics for ICF and requires many precision optical elements to split its beam into 96 separate pulses, form them into a continuous optical "train," and then bring the beam to a focus on an ICF target. Both systems use state-of-the-art optical sub-systems for alignment and beam transport.

As a result of NSO's contacts and screening, approximately $400K worth of equipment has been received, including a SORL alignment telescope for the NOAO Optical Lab. Additionally, several Hextek mirrors of varying sizes and specifications, a 44" fused silica mirror, two large optical benches, a vacuum leak detector and many miscellaneous mounts and frames were received. By reutilizing surplus equipment and materials from other governmental sources, NSO is able to supplement the ever-decreasing equipment budget and maintain state-of-the-art instruments.

Robert Rentschler, Roger Carmichael

Table of Contents

Solar Observing at South Pole (1Mar95)

Table of Contents

Solar Observing at South Pole (1Mar95)
(from NSO, NOAO Newsletter No. 41, 1 March 1995)

South Pole has unique advantages for many types of astrophysical observations. This was recognized and advocated long ago by Martin Pomerantz of the Bartol Research Foundation and quickly exploited by solar astronomers starting in 1979. Other astronomers eventually appreciated the advantages, and the site is now a beehive of astrophysical activity.

Helioseismology has been the main solar work done at South Pole. A group of researchers from NSO, Bartol, and NASA mounted their fifth helioseismology observing campaign during the current austral summer. The advantages of the site for helioseismology include a very slowly changing solar altitude, freedom from diurnal interruptions, exceptionally clean air, and a high duty cycle (weather permitting). The main disadvantages are the cold temperature and fairly poor seeing quality. Observing started on November 20 and will continue until the end of January. This season the weather has been unusually good. To date, more than 50 days of data have been obtained with a usable image duty cycle of more than 70%. A 35-day sequence has a duty cycle of nearly 80%.

The area around South Pole is divided into various use sectors. For example, air sampling is done in the clean air sector up wind of all other activity. Most astrophysical work is done in the 'dark sector.' We set up an observing site, shown in the figure, on the other side of the pole from the light dark sector about 2.1 miles from the Amundsen-Scott station. This distance is as close as one can get and still be free from pollution from the station and especially aircraft contrails generated near the ground. To the right in the figure is our 10-cm telescope set up on top of a mound of snow and protected by a wind screen. About 20 meters downwind, to the left of

Andrew Jones in the figure, is a small building that is buried under a half meter of snow in a trench. The building contains electronics for controlling the experiment and space for a small kitchen and emergency shelter. A further 130 meters downwind is a generator for power.

The goals of our observing project included exploring the spectrum of solar oscillations in ways that will not be done by the upcoming two major helioseismology projects (the GONG project, expected to start network operations in mid-1995, and the Solar Oscillations Imager, to be launched on SOHO late in 1995). In particular, we are exploring the high frequency end of the spectrum of solar oscillations by recording an image every 42 seconds. We are also trying to make localized inferences about the structure beneath activity such as sunspots and to detect activity before it emerges. In this regard, the Sun favored us by producing a nice active region in a good position several days after we started observing. The instrument has a 1K 1K ccd and thus provides four times the resolution of GONG and is comparable with SOI, an important feature for localized helioseismology. (However, seeing at South Pole is rather poor and limits resolution to a few arc seconds.) The spectrum of solar oscillations changes slightly during the course of the solar cycle. We are interested in characterizing the spectrum changes at this phase of the solar cycle and also prior to the start of the two big projects.

A pleasant event that occurred in early December was the dedication of the nighttime astrophysical facility to Martin Pomerantz in recognition of his pioneering role in almost all fields of Antarctic astrophysics. A large crowd braved the -25x outside weather to listen to brief (!) remarks by John Lynch, Aeronomy and Astrophysics Program Manager at the NSF, Neal Lane, Director of the NSF, Neal Sullivan, Director of the Office of Polar Programs, Jack Harvey, representing Martin's co-workers and colleagues, and Martin Pomerantz. By my watch, all the remarks were completed in 12 minutes. This must be a record for an observatory dedication. The reception at the station galley afterward was much more extended.

The NSO-Bartol-NASA team is gearing up for a rapid reduction of the 1/4 terabyte of raw data obtained during this campaign. We expect to continue to find new things about the Sun from this data as has been the case for our previous four campaigns. We were also excited by the other astrophysical programs underway at South Pole, but that is another story.

[Photo not included]

NSO/Bartol/NASA solar observing site 2.1 miles from the South Pole. The telescope is mounted on an alt/az (= RA/dec) tracking platform atop a mound of snow to the right in the photo. The control electronics and observing room are in a building buried under the snow to the left. The Amundsen-Scott Station is on the horizon behind Andrew Jones.

Jack Harvey

Table of Contents

High Spectral Resolution Achieved in Double-Pass with the McMath-Pierce Grating Spectrometer (1Mar95)

Table of Contents

High Spectral Resolution Achieved in Double-Pass...(1Mar95)
with the McMath-Pierce Grating Spectrometer
(from NSO, NOAO Newsletter No. 41, 1 March 1995)

The 120 groove/mm Harrison IR grating (size: 470 X 368 mm) has a theoretical resolving power (/ = Nm) of 110,000 at 4.6 um. In practice, considerably lower resolving power is realized due to illumination under-fill and finite slit widths. The McMath-Pierce 13.5-m spectrometer, which uses this grating, is designed to operate either single-pass or double-pass. At 4.6 um we find that resolution is substantially improved in the double-pass mode. Improvement is dramatic for atmospheric ozone lines but is also noticeable for solar CO. Going from single- to double-pass is accompanied by a throughput loss of about 2.5.

[Figures not included]

Region at 4.6891 um showing atmospheric ozone lines and solar CO at 4.6871 um and 4.6885 um; (a) observed with the 1-m FTS (note false lines because of instrumental sync function ringing), (b) double-pass with 200 um input and output slits, and (c) single-pass, same slits. Air masses are slightly different among the three observations, accounting for some variation in line depth.

William Livingston

Table of Contents

Don't Hold Your Breath! (1Mar95)

Table of Contents

Don't Hold Your Breath! (1Mar95)
(from NSO, NOAO Newsletter No. 41, 1 March 1995)

A new evacuated optical path for FTS laboratory observations will be used for the first time in February. Observers from NASA's Upper Atmosphere Research program will use the FTS to record the infrared spectrum of water. To successfully perform these observations, the atmospheric water vapor had to be removed from the optical path. Evacuated optical cells have been designed that will couple the 25-cm and 150-cm absorption cells to the FTS tank and a new evacuated housing for the laboratory's infrared source. The optical path between the FTS exit ports and detector dewars will also be evacuated. This new evacuated optical path is expected to replace the dry nitrogen purge previously used with programs that employed the 25-cm and 150-cm absorption cells.

Claude Plymate

Table of Contents

NSO Observing Proposals (1Mar95)

Table of Contents

NSO Observing Proposals (1Mar95)
(from NSO, NOAO Newsletter No. 41, 1 March 1995)

Current deadlines for submitting observing proposals to the National Solar Observatory are (1) 15 April 1995 for the third quarter of 1995 for solar instrumentation and (2) 15 April 1995 for the Fall semester (Jul. - Dec.) of 1995 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 the WWW at http://sunspot.noao.edu/SP-home.html.

Dick Altrock

Table of Contents

NSO Telescope/Instrument Combinations (1Mar95)

Table of Contents

NSO Telescope/Instrument Combinations (1Mar95)
(from NSO, NOAO Newsletter No. 41, 1 March 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):	H(a) 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

Table of Contents

GONG Update (1Mar95)

Table of Contents

GONG Update (1Mar95)
(from GONG, NOAO Newsletter No. 41, 1 March 1995)

The Global Oscillation Network Group (GONG) Project is a community-based activity to develop and operate a six-site helioseismic observing network for at least three years, to do the basic data reduction and provide the data and software tools to the community, and to coordinate analysis of the rich data set that should result. The Project is currently deploying its first sites and a fully operational network and data management and analysis center should be online late 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.

The deployment of GONG has begun as this is being written! The first shipment has arrived on Tenerife, in the Canary Islands, and the "setup" team is at the IAC's Observatorio del Teide. The second instrument has left Tucson destined for the IPS's Learmonth Solar Observatory. The remainder of the instrument team is really busy trying to meet the shipping schedule for the remainder of the sites, and the data team is analyzing the data from the instruments undergoing integration and getting ready for the flood of data. On a parallel front, the NSF has announced an opportunity for community support to assure that the initial GONG data is analyzed in an expeditious manner.

Two meetings directly related to GONG are on the horizon. The 1995 GONG Annual Meeting is being hosted by our colleagues at Stanford University and will be held in conjunction with the SOHO Workshop on helioseismology at the Asilomar Conference Center, Pacific Grove, California 2-6 April. On the occasion of the Golden Jubilee Celebrations of the Tata Institute of Fundamental Research (Bombay, India) and a total solar eclipse (which passes within 50 kilometers of the Taj Mahal) and the deployment of the Udaipur GONG station, a workshop entitled "Windows on the Sun's Interior" will be held 19-22 October in the TIFR.

We've had a bit of coming and going within the project team during December. Mark Trueblood left GONG to join the US Gemini office. Mark had been with the Project since 1990 and played a key role in the development of the project's Data Storage and Distribution System which is now operational. We are pleased to welcome Susie Davidson, a long-time NOAO employee, "upstairs" from the Electronic Supply Room as the new GONG Administrative Assistant.

Site Preparations

This should be the last time that you see this section! Learmonth and Tenerife are completed. The concrete pad has been poured at Mauna Loa, and the utilities are being installed. Arden Petri is traveling to Udaipur to coordinate the site work in February, and the location at CTIO has been selected near the former "Director's Residence" beyond the "Round Office Building." The site preparation work is scheduled for March. The Big Bear site is settling over the Winter, during the construction moratorium there, and the final foundation work there is scheduled for June.

Instrument Integration and Deployment

The first station left Tucson for Tenerife on 2 December and arrived at the El Teide site on 26 January. Bret Goodrich, Frank Hill, Neil Mills, Guillermo Montijo, and Sang Nguyen have been on site and are in the process of reassembling the station. The instrument is currently taking data, and final certification for operation is expected in late February.

The second station left Tucson for Learmonth, Western Australia on 24 January and is expected to arrive at the site about 10 March. Tom Bajerski, Rob Hubbard, Duane Miller, Ed Stover, and Jeff Vernon are poised to head "down under" when it arrives. These first two remote stations will form a three-site "mini network" with the Big Bear station operating in Tucson. This will allow data to be gathered and evaluated, beginning in late March or April, while the remaining stations are deployed over the next several months. It will provide us with our first real data for merging, and science-quality data at that!

The station destined for the Udaipur Solar Observatory in India has currently completed its certification tests in Tucson, and it will be shipped to arrive in Bombay as the Indian monsoon season winds down. The instruments for the Mauna Loa Solar Observatory and CTIO are being completed and, along with the instrument for the Big Bear Solar Observatory which is already operational, they will be deployed over the summer. Finally, the Udaipar deployment in September will complete the network. Whew!

Data

During the last three months, the Data Management and Analysis Center (DMAC) began reducing data acquired from the production instruments as construction of the network observing stations proceeded at the integration site here in Tucson. The DMAC calibrated and produced site-day l-n spectra and 4-minute averages from 35 production test data days: Big Bear: October 25-31, November 5,6,9,13,15,17,18,20,21,26-30, December 1,2; Tenerife: October 19,29,30, November 6,13,15,17; Learmonth: November 27-30, December 2,11,13;

The 30 October day was used for the common-site merge test of the Teide versus Big Bear instruments. The 27 November day was used for the common-site merge test of the Learmonth versus Big Bear instruments. These tests indicate that these instruments, sharing a common atmosphere, produce remarkably similar velocity signals in the p-mode band.

The Data Storage and Distribution System (DSDS) volume catalog now contains over eight hundred cartridges, and there are over three hundred thousand files in the file catalog. The cartridge count is higher (or, alternatively, the data volume per cartridge is lower) than anticipated during the network phase of the project since most of the calibratable data obtained from instrument development and production testing has been recorded during relatively short acquisition intervals (i.e. a few days).

Accesses (including 'ftp' logins) to the DSDS's users' machine by non-project GONG members is currently about 3 logins per day. These are primarily 'rlogin' or 'telnet' accesses. 'ftp' access to the anonymous 'ftp' disk has been declining as the use of the World Wide Web has increased. During November, there were over 3000 'http' requests by non-NOAO users, and it is growing rapidly. We have updated the GONG bibliography and placed it on the WWW server, with a modest search capability and links to abstracts maintained by the ADS folks at the CfA, and the SIMBAD folks in Strasbourg. The scientific programs and teams are maintained on the WWW server as well, for broad access and rapid updating.

The anonymous 'ftp' disk, the GONG member accounts, and the 'http' server are on the DSDS user's machine (helios). This workstation was recently upgraded to a SPARC20/61 running Solaris 2.4 with more disk space than the workstation that was replaced. The node name (helios.tuc.noao.edu) and IP address (140.252.8.105) remain the same.

The next DMAC Users Committee (DUC) meeting is scheduled for mid-March. Previous DUC meetings have lasted four to eight hours and have focused on an assortment of technical issues. In contrast, the March meeting will be a two-day session during which the DUC will perform a DMAC readiness review. This will appraise both the functional and performance aspects of the DMAC. This event is scheduled to coincide with the expected onset of network data. The project expects to have two sites operating in late February: the Big Bear instrument in Tucson and the Teide instrument.

We have completed the processing for the large-scale merge test using artificial data. Comparison of the time series of spherical harmonic coefficients shows that the baseline merge algorithm continues to work well. The merged time series is very similar to the "perfect" time series, with the largest differences appearing around changes in the number of stations observing. We are developing statistical comparisons of the time series consisting of scatter-plot comparisons of the time series amplitude, and regressions. We are also peak finding the spectra and comparing the results of the line parameters.

All of this artificial data work is necessary to develop and test the algorithm and, of course, has the great advantage that the right answer is known. However, the real question is "how does it work on actual data?". We have now used the method on actual data obtained simultaneously from the Big Bear and Teide instruments, and the Big Bear and Learmonth instruments at the farm. The answer is, "it works really well!" The most pleasant surprise is that the merging cleans up the low-l region considerably. We suspect that a large contribution to the low-l noise comes from transient objects moving through the image (birds, planes, etc.), and these events, which rarely happen in simultaneous images, are efficiently removed by the merging process.

Note that this test of the merging process is not the acid one, though. These instruments were side by side, no more than 50 m apart and looking through almost identical atmospheres, zenith angles, etc... We have so far demonstrated that the merge can remove instrumental effects, but we have not yet dealt with the terrestrial atmosphere. That opportunity will not come until the instruments have been deployed. We are beginning to look at Taiwanese Oscillation Network data (courtesy of Dean-Yi Chou) that was obtained simultaneously with the NSO High-l Helioseismometer. But, before the next Newsletter appears, we should have data from the three-site GONG mini-network. Stay tuned!

[Photo not included]

John Leibacher and the GONG Team

Table of Contents

USGP Update(1Mar95)

Table of Contents

USGP Update(1Mar95)
(from USGP, NOAO Newsletter No. 41, 1 March 1995)

Mid-Infrared Imager Announcement of Opportunity

Design and fabrication of the 10-30 um Imager, destined for shared use on the Gemini Mauna Kea and Cerro Pachon telescopes, was allocated to the United States in the international distribution of instrumentation to the Gemini partners. The USGP, currently in the process of defining a procurement plan for this instrument, expects that the supplier will be selected through an open competition. All institutions potentially interested in this opportunity should contact the USGP immediately to obtain further information.

Search for Gemini Project Scientist

An international Search Committee has been formed to lead the effort in filling the position of Gemini Project Scientist. The committee is chaired by Gordon Walker, the Canadian Gemini Project Scientist. This position is a key position in the international Gemini Project and reports to the Gemini Project Director. US astronomers are encouraged to communicate with the following US members of the Search Committee for information:

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

Project Systems Review

The Gemini Project will be holding its second Systems Review in Tucson, 6th and 7th of March. The purpose of the Review is to obtain an independent assessment of the entire system with an emphasis on the interfaces of the various subsystems. The topic of emphasis at this review will be the primary mirror assembly. Attendance at the Review is open to interested members of the astronomical community by contacting the USGP for an invitation.

International Operations Workshop

Planning is underway to organize an international workshop on innovative observing modes. This workshop will feature presentations, poster papers and working groups to discuss non-traditional observing modes, including remote and queue-scheduled observing. The workshop is provisionally scheduled to be held in Hilo, Hawaii on 6-8 July. If you have an interest in attending the workshop contact Todd Boroson. The USGP has very limited funding available for partial travel assistance to participants from the United States.

New US Gemini Board Member

Peter Conti (JILA) is completing a three year term as one of the original US Gemini Board Members. His guidance and support was greatly appreciated during the crucial formative years of the Project.

Robert Kirshner (Harvard) will fill the vacancy but is not new to Gemini as he has recently chaired the AURA Oversight Committee - Gemini. He joins Gemini Board members, Ian Corbett (UK), Alan Dressler (Carnegie Observatories), Jim Houck (Cornell), Malcolm Longair, Chair (UK), Bob McLaren (U. of Hawaii), Donald Morton (Canada), Wayne van Citters (National Science Foundation), Gordon Walker (Canada), Juan Forte (Argentina), Claudio Anguita (Chile), and Joao Steiner (Brazil).

Adaptive Optics Workshop

The USGP has asked Steve Ridgway (NOAO) to Chair an Adaptive Optics Workshop to consider a future, second generation, adaptive optics program for Gemini. The Gemini Telescope sited on Mauna Kea will employ a first generation adaptive optics design utilizing natural guide stars to enhance image quality. This first generation adaptive optics system, to be designed and built as a Canadian workpackage, will undergo a conceptual design review in March.

The AO Workshop, scheduled for late March, will explore the current status and future plans of AO technology development in the US with an eye on what is likely to be the state of the art in the year 2000 and what will best enhance the Gemini telescope capabilities. The program for a second generation AO system, utilizing a laser beacon approach, is generally considered to be a high scientific priority but is not currently defined or funded.

US Science Advisory Committee

The next meeting of the US SAC is scheduled for 20 and 21 April immediately prior to the international GSC meeting on 24 and 25 April. The US SAC previews material presented to the GSC to broaden the US voice in the GSC. The US SAC will review the reports of the Instrument and Operations Science Working Groups and the results of the mirror coating and surface heating studies in advance of the Coating Plant Critical Design Review in late April.

The current membership of the US Science Advisory Committee is: Todd Boroson - Chair, Eric Becklin (UCLA), Charles Beichman (IPAC), Jay Gallagher (Wisconsin), Bob Gehrz (Minnesota), John Huchra (Harvard/CfA), Frank Low (Arizona), Gerry Neugebauer (Caltech.), Pat Osmer (Ohio State), Steve Ridgway (NOAO), Paul Schechter (MIT), Steve Strom (Massachusetts), Charles Telesco (Florida), and Alistair Walker/Bob Schommer (NOAO/CTIO). Those US SAC members who are also GSC members are Boroson, Beichman, Gallagher, Gehrz and two new members to fill the vacancies left by Fred Gillett, who is now Chair of the GSC as interim Gemini Project Scientist, and Alan Dressler, who recently became a Gemini Board Member.

Communications

At the January, 1995 AAS meeting in Tucson, the USGP held a town meeting and invited the US astronomy community to hear plans for Gemini and to give the USGP comments and ask questions concerning these plans. Approximately 300 members of the US community heard presentations by Matt Mountain, Fred Gillett and Todd Boroson, and Hugh Van Horn moderated a Q&A session. These questions/answers and a copy of the comment sheet distributed for providing written feedback to us on any Gemini topic are available on the USGP World Wide Web address: http://www.noao.edu/usgp/usgp.html

If your institution, symposium or conference is interested in a speaker to talk about Gemini, please let us know. Internet e-mail address: usgp@noao.edu.

USGP Staff Expands and Contracts

Mark Trueblood has recently joined the small but dynamic ranks of the US Gemini Program office as a Project Engineer to assist in the procurement and management of the US-allocated instruments and in advocating US technical interests. Trueblood has a degree in Astronomy and has contributed to the data management software designs for Space Telescope and most recently at NOAO for the GONG Project.

Fred Gillett is now "on loan" to the international Gemini Project to assume interim responsibilities as Project Scientist, the position made vacant when Matt Mountain was appointed Gemini Project Director.

Gemini Newsletter

The quarterly Gemini Newsletter which normally accompanies the NOAO Newsletter will be distributed twice a year in June and December. The USGP column in the NOAO Newsletter will summarize Project highlights in March and September.

Gemini Project Status

The Project continues to make headway in all areas, primarily in negotiating contracts for fabrication and construction.

Telescope. Contracts are still in negotiation for the telescope structures and azimuth tracks for both telescopes.

Optics. The contract for the secondary mirror fast articulation mechanism has been negotiated and is awaiting final approval. The Request for Proposals to provide the secondary mirrors has been released and bids were received in February.

Enclosure and Site Facilities. The bids to construct the Mauna Kea support facility and site excavation were received, and the process was halted due to high bid costs. Some design changes were effected which are expected to reduce construction costs, the construction work packages were divided to increase the number of available bidders, and the invitation for bids on the first rebid package was issued in January. Those changes include reducing the support facility to a one story building, thereby reducing excavation costs, and offering an option to delay construction of the northern ventilation tunnel. The Mauna Kea site preparation work to relocate the road and utilities was begun in October but was cut short in November due to an early, heavy snow. Site work was resumed in January and will proceed, weather permitting. Site work proceeds on schedule at Cerro Pachon.

Instrumentation. The IR Spectrograph bids were received, evaluated by an independent, NSF-appointed committee, and a supplier selected for negotiation. The near-IR Imager will be having a Conceptual Design Review in mid-March. The mid-IR Imager is in the announcement of opportunity stage. The MultiObject Spectrograph will have a conceptual design review in early June.

Gemini Instrument and Operations Science Working Groups

Initially, the scientific and functional requirements for the Gemini instrumentation were defined by a number of instrument working groups, appointed by the international Gemini Science Committee, composed of individuals from the Gemini partner countries. Subsequently, the instrument complement and the science requirements of those instruments were refined by the GSC and approved by the Gemini Board of Directors. About one year ago, the Gemini Project established Instrument Science Working Groups, which meet semiannually to provide a scientific assessment and recommendations in the areas of optical instrumentation, infrared instrumentation, and adaptive optics/acquisition and guiding. In addition, a new Operations Science Working Group has been formed with a similar charter to assess and advise the Project on scientific aspects of operations. The membership of these committees includes scientific representatives from the instrument suppliers, Project and National Project Scientists, representatives from the international project, and the following independent members:

Optical Instruments Science Working Group:

G. Walker (Canadian Project Office) - Chair
T. Armandroff (NOAO), G. Lupio (Hawaii)
and R. Schommer (NOAO).

Infrared Instruments Science Working Group:

F. Gillett (Gemini Project) - Chair,
T. Geballe (JAC), P. Puxley (ROE),
P. Roche (Oxford),and T. Soifer (Caltech).

AO/A&G Science Working Group:

D. Simons (Gemini Project) - Chair,
B. Ellerbroek (SOR/USAF),
D. Monet (USNO), and R. Myers (Durham).

Operations Science Working Group:

T. Boroson (USGPO) - Chair,
F. Chaffee (MMTO), T. Davidge (DAO),
M. Edmunds (Cardiff), B. Gillespie (ARC),
R. McLaren (Hawaii), S. Strom (Massachusetts).

Kathy Wood, Todd Boroson

Table of Contents

1995 Software Conferencr Update (1Mar95)

Table of Contents

1995 Software Conferencr Update (1Mar95)
(from CCS, NOAO Newsletter No. 41, 1 March 1995)

The Fifth Annual Conference on Astronomical Data Analysis Software and Systems (ADASS) will be held in Tucson on 22-25 October 1995. The Conference will be hosted by the National Optical Astronomy Observatories. Additional sponsors include the Infrared Processing and Analysis Center, the National Aeronautics and Space Administration (tentative), the National Radio Astronomy Observatory, the National Research Council of Canada, the National Science Foundation (tentative), the Space Telescope Science Institute, the Smithsonian Astrophysical Observatory, and the University of Arizona Steward Observatory. 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 (University of Massachusetts), and Doug Tody (NOAO). The Local Organizing Committee is chaired by Jeannette Barnes (softconf@noao.edu).

Plans for this year's Conference are now underway. The meeting agenda will consist of invited and contributed talks and poster sessions on the following special topics: 1) real-time and nearly real-time systems and data acquisition, 2) archives of ground-based data, 3) astronomy science software applications, and 4) software architectures and development methodologies.

Several birds-of-a-feather sessions (BOFs) are also planned. BOFs generally run 1 1/2 - 2 hours, often concurrently with other BOFs, and can be any format defined by the organizer. 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). Current plans are for a BOF on the future of astronomical software development projects and methodologies, an IRAF User's Group meeting, and a FITS BOF.

The Proceedings of the Conference will be published as part of the Astronomical Society of the Pacific Conference Series, as were those of previous Conferences.

An e-mail update will be sent to the Conference electronic mailing list this coming spring. A preliminary program will be sent by posted mail in May containing registration and hotel information and a call for papers. New information will be posted to the World Wide Web as it becomes available or made available in our anonymous FTP directory (see below).

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

Table of Contents

IRAF Update (1Mar95)

Table of Contents

IRAF Update (1Mar95)
(from CCS, NOAO Newsletter No. 41, 1 March 1995)

The patch to V2.10.3 IRAF, originally planned for late 1994, has been delayed for some time awaiting the release of Solaris 2.4. We just received Solaris 2.4 in late January, and we anticipate releasing the V2.10.3 patch by the middle of February. The main reason for the patch is to support both Solaris 2.4 and the new SunSoft V3.0.1 compilers. The patch will also include all bug fixes to IRAF V2.10.3 made since the release last August.

The port to the DEC Alpha running OSF/1 was completed in late December 1994, and the system is now undergoing testing. Look for this to be released sometime in February. An announcement will be posted to the newsgroup adass.iraf.announce when the software becomes available. The release version will be V2.10.3BETA, identical to the V2.10.3 patch mentioned above. Support for OpenVMS running on the DEC Alpha is not planned until the V2.11 release cycle begins later this year. In the meantime a preliminary port to OpenVMS running on the Alpha is available from the STSDAS group at STScI.

The PC-IRAF project got underway late in the year. There is no clear winner yet in the PC operating system wars so we plan to experiment initially with several different systems. The initial IRAF port will be to both Linux and Solaris x86, with a BSD port to follow soon thereafter. Testing will be performed on two separate platforms, a high end Pentium 90 system (PCI/SCSI bus, 32 Mb), and a more modest 486DX2 66 MHz system (IDE/SCSI 16 Mb). We plan to test a laptop version of the system later this year as well. By the time we finish testing on all these platforms we should have a pretty good understanding of what kind of performance one can expect to see with IRAF running on a PC.

A preliminary port of IRAF to Linux, done by David Mills (a programmer at Kitt Peak), was demonstrated at the AAS meeting in Tucson in January, running on the 486DX2 system mentioned above. The X11IRAF package has also been ported to Linux. Completion of the initial PC-IRAF port will follow as soon as we finish configuring Linux and Solaris on these platforms. Although we do not have any release dates yet, we hope to release the initial PC-IRAF systems within the next couple of months.

The IRAF group presented an IRAF demo at the AAS meeting, held in Tucson the second week in January. The new IRAF Version 2.10.3BETA software was demonstrated along with the latest developments in graphical user interface application software including a radial velocity GUI, an aperture photometry GUI, and a spectroscopic analysis GUI. These GUIs are expected to become available for general use sometime later this year, once IRAF Version 2.11 has been released. A highlight of our display this year was a preview of IRAF running on the PC under Linux, using the preliminary Linux/IRAF port done by Dave Mills. As always, it was nice visiting with our IRAF user community at the meeting, and we enjoyed the opportunity to discuss IRAF problems or concerns with them.

The IRAF Users' Committee met in Tucson following the AAS, on Friday, 13 January. The IRAF group presented project reports to the committee and discussed priorities for the coming year. An IUC report to the NOAO Director is now being prepared and is expected to appear in the next Newsletter. The current IUC members are:

Belinda Wilkes (SAO) - Chair,
    belinda@cfa.harvard.edu
Timothy Carone (UC Space Sciences Lab),
    tcarone@aegis.ssl.berkeley.edu
Peter Eisenhardt (JPL),
    prme@kromos.jpl.nasa.gov
Jeff Pier (US Naval Observatory),
    jrp@nofs.navy.mil
Bill Romanishin (University of Oklahoma),
    romanishin@phyast.nhn.uoknor.edu
Bill Sparks (STScI),
    sparks@stsci.edu
Stephen Walton (Cal State, Northridge),
    swalton@csun.edu.

For further information about the IRAF project, please contact Jeannette Barnes (jbarnes@noao.edu), Central Computer Services.

Doug Tody, Jeannette Barnes

Table of Contents

NOAO FTP Archives (1Mar95)

NOAO FTP Archives (1Mar95)
(from CCS, NOAO Newsletter No. 41, 1 March 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 x 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 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 numbers are available 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

Table of Contents