NOAO Newsletter - December 1995 - Number 44

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NOAO Highlights!

Director's Office

Cerro Tololo Inter-American Observatory

Kitt Peak National Observatory

National Solar Observatory

Global Oscillation Network Group

US Gemini Program

Central Computer Services

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

GONG Rings Around the World (1Dec95)

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GONG Rings Around the World (1Dec95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 44, December 1995)

The Udaipur, India GONG station was commissioned on 5 October,
completing deployment of the full six-site network. Routine operations
have begun, and the data have been processed all the way through the
pipeline to produce p-mode frequencies, which have been distributed to
the scientific community. While it has been a full eleven-year solar
cycle since conception, the deployment went very quickly and smoothly,
and operations have been uneventful to date. In short--GONG works!!

                         [Photo not included]

        The Udaipur, India site is watched over by a temple in the
        background.

An important figure-of-merit of the network's performance is the
reduction of the 1/day sidelobes, which generate ghosts in single site
observations. Here is the spectrum of the observing window (1 if any of
the stations were guiding on the Sun, 0 otherwise) for the first 25
days of network observations, compared to that from a good single site
(Big Bear). The daily sidelobe is reduced by more than a factor of
2200. The duty cycle for the network was 97.7% during this period, and
the longest completely clear period has been 128.9 hours (5.4 days).
The performance will be reduced slightly when bad images (e.g. condors
in the beam) are rejected.

While preliminary inversions on the internal rotation and sound speed
variation have already been performed, the Scientific Teams are working
towards a first presentation of results at the January AAS meeting with
publication in a special issue of Science in the late spring.

                         [Figures not included]

        Power spectra of observing windows for one site (left) and
        full GONG network (right).
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More Diffraction-limited Images at the KPNO 4-m Telescope (1Dec95)

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More Diffraction-limited Images at the KPNO 4-m Telescope (1Dec95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 44, December 1995)

During the summer shutdown in 1994 we conducted an experiment to
determine the parameters appropriate for infrared shift-and-add imaging
at the KPNO 4-m telescope. As reported in an earlier Newsletter, we
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built a new camera for the Cryogenic Optical Bench (COB) with a scale of 0.1" per pixel, and took bursts of data at rates up to twenty frames per second. We found that we could often achieve images with a full width at half maximum of 0.3" at wavelengths longer than 3 um with frame rates of only a few hertz. To capitalize on this finding from the prototype experiment, we built a data system that can perform the shift and add calculations in real time. During the summer shutdown this year we installed and successfully operated this system. In early September, this diffraction limited infrared imaging experiment (DLIRIM) was operated in service mode, producing satisfactory data for several proposers.

In each of the illustrations shown here the field of view is approximately 20". (We used a 256 x 256 InSb detector, and the images have been cropped after shift and add processing).

This experiment was built by Jerry Heim and Nick Buchholz, and operated by Mike Merrill and Ian Gatley. The Lucy deconvolution is by Tod Lauer.

[Photos not included]

Figure 1: The left panel shows the Galactic center in the L band. The point spread function can be seen to be uniform across the field. A Lucy deconvolution of this image is shown at right.

Figure 2: This shows an image of the H II region W3A in the L band with one taken at the 50 inch telescope (0.9" per pixel) through a narrowband 3.3 um filter centered on the wavelength of a bright dust emission feature. The bandpass of the narrowband filter is contained within the L filter used at the 4-meter telescope. It was necessary to use the wider filter at the 4-m because of the requirement in shift and add mode that a star in the field be detectable in each individual frame. The limiting magnitude for such stars in this experiment is about L = 8.

Figure 3: The Galactic center in Brackett a emission. This image was made by differencing two images taken in narrowband (1%) filters on and off the emission line, using the same star for shift and add in both cases. The shift and add algorithm employs integer pixel shifts, and returns the (integer) address of the star used for shifting, making the differencing of the two images easy. Notice the diffraction pattern around the emission line star in the lower right.

Figure 4: The bright reflection nebula in W75N. Earlier infrared images had left unresolved the issue of whether this object was a star. This snapshot clearly shows its extent.

Ian Gatley

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Unlocking the Story of the Early Solar System (1Dec95)

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Unlocking the Story of the Early Solar System (1Dec95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 44, December 1995)

Comets falling into the inner Solar System from distant space may be telling us stories about the distant time of the solar system's formation. They are, in fact, of fundamental importance to planetary science because their nuclei may yet preserve in deep freeze not only the primitive material out of which the solar system formed, but physical traces of the various conditions throughout the primitive solar nebula. However, just as the geologist must contend with the continual weathering and processing of ancient geological strata, the planetary astronomer must understand how the comets have been altered by their travels through the warm heart of the solar system.

Karen Meech (Hawaii) has been conducting a long-term program to understand fully the extent and nature of aging effects on the different populations of comets. The core of this program involves monitoring and then modeling the light curve behavior of comets over a large range of heliocentric distance, r, contrasting the behavior of periodic comets that have spent considerable time in the inner Solar System to comets new to the inner Solar System (the Oort Comets). This program has been ongoing since 1985, and has involved the use of the KPNO Schmidt, 2.1-m and 4-m telescopes, the CTIO 0.9-m, 1.5-m and 4-m telescopes, as well as other facilities on Mauna Kea, at ESO, in Russia and the HST.

Meech has shown that the Oort comets systematically possess dust comae out to large heliocentric distances, whereas, with the exception of the outburst of P/Halley, the periodic comets do not. In addition, the shape of the Oort comet light curves is shallower, which in combination with Finson-Probstein dust modeling, shows that the Oort comets remain active at temperatures much colder than the regimes for water-ice sublimation. Figure 1 shows a sequence of images of P/Neujmin 1 from r = 3.8 to 12.3 AU during which time there is no apparent activity. In contrast, Figure 2 shows the Oort comet, Shoemaker 1984f (C/1984 K1) from r = 4.9 to 11.8 AU, and the difference in the amount of coma is striking. Figure 3 shows composite light curves for 5 Oort comets (solid lines) and P/Halley (filled circles and solid line at bottom of figure representing the behavior of the bare nucleus) showing the difference in their heliocentric light curves. All the other periodic comets in the program are much fainter and steeper than P/Halley. Because the observations of the Oort comets at large r show that the nuclei are not unusually large, Meech infers that either they have larger percentages of active surface area, or that they have different compositions, with more volatile ices responsible for the activity.

[Figures not included]

Figure 1: Images of Comet P/Neujmin

Figure 2: Images of Comet Shoemaker 1984E

Figure 3: Cometary Light Curves

With the two comet classes showing clear physical differences, the question of whether this is an evolutionary effect, or the result of different formation locations, becomes important. Recent solar nebula model formation scenarios for comets indicate that they may form in more massive disks than previously believed, and that frictional heating as interstellar grains settle down to the disk mid-plane may cause sublimation of the original volatile materials. The water vapor will then recondense to amorphous water ice in the presence of other more volatile gases at temperatures dependent upon the heliocentric distance. Nebula models and laboratory experiments suggest that comets, such as the periodic comets which form in the Kuiper Belt at 100 AU, should trap large amounts of these other volatiles, whereas the Oort comets, forming closer to the sun in the Uranus-Neptune region between 20-30 AU, should have 2-3 orders of magnitude less trapped volatile material. This suggests that the periodic comets should initially be more active than their Oort counterparts. The fact that exactly the opposite is seen in this study is strongly suggestive that we are seeing the effects of aging in the periodic comets, and that the Oort comets best represent the pristine remnants of the early solar system.

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The Victor M. Blanco Telescope (1Dec95)

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The Victor M. Blanco Telescope (1Dec95)
(from NOAO HIGHLIGHTS!, NOAO Newsletter No. 44, December 1995)

On 8 September 1995, in a well attended mountain top ceremony, the CTIO 4-m telescope was officially named the "Victor M. Blanco Telescope." A large bronze plaque affixed to the building reads (in Spanish, then

English):

Telescopio
Victor M. Blanco

Enreconocimiento a los anos de destacada
labor y servicio en Cerro Tololo.

In appreciation for many years of
outstanding leadership and service at CTIO.

This plaque was initially unveiled on a pedestal at the console room level of the 4-m dome, following remarks by Victor and others. In the time required to transport attendees back down to the ground floor by elevator, it was swiftly and secretly relocated to its permanent site outside the main entrance to the building, greeting Victor when he arrived from upstairs! This gives an indication of the level of service that Victor instilled in the staff, and which subsequent Directors have maintained.

The following reminiscences of Victor's directorship have been provided by former CTIO director Pat Osmer.

Victor M. Blanco and CTIO

I very much regret being unable to attend the naming ceremony for the Blanco telescope. I offer these remarks as a token of my great esteem for the man who is truly the father of the Cerro Tololo Inter-American Observatory.

I first met Victor when he was a Professor at the Case Institute of Technology, and I an undergraduate student from 1961 to 1965. I still remember taking his course in Astrophysics and the remarkable clarity and insight of his teaching. Little did I expect at that time that I would be working with Victor, in Chile, at CTIO, for the 16 years from 1969 to 1986.

When I think of Victor and his accomplishments at CTIO, I think of how he built the scientific, engineering, and technical staff from scratch. I think of how he made CTIO a model of what a national observatory should be, and what an international scientific organization should be. I think of how he both provided outstanding scientific leadership and how he himself made fundamental contributions to astronomical research. And what I think most of is how he did all this while maintaining a warmth and compassion for people that never failed, even in the most difficult moments.

Building CTIO

When I arrived at CTIO, the 60-inch telescope was in operation and the 4-m was under construction. The detectors were single channel photomultipliers and photographic plates, and the electronics ran on tubes and discrete components. We communicated with the US via short wave radio because it would often take hours to get a telephone connection. Our "Internet" was a teletype and a paper tape reader connected to the radio--how prehistoric!

Victor hired John Graham, Jim Hesser, Bill Kunkel, Barry Lasker, Malcolm Smith, and me for the scientific staff. Barry brought the first computer, a Data General Nova that should now be in a museum, and Steve Bracker, our first and unforgettable programmer. With that we began to enter the modern age, and I like to think we kept right at the forefront in instruments and computers all during Victor's tenure.

What attracted us all was the expectation of using the 4-m telescope, the first large telescope in the Southern Hemisphere--and still the largest. I think the scientific excitement at CTIO during those first years with the telescope will never be forgotten by all who were there at that time. Victor was not only Director of the Observatory at the time, but personally played a major role in the alignment and commissioning of the telescope. The 4-m became the most productive telescope in the Southern Hemisphere, and it is entirely fitting that it be named today for Victor.

CTIO as an Institutional Model

Victor instilled in us all that the mission of CTIO was not only to provide first-rank facilities for visiting astronomers, but also to provide equally first-rank service, so that observations could be obtained and the research completed. This just became part of the atmosphere at CTIO. I think that CTIO has never been surpassed in terms of getting the right balance among service, innovation, and research, and it was Victor who saw that we got it right.

Victor brought special qualifications to the Directorship because of his Latin heritage, and many years of academic and research experience in the US. But what really made him stand out was the unique combination of his understanding of the US and Chilean cultures and his vision of how CTIO should function as a truly Inter-American Observatory. Victor understood the crucial importance of working within the norms of Chilean culture, Chilean laws, and Chilean labor practices, while maintaining US standards and meeting the high scientific goals of the observatory. Victor used the critical diplomatic advantages conferred by CTIO's status as an international organization, so necessary to make a high-tech operation function in a remote site, without ever abusing the privileges in fact or in perception. Victor recognized the tremendous talent available among the Chilean staff and constantly nurtured and promoted it, which yielded both excellent labor relations and outstanding productivity. Victor likewise worked to maintain excellent relations with the Chilean astronomical community and the Chilean public at large.

Victor's legendary diplomatic skills become apparent when we consider that his tenure spanned the presidencies of Eduardo Frei M., Salvador Allende, and Augusto Pinochet, an era that included some of the most divisive and difficult times in Chilean history. Yet not only did the observatory never lose a night of observation in this period, and not only did Victor maintain successful relations with all three governments, and not only was the Observatory's position never an issue, but CTIO was and is proudly perceived by the Chilean people as a national institution. I've always suspected that Victor viewed this as one of his greatest achievements. I dare to say that any university program looking for case studies on how to run an international operation should start with Victor's directorship.

Victor's Scientific Accomplishments

Victor had an outstanding sense of what would be good scientific efforts and directions to support, so that his scientific leadership was excellent, and he made major contributions himself. While space does not permit a full accounting of his many efforts, I still think of his work with Betty Blanco and Martin McCarthy on the stellar population in the central regions of our own galaxy and in the Magellanic Clouds as truly pioneering and outstanding work. In particular, their discovery of the astonishing change in the ratio of carbon stars to M-type stars from the nuclear bulge of our galaxy to the LMC and then the SMC still stands out in my mind as one of the most dramatic indicators of the profound impact that the differing chemical composition and evolutionary histories of these systems can produce.

Victor's Humanity

As if all of the above accomplishments were not enough in themselves, I think that what really mattered to all who had the privilege of working with Victor was his innate personal warmth, unexcelled wisdom and understanding of human affairs, and his unfailing courtesy. He was the padrino for many of us personally (including my wife and me); more than that, he was the padrino of CTIO itself. Que hombre mas simpatico y respetado!

Victor, we all salute you.

Patrick S. Osmer

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A Handbook of Answers for NOAO Users (1Dec95)

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A Handbook of Answers for NOAO Users (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

I received the following e-mail about a month ago:

"xxx is here visiting and tells me, 'Hugh Van Horn wants to take $5 million from the grants program and give it to NOAO.'....What's the story behind this?"

There has been considerable community discussion since the Director of the NSF Astronomy Division shared his FY 1996 funding models with various advisory committees. It is important for you as users to understand the factsof the funding debate, so that you can help make the case for continuing support and access to NOAO facilities.

Following are some of the statements that we have heard; if you have heard others, send them to us, and we will either confirm or clarify.

1. Funding is increasing for the centers at the expense of the grants program.

The following table shows the fraction of the NSF astronomy division budget, exclusive of construction funds, that has gone to the grants program since 1980.

Year	% Research Projects	Year	% Research Projects
1980	31%	1988	33%
1981	33%	1989	32%
1982	33%	1990	34%
1983	34%	1991	34%
1984	36%	1992	34%
1985	33%	1993	35%
1986	33%	1994	38%
1987	33%	1995	38%

The budgets for FY 1996 are unknown, but in the "level funding" scenario presented by Hugh Van Horn to stimulate debate on priorities, the fraction of the total budget that would go to grants is 34 percent. A significant portion of the funds proposed in that scenario for the national centers is for one-time expenditures on construction ($2M at NOAO, $1M at NRAO, and $600K at NAIC). The operating budgets for the centers, with these construction funds excluded, are then at 64 percent of the total. Therefore, as a percentage of the total NSF budget, the operating budgets of the national centers have been at an all time low for the past three years, and that trend is likely to continue in FY 1996.

It is even more interesting to look at the evolution in funding expressed in 1993 dollars of the NOAO operating budget and the grants budget. The numbers look like this:

Year	Grants(1993$)	NOAO(1993$)
1980	$30.8M	$28.9M
1981	$30.7M	$29.1M
1982	$28.9M	$28.3M
1983	$30.4M	$28.8M
1984	$37.6M	$31.4M
1985	$35.5M	$31.1M
1986	$33.5M	$29.8M
1987	$34.7M	$28.1M
1988	$33.6M	$27.6M
1989	$32.6M	$27.0M
1990	$33.5M	$24.6M
1991	$35.9M	$25.1M
1992	$38.9M	$27.3M
1993	$36.1M	$24.3M
1994	$40.0M	$24.2M
1995	$36.4M	$22.7M

These numbers for NOAO differ from those published by the NSF for two reasons. First, we have subtracted from the NOAO total the funds for two projects, GONG and RISE, and funds channeled through NOAO to the Steward Observatory Mirror Laboratory. Second, we have allowed for inflation in Chile, which has run at a much higher rate than US inflation in recent years. Therefore, over this period of time, the ratio of research project support, which we have termed grants in the table, to support for operations at NOAO has changed from 1.06 to 1.60. We have not done the calculation for 1996, since we do not know either the actual NSF funding levels or the inflation rate in Chile.

2. NOAO is taking money from the grants program to build two 2-m telescopes on Kitt Peak.

Given that NOAO has been told to plan for declining budgets, that we are unable to devise a way to reduce the budget and continue to operate all the existing facilities, and that we have an obligation to provide data to the user community, we have worked with the user's committees to develop a plan for restructuring NOAO, both solar and nighttime, that represents an optimization of cost and performance. The solar component of the proposal that we plan to submit to the NSF is available on the network through the NOAO home page. It calls for replacement of the existing synoptic solar telescopes for monitoring both the disk and corona with facilities that would provide for automated observing and archiving while improving the quality of the measurements. The scientific pros and cons of the nighttime proposal are currently open to debate by the community, again on the network. The nighttime plan is to join the SOAR project, which is a partnership involving Brazil and the University of North Carolina to build a 2.4-m telescope for imaging at CTIO that would offer the same wide field as the Sloan survey telescope in the north and keep open the option that the Sloan consortium might extend their survey to the south; and to build a 2.4-m telescope at Kitt Peak that would accommodate a mosaic CCD imager with a field of view of 34' x 34' arcmin. The other instrument proposed for the 2.4-m telescopes is a fiber feed to a bench-mounted spectrograph. The cost of construction of the 2.4-m telescopes would be recovered in operations cost savings in less than eight years.

With these telescopes in place, we would close or turn over to universities for private operation nine others (the 2.1-m, 0.9-m, Coude Feed, and the Burrell Schmidt on Kitt Peak; the 1.5-m, 1.0-m, 0.9-m, and Case Schmidt at CTIO; and the solar Vacuum Telescope on Kitt Peak).

One of the primary motivations for the proposed nighttime facilities, and particularly the 2.4-m telescopes, is to take advantage of the technologies implemented for WIYN to improve imaging performance. The delivered image quality at WIYN is less than 0.7" about 25 percent of the time, and the median averaged over one year is 0.8". It is highly doubtful that such performance can be achieved even with major modifications to existing 30-year-old telescopes, which were simply not designed with tight imaging specifications in mind. Primary scientific use of these telescopes would be for imaging surveys to select objects for observation with Gemini and other large telescopes, and to study time variable phenomena.

This restructuring proposal for nighttime astronomy would leave the community as a whole with facilities in each hemisphere that are approximately comparable to what the large individual astronomy departments will have available. KPNO with three telescopes plus Gemini in the north, and CTIO with three telescopes plus Gemini in the south, offer capabilities similar to those provided by Lick plus Keck; Palomar plus Keck; Texas plus the Hobby-Eberly Telescope; Steward plus the MMT upgrade and the Large Binocular Telescope; and Carnegie plus Magellan. Surely the federal government ought to be able to provide as much support the national community as individual states do for their much smaller communities of users. The alternative to funding the restructuring proposal will be, given the projected operating budgets, the operation of only the 4-m Blanco Telescope and the 1.5-m telescope at CTIO; operation of WIYN and the 4-m Mayall Telescope on Kitt Peak; and limited accessibility to solar synoptic data, with much being in photographic rather than digital form.

The philosophy and highlights of the restructuring proposal have been available for public discussion over the network. AURA's advisory structure must approve the proposal for submission to the NSF. The proposal will then undergo a stringent peer review. You as users can increase support for NOAO and all of NSF astronomy by resisting the spread of baseless rumors that distort the content of the proposal and the process of its review and acceptance.

3. KPNO has $2M and they did not even spend it when it could have gone to the grants program.

At the end of January 1995, NOAO was told it would be given $2M toward restructuring from a special fund held by the Math and Physical Sciences directorate, not at the astronomy divisional level of the NSF. There is no chance in our view that this $2M would have been available for the grants program given its source. NOAO was told that an additional $2M would be made available in FY 1996 subject to receipt of a suitable proposal; the source of the second $2M was not indicated at the time. NOAO spent approximately $1M in order to deploy GONG one year earlier than would otherwise have been possible (thereby saving $1.7M by shortening the deployment schedule); to provide severance pay; to offer retirement options to tenured staff; and to extend the solar-stellar program for one additional year. By completing outside contracts for WIYN, CHARA, and Gemini, holding down internal spending, and not committing $500K carried over from the previous year, we were able to restore the $1M. How we spend the restructuring money obviously depends on whether or not the $2M in FY 1996 is forthcoming.

Therefore, we do not plan to make any major financial commitments until our restructuring proposal is reviewed.

4. Meanwhile, back to the $5M dollar story:

The interpretation of the NSF planning for the FY 1996 budget as a transfer of $5M is not grounded in the facts of the case. Not only did the $5M never exist, it certainly did not go to NOAO.

The facts are these. The President's budget as submitted to Congress for FY 1996 contained $40M for the grants program. This budget was, of course, even more dead on arrival than usual, given the Republican takeover of Congress. Hugh Van Horn has presented an alternative "flat budget" scenario to stimulate discussion about the budgetary issues we will have to face once the budget for FY 1996 is passed. In this "flat budget" scenario, the grants program is set at $35M, which is $5M below a hypothetical budget that had no chance of becoming a reality. If this is a $5M cut, I could say with equal justification that the NOAO operating budget has been reduced by $2.5M. The request for NOAO in the President's budget was $29.2M. In the "flat budget" scenario, NOAO would have $26.7M for operations and $2M for a onetime investment in projects. There were no restrictions on the use of funds by NOAO in the President's original submission.

A more relevant comparison may be with FY 1995. In the "flat scenario," which is not yet a reality, the total budget for all the centers is slated to increase by $3.3M while the grants budget is slated to decrease by $3.3M in going from FY 1995 to FY 1996, with all of the increase in the centers' budgets being earmarked for construction projects. Operations are being level dollar funded. The reverse of this change in balance between grants and centers happened between FY 1993 and FY 1994. The grants budget increased by $4.6M while the centers budget decreased by $1.5M. These percentage changes are reflected in the table given above.

It is not clear that a narrow focus on NSF funding alone will allow us to focus resources in the right direction, given the budgetary constraints that we will all face. The support for grants by NASA has increased sharply in the past five years. As just one example, HST funding for general observers, Hubble fellows, and users of the archive is projected to be $25M in FY 1996, up from $5M in FY 1992 and near zero in FY 1990. These numbers do not include the NASA funding for theory or data analysis from missions other than HST. It appears likely that $1-3M will be added to the currently planned HST grants budgets in the years 1996-2001. This increment in just one NASA program is nearly equal to the entire amount being debated on the NSF side, which serves to illustrate the dominant role that NASA plays in awards to individual investigators.

The bottom line:

Both NOAO and the NSF grants program are under extreme stress because of the increasing demand for resources and the steady loss in purchasing power in recent years. The health of our field requires vitality in both centers and grants. The NOAO restructuring proposal is a positive response to the opportunity for timely reinvestment in the National Observatory infrastructure. It offers the prospect of attracting more money to astronomy from outside the Astronomy Division budget. A community willing to cooperate to increase support for our field is a necessary prerequisite for any prospect of success. If your science is strengthened by competitive access to facilities and data of the National Observatories, you must be prepared for active advocacy, with straight facts. The alternate may be that the attacks of a vocal few undermine the NSF Astronomy Division's ability to advance a balanced astronomy program within the Foundation, to the detriment of our entire discipline.

Sidney C. Wolff, Richard F. Green

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Our National Observatories (1Dec95)

Our National Observatories (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

Even as astronomy enjoys increasing popular support inside and outside the Washington beltway, NOAO is under attack from some in our community. How is NOAO really doing? The good news is that it enables and produces top quality science cost-effectively. See the list of all-time science highlights in this issue. Working for and with Wisconsin, Indiana, and Yale, NOAO built the WIYN telescope within budget and on schedule. It has reached world-class performance in an astonishingly short time. GONG is deployed and works perfectly. NOAO's twin children, the Gemini telescopes, are now independent under international sponsorship and proceeding well, despite numerous technical and other challenges. At its three observatories, NOAO serves more than 1,000 users per year. On a comparable basis, its operating costs are similar to or less than those of other observatories, even those with fewer telescopes, sites, and users. It competes favorable for instrumentation, and its costs for facility-class instruments compare very well with others.

What is the bad news? It is certainly not bad news that there are private observatories. To the contrary, the "privates" enrich US astronomy in innumerable and immeasurable ways. NOAO, even by providing access to Gemini, could not begin to provide the depth and breadth of observing capabilities the US community now enjoys and looks forward to, certainly not without "astronomical" amounts of additional Federal funding that would be very unlikely to emerge. The existence of the privates is therefore in the best interest of US astronomy. That is why I have consistently encouraged private initiatives and invited them to locate at NOAO sites. I support them whether or not they opt to co-locate with NOAO, even though many of them are not open to the general community but primarily to those of the sponsoring private institutions. That policy makes sense as long as there are national observatories, places where any astronomer with a good idea can go and get data--Leo Goldberg's principle. More access may become available if NSF implements the McCray panel's recommendation that privates provide access to the general community in return for NSF funding for instruments. I am hopeful that NSF will do so. If it does, AURA will endeavor to make this idea work.

What then is the bad news? Not enough money to operate the observatories and to provide grants for observers, theorists, and builders of instruments. Funding for NOAO declined by 25% in real terms since 1984, after correcting for inflation. The "national observatories" to "grants" funding ratio in NSF's Astronomy division declined from 2.0 to approximately 1.6 during the past two decades. Fortunately for the grants program, this shift from centers to grants in NSF was complemented by NASA which increased its funding for grants substantially. For example, HST funding for grants to General Observers, Hubble Fellows, and archival researchers increased from near zero in 1990 to a projected $25M per year in 1996.

Funding for grants is essential. It would not make sense to operate observatories that people do not have the resources to use and derive knowledge from. The reverse, however, to close national observatories and put the money into grants instead--if Congress would permit that--would not make sense either, certainly not to anybody without the privilege of access to private telescopes. What to do?

To find the right balance is NSF's job. As lead agency for science, NSF considers all sources of support for our science, federal and private, and uses its funds as a "flywheel" to provide the right overall balance. Our job in AURA and NOAO is to enable the best possible science through merit-based, open-to-all access, and to do that at the lowest attainable costs. NOAO now has an outstanding record of enabling excellence, while completing projects on time and within budget. And it has the lowest overhead rate of any institution I know.

What is AURA's view? We are committed to national observatories that enable the best possible science and that are cost-effective. We are committed to provide as many such capabilities at NOAO as we can. Our national facilities should compete with the best. If lack of funding forces us to do so, we may be forced to shut down some of them because it is better to operate few facilities well than many submarginally. If so, we will look for other ways to enable the science that would be lost. And we will continue to encourage NOAO to propose, and NSF and partners to invest in, improvements that enable better science while lowering operating costs. It should "do better--if not necessarily more--with less."

It is possible that NOAO, like much of the federally-funded research effort, may grow yet smaller in the coming years. All astronomers must face this reality, not just at the national facilities but at universities as well. If further contraction is unavoidable, we need to accomplish it in the cleverest way that preserves the maximum science for our discipline as a whole.

NOAO's excellent scientific, technical, and managerial performance is necessary to ensure its future. But it is not sufficient. The future depends critically on broad support in the community for the concept of national centers. That support is strong and broad but not unanimous: it is shared by those who depend on national observatories, and by many who do not--but it is not shared by everyone.

What do you think? Comment to (goertel@stsci.edu), or to Sidney (swolff@noao.edu), or to our new Chair, Bruce Margon, (margon@astro.washington.edu), or to Observatories Council Chair, Lee Anne Willson, (s1.law@isumvs.iastate.edu).

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10 Greatest Hits (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

We are often called upon to provide lists of the contributions that KPNO has made over the years. For one recent meeting, a past chair of the AURA oversight committee for NOAO prepared a list of what he thought were the ten most important results from KPNO. I will let his name remain anonymous, since obviously any such list can win more enemies than friends. I would like your help in adding to this list and extending it to CTIO and NSO. What do you consider the most important results to be obtained in large part at NOAO facilities? Send e-mail to swolff@noao.edu.

KPNO Observational Results: 1963-1994

1) Infrared Tully-Fisher Relation (Aaronson, Huchra, and Mould)
2) Bootes Void (Kirshner, Oemler, Schechter, and Shectman)
3) Lyman Alpha Forest (Lynds)
4) Butcher-Oemler Effect
5) Surface Brightness Fluctuations (Tonry)
6) First Gravitational Lens (Walsh, Weymann, and Carswell)
7) Flat Rotation Curves for Spiral Galaxies (Rubin and Ford)
8) Slow Rotation of Elliptical Galaxies (Illingworth)
9) Faint Quasar Counts (Koo and Kron)
10) M87 Black Hole (Sargent, Young, Boksenberg, Shortridge, Lynds, and Hartwick)

Sidney C. Wolff, Director

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NOAO Nighttime Instrumentation Program (1Dec95)

NOAO Nighttime Instrumentation Program (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

1 October marks the start of our program year 1996. We anticipate the completion of four projects this year, and a strong beginning on four more.

At the head of the queue is Phoenix, the high-dispersion near-IR spectrograph. The large dewar shell has been successfully completed. Mechanism assembly and cold testing is well underway. A major push is on to modify the WILDFIRE controller to operate the two adjacent quadrants of an ALADIIN InSb array to provide the usable 1024 x ~300 format. Project Scientist Ken Hinkle has been working with the IPG team to a schedule that calls for lab integration and system testing starting in early February and telescope testing later in the spring. Watch the next Newsletter for the possibility of shared risk availability in fall semester 1996.

As Phoenix winds down its design and fabrication activity, the Large CCD Mosaic Imager will take its place. Detail design and initial fabrication is underway for the filter transport mechanism, the supporting frame, and the dewar layout. The CTIO technical group is heavily engaged in modifying the Arcon software and fabricating the hardware to control the eight CCDs. Project Scientists Todd Boroson and Taft Armandroff are devising the strategy to populate the full detector format with devices. It is likely that there will be a steady improvement in cosmetic quality as the first-light CCDs are replaced with later generation 2K x 4K devices. The schedule goal is to test the system at the 0.9-m during summer shutdown. During that time, the required modifications will be made to the Prime Focus pedestal of the Mayall 4-meter, particularly to accommodate the increased demand for precision motion with a 500 pound load. The new Prime Focus corrector with increased back focal distance and dispersion compensating prisms is planned to be installed later in 1996. The CCD Mosaic could be available for shared risk use in spring semester 1997.

At the end of spring observing next semester, the Cryogenic Optical Bench will be removed from service for retrofitting with an ALADDIN InSb array with one high quality 512 square working quadrant. The imager and modified WILDFIRE controller will then be shipped to CTIO for regular use as a high-resolution imager, matched to the new tip/tilt secondary. Ultimately, it is the intention to upgrade the system to a full 1024 square format array and new generation controller, as they become available.

As you read elsewhere in the Newsletter, the experiment of near diffraction-limited imaging with hardware shift-and-add on the Kitt Peak 4-meter telescope was a great success. The Datacube fast DSP enabling the experiment will serve as the heart of the next generation IR array controller, with adequate capacity for operation of full-format ALADDIN arrays in the thermal infrared. Ian Gatley is working with the IR electronics group, Jerry Heim, Nick Bucholz and Al Fowler to design and implement these new controllers, which will be integral parts of the next generation instruments for both NOAO and Gemini. The plan is to test their performance at the telescope during shutdown this coming summer.

The Gemini IR Spectrograph is now an official project, with the signing of the Workscope by the US Gemini Project Office, the International Gemini Project, and NOAO. Dan Vukobratovich has been brought on board as the Project Engineer, Jay Elias is serving as Project Scientist, and the technical team is being assembled. While the conceptual design is being polished, preliminary functional documentation is being prepared. The Conceptual Design Review will be held next March.

For continuity in the program, new instruments are being planned to follow the major projects nearing completion. The highest priority of the Users Committee was a clone of the Hydra fiber positioner, now successfully in routine scientific operation at WIYN. The design for the R-C focus of the Blanco 4-meter will, of course, be similar to that for the Mayall 4-meter. Project Scientist Sam Barden will lead the effort to replace the current motor controllers, which are no long available, with higher performance, modern ones. A first design review is scheduled for 13 December.

Two strongly desired capabilities are near-infrared spectroscopy for Kitt Peak, and new high-throughput optical spectrographs for both sites. The GRASP design for multi-color IR imaging and spectroscopy was brought to completion, but was likely to have a protracted development schedule with available resources. The possibility of collaboration to produce a multi-band imager/spectrograph is being actively pursued, and will be discussed further as positive results develop. New technology for high-throughput optical spectroscopy will be investigated in the lab this year, as the basis for a new design to be discussed with users and the community.

As always, we want your comments. As we move Phoenix and Mosaic to completion, we will have the opportunity for new starts. What should be our highest priorities for updating our current suite of instruments? What capabilities are most needed, and at which site? These will be the instruments that will be completed as the Gemini telescopes come on line, and will provide the support for and complement to Gemini observational programs. We value your participation in that forward look.

Richard Green

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Transitions (1Dec95)

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Transitions (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

I am pleased to announce the promotions of several members of the NOAO scientific staff. Richard Elston (CTIO) and Tod Lauer (KPNO) have been promoted to Associate Astronomer. Phil Massey, Alistair Walker, and Jay Elias have been promoted to Astronomer.

Dave Crawford will become an Emeritus Astronomer at the end of November.

Chuck Claver, who came to KPNO from Texas as a postdoc last December, was promoted to Assistant Scientist.

Stephane Charlot, a postdoc at KPNO, accepted a position at the Institute d'Astrophysique in Paris and left Tucson in mid-November.

Arjun Dey, from Berkeley, joined the KPNO staff as a postdoc at the end of October.

Sidney C. Wolff, Director

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Closure of Solar-Stellar Program at the McMath-Pierce Telescope (1Dec95)

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Closure of Solar-Stellar Program at the McMath-Pierce Telescope (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

In September, I informed Goetz Oertel, the President of AURA, that we would be forced to end the program of solar-stellar observations at the McMath-Pierce Telescope for budgetary reasons. Following is the memo I sent him justifying this action and giving a summary of the alternatives that I believe are now available for pursuing this type of science:

I regret to inform you that the synoptic solar-stellar program at the McMath-Pierce Telescope will be terminated at the end of calendar year 1995. This decision has been made for budgetary reasons and after careful consideration of priorities within NSO and alternate opportunities to pursue solar-stellar research.

As you recall, Jacques Beckers announced the termination of this program as a result of the budgetary reduction that was imposed in early January of this year. It was his view that NSO had to give highest priority to its programs in solar physics and that the budget was no longer adequate to keep all of the NSO facilities in operation. We received a large number of letters from the solar-stellar community expressing concern about this decision.

In late January, the NSF provided an additional $2M to NOAO in order to restructure its program. Although these funds were specifically not to be used to cover long-term operations, I did use some of the restructuring money in order to continue the solar-stellar program for one additional year. It was hoped that the solar-stellar community would find alternate ways to continue operation of the nighttime program either at the McMath-Pierce or at some other facility.

Additional non-NSF support has not yet been identified by the solar-stellar community, and NOAO's own operating budget has been cut by an additional 5 percent effective this coming fiscal year. NSO has not changed its view of its own priorities and has not funded the operation of the solar-stellar program in FY 1996.

In reviewing NOAO's overall priorities, I have concluded that there are now viable alternatives for solar-stellar research that did not exist when the McMath-Pierce nighttime program was initiated. The WIYN telescope is on line, and the NOAO share of the observing time is queue-scheduled, thereby enabling studies of variability on a variety of time scales. The WIYN is equipped with a multi-fiber spectrograph, which is well suited to the study of rotation and dynamo-related activity in solar-type stars in clusters. Determinations of rotation periods, activity levels, cycle lengths and amplitudes for a well defined sample of stars with a range of ages will lead to major advances in the understanding of stellar astrophysics. Phoenix will soon come on line, offering resolutions of 100,000 in the near infrared. This instrument will enable breakthrough studies of magnetic fields in late-type stars. The Coude Feed and the 4-m telescope are both equipped with moderate to high resolution spectrographs. We expect to build a clone of the WIYN fiber positioner for CTIO, and cluster studies can then be extended to the southern hemisphere.

I will work with the solar-stellar community to understand what modifications in nighttime instrumentation and scheduling approaches would best accommodate observations of solar-type and other cool stars. I will ensure that appropriate NSO staff are included in discussions of instrument priorities in the NOAO nighttime program; it is likely that the KPNO and CTIO time allocation committees will merge sometime in the next year or two and will very likely change to discipline-oriented sub-committees, which may help with some of the scheduling issues. A major lack in the KPNO suite of instrumentation is a spectrograph at the 4-m telescope with a resolution of 100,000 or greater. KPNO has considered building such a spectrograph but it is not currently possible within the resource envelope. If NOAO cannot find funds in a timely manner, perhaps some group in the solar-stellar community will take on the task of building such a spectrograph. If it could be coupled with a fiber to the 4-m focal plane, then this instrument could easily be switched in during gray, bright, and non-photometric conditions and possibly gain significant amounts of observing time in that manner.

While it is painful for any portion of the community to lose access to a highly productive facility and also painful for NOAO to reduce observing opportunities for the scientists we are committed to serve, we see no alternative given the current budget and the negative projections for future budgets. Because there appear to be viable alternatives for solar-stellar research at NOAO, I must regretfully conclude that it is necessary to end the synoptic solar-stellar program at the McMath-Pierce.

Sidney C. Wolff, Director

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The Gerard P. Kuiper Prize for 1995 (1Dec95)

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The Gerard P. Kuiper Prize for 1995 (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

I am very pleased to announce that Mike Belton of the KPNO staff has been given the Gerard P. Kuiper prize. This prize is the highest honor granted by the Division of Planetary Sciences of the American Astronomical Society. The citation that accompanied the award reads as follows:

The Gerard P. Kuiper Prize for 1995 is awarded to Michael J. S. Belton in recognition of the great breadth of his contributions to planetary science. From early in his career, he exhibited exceptional versatility--investigating the orientation of plasma tails in comets, studying the dynamics of dust in the solar system, setting limits on the atmosphere of Mercury, and studying the water vapor in the atmosphere of Venus. Subsequently, his studies of the rotation of the outer planets, which followed his analysis of the circulation of the atmosphere of Venus using the data from Mariner X, have been particularly seminal.

Michael Belton's recent scientific contributions have emphasized the smaller bodies of the solar system and include the first unambiguous discovery of a satellite of an asteroid with the Galileo imaging team and outstanding work clarifying the ambiguities inherent in the many conflicting studies of the rotation of comet 1P/Halley. The latter work led to the best current model for the comet's rotation and demonstrated that excited, complex rotation is present.

Belton has also led in merging scientific questions with spacecraft capabilities, as is illustrated particularly well in his leadership of the imaging team on Galileo and also in his ideas for new types of interplanetary missions that allow the study of the numerous, smaller members of the solar system. He has played a key role in assuring the availability of ground-based instrumentation for planetary science through his service roles, both within NOAO and on various advisory committees. For all these reasons, Michael Belton is an especially worthy recipient of the Gerard P. Kuiper Prize.

Sidney C. Wolff, Director

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NOAO K-12 Educational Outreach (1Dec95)

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NOAO K-12 Educational Outreach (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

IDEA Grant Status

Classroom presentations in our year long implementation of the IDEA Grant "Active Learning Exercises in Planetary and Solar Astronomy for K-3 Students" are drawing to a close. Eight members of the National Solar Observatory have been making repeat visits to the elementary classrooms this semester, presenting topics which include The Natural Sun, Sunspots and Solar Rotation, The Sun as a Clock, and Solar Music--Helioseismology. Students get involved with hands-on activities during each presentation and have worked with prisms and diffraction gratings, "old fashioned" blueprint paper, photographs showing shadows changing during the day, and made sun clocks during the course of the solar unit. Lessons learned, by astronomers and students, will be presented at the San Antonio AAS meeting. Lesson modules are being written up now, for World Wide Web and paper distribution.

FAQ Brochures Available

A list of Frequently Asked Questions About Being an Astronomer has been assembled, with questions compiled from students' phone calls into this office and answers based on interviews with NOAO staff astronomers. This Frequently Asked Questions (FAQ) list is available on-line through the K-12 Educational Outreach Activities link of the NOAO WWW Home Page (http://www.noao.edu/) and is expected to be most useful for middle and high school students interested in knowing more about astronomy as a career and lifestyle choice. Due to popular request, this FAQ is also available as a printed tri-fold brochure. You may order up to 25 copies of the brochure by sending your request to the following address:

FAQ Request,
NOAO Education Office
P.O. Box 26732,
Tucson, AZ 85726

Please include your name and mailing address, the number of copies requested, and a brief note about about how you will be using the brochures. Thank you for your interest.

Suzanne Jacoby, Education Officer

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Congratulations! (1Dec95)

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Congratulations! (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

John Salzer, Assistant Professor of Astronomy at Wesleyan University and Chair of the CTIO/KPNO Users Committee, has been named an NSF Presidential Faculty Fellow. John was one of 15 scientists receiving the award, which was announced by President Clinton. He will use the support to pursue his research on the properties of emission-line galaxies and the incidence of starbursts.

The NOAO staff joins in congratulating John on his accomplishment. We're pleased that our facilities play a key role in his program, and that John is willing to devote his time and energy to work for the long-term success of NOAO and its users.

Richard Green

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News from AURA: Welcome New Members (1Dec95)

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News from AURA: Welcome New Members (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

We are pleased to announce that the University of Minnesota and the University of North Carolina, Chapel Hill have joined AURA as its newest members. Bruce Carney from Chapel Hill and Len Kuhi from Minnesota have joined our Board. We cordially welcome Bruce and Len. Len had served on the Board previously, from 1978 to 1989, when he was at the University of California--we are glad to have him back! Bruce has worked closely with us in several capacities. We are glad to see him in this new role.

Goetz Oertel

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News from AURA: Key AURA Committees (1Dec95)

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News from AURA: Key AURA Committees (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

Annual elections at the AURA Board meetings change the membership of key committees of the Board. For your information, here are the members of the Executive Committee and the Observatories Council (OC), as a result of this year's elections.

Executive Committee

Bruce Margon (Chair)	- University of Washington
Richard Zdanis (Vice Chair)	- Case Western Reserve
Donald Baldwin	- University of Washington
Jay Frogel	- Ohio State University
John Huchra	- Harvard/Smithsonian Center for Astrophysics
Morton Lowengrub	- Indiana University
Richard Margison	- University of Illinois
Goetz Oertel	- AURA
Vera Rubin	- Carnegie Institution of Washington
Lee Anne Willson	- Iowa State University

Observatories Council (OC)

Lee Anne Willson (Chair)	- Iowa State University
Juri Toomre (Vice Chair)	- University of Colorado
Michael A'Hearn	- University of Maryland
Claudio Anguita	- Universidad de Chile
Phillip Certain	- University of Wisconsin, Madison
William Hoffmann	- University of Arizona
Edward Kibblewhite	- University of Chicago
Goetz Oertel	- AURA
Paul Schechter	- Massachusetts Institute of Technology
Arthur Walker	- Stanford University

Diana Whitman

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NOAO Preprint Series (1Dec95)

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NOAO Preprint Series (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

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

664 *Hinkle, K., Wallace, L., Livingston, W., "Infrared Atlas of the Arcturus Spectrum, 0.9-5.3 Microns"

665 Patron, J., *Hill, F., Rhodes, Jr., E.J., Korzennik, S.G., Cacciani, A., "Velocity Fields Within the Solar Convection Zone: Evidence from Oscillation Ring Diagram Analysis of Mt. Wilson Dopplergrams"

666 *Charlot, S., Worthey, G., Bressan, A., "Uncertainties in the Modeling of Old Stellar Populations"

667 *Layden, A.C., "The Metallicities and Kinematics of RR Lyrae Variables. III. On the Production of Metal-Rich RR Lyrae Stars"

668 *Sarajedini, V.L., Green, R.F., Jannuzi, B.T., "Requirements for Investigating the Connection Between Lyman Alpha Absorption Clouds and the Large-Scale Distribution of Galaxies"

669 *Massey, P., Armandroff, T.E., Pyke, R., Patel, K., Wilson, C.D., "Hot, Luminous Stars in Selected Regions of NGC 6822, M 31, and M 33"

670 *Geisler, D., "New Washington System CCD Standard Fields"

671 Chaboyer, B., Demarque, P., *Sarajedini, A., "Globular Cluster Ages and the Formation of the Galactic Halo"

672 *Jannuzi, B.T., Elston, R., Schmidt, G.D., Smith, P.S., Stockman, H.S., "Detection of Extended Polarized Ultraviolet Radiation from the z=1.82 Radio Galaxy 3C 256"

673 *Wallace, L., Hinkle, K., "An Infrared Spectral Atlas of Arcturus for the Range 10750-1150 cm-1 (8600-9300)"

674 *Courteau, S., "A Catalog of Deep r-Band Photometry for Northern Spiral Galaxies"

675 *Jacoby, G.H., Ciardullo, R., Harris, W.E., "Planetary Nebulae as Standard Candles X. Tests in the Coma I Region"

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Other NOAO Papers (1Dec95)

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Other NOAO Papers (1Dec95)
(from Director's Office, NOAO Newsletter No. 44, December 1995)

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

Alexander, D., *Harvey, K.L., Hudson, H.S., Hoeksema, J.T., and Zhao, X. "The Large Scale Eruptive Event of April 14 1994"

Andretta, V., *Giampapa, M.S., and Jones, H.P. "Helium in the Spectrum of the Sun and of Solar-Type Stars"

*Balasubramaniam, K.S., Keil, S.L., and Tomczyk, S. "Stokes Profile Asymmetries in Active Regions"

Baum, W.A., Hammergren, M., Groth, E.J., *Ajhar, E.A., Lauer, T.R.,

O'Neil, Jr., E.J., Lynds, C.R., Faber, S.M., Grillmair, C.J., Holtzman, J.A., Light, R.M. "Globular Clusters in Coma Galaxy NGC 4481"

Christou, J.C., Hege, E.K., and *Jefferies, S.M. "Multiframe Blind Deconvolution for Object and PSF Recovery for Astronomical Imaging"

Christou, J.C., Hege, E.K., and *Jefferies, S.M. "Speckle Deconvolution Imaging Using an Iterative Algorithm"

Cliver, E.W., Kahler, S.W., *Neidig, D.F., Cane, H.V., and Richardson, I.G., Kallenrode, M.B., and Wibberenz, G. "Extreme 'Propagation' of Solar Energetic Particles"

*D'Silva, S. "Measuring the Solar Interior"

*Eggen, O.J., "Photometric Parameters for Short Period Cepheids"

*Giampapa, M.S., Rosner, R., Kashyap, V., Fleming, T., Schmitt, J., and Bookbinder J. "The Coronae of Low Mass Dwarf Stars"

*Giampapa, M.S., Craine, E.R., and Hott, A. "Comments on the Photometric Method for the Detection of Extrasolar Planets"

*Giampapa, M.S., Rosner, R., Kashyap, V., Fleming, T., Schmitt, J., and Bookbinder, J. "Coronal Structure in M Dwarf Stars"

Griffiths, R.E., Ratnatunga, K.U., Casertano, S., Im, M., Neuschaefer, L.W., Ostrander, E.J., Ellis, R.S., Glazebrook, K., Santiago, B., Windhorst, R.A., Driver, S.P., Mutz, S.B., *Green, R.F., Sarajedini, V., Huchra, J.P., Tyson, J.A. "The HST Medium Deep Survey: Progression Towards Resolution of the Faint Blue Galaxy Problem"

*Harvey, J.W. "Helioseismology: the State of the Art"

*Harvey, J.W. "Helioseismology"

Hick, P., Jackson, B.V., and *Altrock, R.C. "Coronal Synoptic Temperature Maps Derived from the Fe XIV/Fe X Intensity Ratio"

Hinkle, K., Wallace, L., and *Livingston, W.C. "Infrared Atlas of the Arcturus Spectrum, 0.9-5.3 Microns"

Hudson, H.S., Acton, L.W., Alexander, D., Freeland, S.L., Lemen, J.R., and *Harvey, K.L. "Yohkoh/SXT Soft X-Ray Observations of Sudden Mass Loss from the Solar Corona"

Hudson, H.S., Acton, L.W., Alexander, D., *Harvey, K.L., Kahler, S.W.,

Kurokawa, H., and Lemen, J.R. "The Solar Origins of Two High-Latitude Interplanetary Disturbances"

Jackson, B.V., Buffington, A., Hick, P.L., Kahler, S.W., *Altrock, R.C., Gold, R.E., and Webb, D.F. "The Solar Mass Ejection Imager"

*Jefferies, S.M., and Harvey, J.W. "Helioseismology from South Pole: 1994-95 Campaign"

*Keil, S.L., Balasubramaniam, K.S., Ljungberg, S.K., Smaldone, L.A., and Rimmele T.R. "Restored Solar Velocity Measurements Obtained from the May 10, 1994 Annular Solar Eclipse"

Kormendy, J., Byun, Y-I., Ajhar, E.A., *Lauer, T.R., Dressler, A., Faber, S. M., Grillmair, C., Gebhardt, K., Richstone, D., Tremaine, S. "An HST Survey of Cores of Early-type Galaxies"

*Kuhn, J.R., Penn, M.J., and Mann, I. "The Near Infrared Coronal Spectrum"

Lemen, J.R., Acton, L.W., Alexander, D., Galvin, A.B., *Harvey, K.L., Hoeksema, J.T., Zhao, X., and Hudson, H.S. "Solar Identification of Solar-Wind Disturbances Observed at Ulysses"

Linsky, J., Wood, B., Brown, A., *Giampapa, M.S., and Ambruster, C. "Stellar Activity at the End of the Main Sequence: GHRS Observations of the M8 Ve Star VB 10"

*Livingston, W.C., Wallace, L., White, O.R., and Huang, Y.R. "Changes in the Quiet Sun, not Solar Activity, may Influence Global Temperatures"

Mann, I., *Kuhn, J.R., and Penn, M.J. "Infrared Spectroscopic Observations of Neutral Helium During the 1994 Eclipse"

*November, L.J., and Koutchmy, S. "Coronal White-Light Dark Loops and Density Fine Structure"

Olszewski, E.W., Pryor, C., *Armandroff, T.E., "The Mass-to-Light Ratios of the Draco and Ursa Minor Dwarf Spheroidal Galaxies. II. The Binary Population and Its Effect on the Measured Velocity Dispersions of Dwarf Spheroidals"

Patron, J., *Hill, F., Rhodes, E.J., Korzennik, S.G., and Cacciani, A. "Velocity Fields Within the Solar Convection Zone: Evidence from Oscillation Ring Diagram Analysis of Mt. Wilson Dopplergrams"

Reipurth, B., Raga, A.C., *Heathcote, S.R., "HH 110: The Grazing Collision of a Herbig-Haro Flow with a Molecular Cloud Core"

Rieger, E., *Neidig, D.F., Engfer, D.W., and Strelow, D. "The Role of High-Energy Protons and Electrons in Powering the Solar White Light Flare Emission"

Soffner, T., Mendez, R.H., *Jacoby, G.H., Ciardullo, R., Roth, M.M., Kudritzki, R.P., "Planetary Nebulae and H II Regions in NGC 300"

*Toner, C.G., Jefferies, S.M., and Duvall, T.L. "Restoration of Full-Disk, Time-Averaged, Solar Intensity Images"

von Hippel, T., Bothun, G.D., *Schommer, R.A., "Stellar Populations and the White Dwarf Mass Function: Corrections to SNe Ia Luminosities"

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

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IR Instrumentation Program News: Getting Ready for AO (1Dec95)

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IR Instrumentation Program News: Getting Ready for AO (1Dec95)
(from CTIO, NOAO Newsletter No. 44, December 1995)

f/14 Tip-Tilt Secondary

The f/14 tip-tilt project, presently well advanced, will bring the benefits of low order adaptive optics to the Blanco 4-m in second semester 1996. With tip-tilt we expect to produce images in the K (2.2 um) band with core FWHM of a few tenths of an arcsecond. This f-ratio will also allow CTIO to exchange IR instrumentation with the Gemini 8-m telescope and KPNO. Capital costs have been kept down by "recycling" an existing, unfinished mirror and a complete mechanical assembly, left over from the original construction of the telescope. These were originally intended for an f/13 Cass focus, which was never implemented. A dummy mirror with the same moment of inertia and mass as the secondary mirror was successfully installed in the mirror cell and shaken in the La Serena machine shop with a full amplitude throw of 15 mm (3"). At frequencies up to 80 Hz the dummy responded very well to the drive signal. The mirror itself has been trimmed and cored for lightweighting, and is currently being figured in the NOAO optical shop in Tucson. It will be installed in the telescope in late February 1996. It will initially provide a passive f/14 focus. We plan to begin testing the tip-tilt capability of the secondary following the extended winter down time of the Blanco 4-m (described in another article in this Newsletter).

COB Goes South

Both infrared imaging and spectroscopy will benefit tremendously from the improvement in image quality offered by the f/14 tip-tilt secondary. A plan is in place to upgrade the detector in the Cryogenic Optical Bench (COB) and transfer it from KPNO to CTIO to take advantage of the tip-tilt capability of the Blanco 4-m for imaging. COB will be fitted with an Aladdin array between June and September

1996 and will be brought to Chile in October 1996. With its Aladdin array in place COB will offer 0.1" pixels which should be well matched to tip-tilt images obtained in good seeing on the Blanco 4-m. COB will serve both as the facitility imager for the 4-m and as the first light imager for the Southern Gemini 8-m telescope.

The IRS Goes f/14

The CTIO IR spectrograph "IRS," as currently configured, is optically matched to an f/30 input beam and so requires modification to work with the new f/14 secondary. As an instrument improvement project just approved by ACTR, the IRS will be optically upgraded to accept an f/14 beam, to provide the narrower slits matched to the expected tight image cores at K, and to provide an improved cold stop, which should help instrumental performance in the thermal infrared. While the design and fabrication can proceed with the instrument in active service, the final modification of the dewar will require the IRS to be removed from use for two months. This is tentatively scheduled for January-February 1997, subject to change as the project schedule is finalized. This will affect instrument availability for the second semester 1996 so check the March NOAO Newsletter before submitting proposals.

Richard Elston, Brooke Gregory

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1.5-m Telescope Drive Interface Upgraded (1Dec95)

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1.5-m Telescope Drive Interface Upgraded (1Dec95)
(from CTIO, NOAO Newsletter No. 44, December 1995)

The definitive version of the electronics that interface the drives at the 1.5-m telescope to its control computer were successfully installed during an engineering run in August. This new PCB based version replaces the handwired prototype that has been in service for two years. This change is invisible to the user but it was greeted with a big sigh of relief from those who must keep the telescope running. Although the prototype has given trouble free service, we have, until now, been completely without spares for this vital piece of the 1.5-m control system. Those responsible for the successful completion of this project were Rolando Rogers, Ramon Galvez, Javier Rojas and David Rojas.

Steve Heathcote

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La Serena Computer Facility: Changing Times (1Dec95)

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La Serena Computer Facility: Changing Times (1Dec95)
(from CTIO, NOAO Newsletter No. 44, December 1995)

A moment of history occurred in September when the last computer in our central facility was moved into its new and much smaller home. The old computer room, now decimated and strewn with disused cables, has seen the passing of IBM, Harris, Data General, DEC, and Sun Microsystems mainframes. The advent of network file servers and desktop workstations has enabled us to reduce our central facility, and cut electricity costs used for air conditioning and the large UPS and power conditioning equipment. The new computer room, remodeled from an existing space in the computing building, houses two Sparc 10 central servers and two Sun 4/390 multipurpose machines. The Suns are candidates for near to medium term replacement. Two 1/2" nine-track tape drives remain available for use by those users with archived 1600/6250 bpi data.

The move was carried out over a two month period with no significant disruptions to normal operation. The large, old computer room will be used as office space for incoming Gemini Project staff.

Ron Lambert

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Refurbishing the Drives on the Blanco 4-m Telescope (1Dec95)

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Refurbishing the Drives on the Blanco 4-m Telescope (1Dec95)
(from CTIO, NOAO Newsletter No. 44, December 1995)

The next step in CTIO's program to modernize the Blanco telescope involves upgrading its drives and control software. This will be carried out during two extended shutdown periods in 1996 and 1997.

The planned hardware changes should result in significantly improved pointing and offsetting accuracy. They will also lead to better open-loop and closed loop (guided) tracking performance, which is essential if we are to reap the fully benefits of the recent image quality improvements. Other major motivators for this effort are to improve reliability and maintenance. The present servo system, encoders, and sequencing logic are more than 20 years old. Thus, like a well-maintained but aging car, the Blanco telescope is beginning to suffer from creaks and rattles and the kind of idiosyncratic behavior that presages an increase in both down time and the effort that must be expended to keep it going. The changes to the telescope control software are aimed at improving efficiency in the operation of the telescope. For instance, we plan that a suitable guide star will be selected and the guide probe moved to the correct position while the telescope is slewing, eliminating the time currently lost in manually searching for guide stars. The same software will also allow the automatic selection of wavefront reference stars when working with the f/14 tip-tilt secondary. This will also make the control software for the Blanco and Mayall telescopes fully compatible, simplifying the planned interchange of instruments between North and South.

In carrying out this project we will follow closely the steps taken at KPNO in the successful effort to upgrade the drives of the Mayall telescope. We thus economize on the engineering effort required and benefit from the experience gained at KPNO. We have already received considerable help from Scott Bulau and his team in the planning stages of this project. Nonetheless, completely replacing the drive electronics remains a major effort that will occupy a significant fraction of CTIO's resources over the next two years. It also inevitably involves shutting down the telescope for substantial periods so that the installation, testing, and tuning of the new system can take place.

We are planning for two shutdown periods. The first will occupy the last six weeks of the fall 1996 semester and the first few weeks of the spring 1996 semester (mid-June through August 1996). The total duration of the shutdown will be about eleven weeks; as of mid-October the exact schedule is not yet defined. This first shutdown will be used to carry out the following activities:

o Repair the declination gear box. Two of the gears in the declination drive suffered severe damage when a fragment of metal found its way into the gear box and got trapped between their teeth. The damage was repaired as well as possible during the last shutdown in August 1994. However, the damage still shows up as periodic spikes in the drive current (one every 2.5d) as the telescope is moved in declination. Generally, the present 4-m servos ride out these fluctuations, although occasionally they cause the declination brakes to trip in during a slew. The new servos we plan to install, however, have much higher frequency response, and are hence highly sensitive to such perturbations. Fixing this problem is thus a prerequisite if the new drive electronics are to function properly. Unfortunately, disassembly and reassembly of the gear box is a complex operation that requires the whole assembly to be returned to the US to carry out the repair. The time to ship the gearbox to and from the US, and to effect the repair, determines the duration of the shutdown. The exact time required is uncertain, subject to final negotiations with the manufacturer.

o Replace the 20 year old relay-based "ladder logic," which provides for sequencing, enabling, interlocks, etc., for any activity performed on the telescope with the solid state equivalent--Programmable Logic Controllers.

o Install new, more reliable, absolute encoders.

o Carry out normal maintenance activities such as realuminising the mirrors.

The second shutdown, of similar length, will be during the fall semester of 1997. By blocking out different months, we hope to spread the scientific impact of these closures on our user community. During this second period we will replace all the telescope drive electronics, including the servo controllers and drive amplifiers. Unfortunately, the activities in the first and second shutdown cannot occur in parallel. Most of the time during the second shutdown will be dedicated to tuning the servos, which requires that the telescope be moveable.

Steve Heathcote, Mark Phillips

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Image Quality Improvement at the 0.9-m (1Dec95)

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Image Quality Improvement at the 0.9-m (1Dec95)
(from CTIO, NOAO Newsletter No. 44, December 1995)

We now have the data in hand to demonstrate the gain in image quality resulting from recent improvements to our dedicated CCD imaging telescope. The installation of fans at the primary mirror cell (April 1995) and new radial supports for the primary (June 1995) have produced several beneficial results. Some of the image astigmatism has been eliminated, and the focus is now nearly constant over the sky. Tests on 5-6 October showed focus changes of approximately +50 um as the telescope is moved from zenith to 50d-60d from zenith. This is a factor of two to four times smaller than previous focus changes. These improvements are being supported by funding from the MACHO project.

Figure 1 shows a histogram of FWHM image diameters measured on focus frames over the past four months. During 59 nights, the median seeing is 1.25", the mean is 1.32", and the first quartile is at 1.04". Eight nights (13%) have FWHM less than 1.0", with the best images at approximately 0.8" arcsec. Previous seeing statistics tabulated by Nick Suntzeff from focus frames over a three-year period (335 nights, 1988-1991) gave a median seeing of 1.78" FWHM for the 0.9-m. My previous estimate of the number of nights with seeing &lt 1.0" on this telescope was about 1 night/year (0.3%), and the statistics from Suntzeff showed no nights with seeing &lt 1.0".

The telescope is still far from perfect. The focus is very temperature dependent, about 35-40 um per degree C change. The temperature should be monitored carefully, particularly at the start of the night when the temperature change is large and focus frames are usually done. The leaky guider adds about 0.2" to the FWHM when used; a guider upgrade is under development. A coma corrector would help image quality over the full Tek2048 field. Current PSF variations require careful applications of quadratic terms; ~100 stars are needed to determine the PSF accurately.

[Figure not included]

Bob Schommer

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Fringing Properties of the Loral 3K CCD on the R-C Spectrogragh(1Dec95)

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Fringing Properties of the Loral 3K CCD on the...(1Dec95)
R-C Spectrograph
(from CTIO, NOAO Newsletter No. 44, December 1995)

The Loral 3K x 1K CCD now offered in the Blue Air Schmidt camera for use on the Blanco 4-m telescope R-C, Echelle, and Argus spectrographs has, as expected, proved to be popular with users due to both its large format and very high quantum efficiency--especially at UV wavelengths. (See NOAO Newsletter No. 42 page 29 for a general description of the properties of this detector.) It has been our hope that this CCD would serve for all spectroscopic programs on the R-C spectrograph, and for all low-resolution applications on the Echelle spectrograph, thus decreasing the number of detector/camera combinations that we must support on these spectrographs. However, worries about the ability to remove the significant fringing of the Loral 3K CCD at wavelengths longer than 7500 A have kept us from withdrawing the Tek 1K/Folded Schmidt camera combination as an alternative for spectroscopy with the R-C and Echelle spectrographs in the red. We have now demonstrated that this fringing can be simply and successfully removed from R-C spectrograph data. Accordingly, the Tek 1K/Folded Schmidt camera combination will no longer be an option with the R-C spectrograph.

Test were carried out with the R-C spectrograph during an engineering night in August. These were aimed at understanding more thoroughly the fringing properties of the Loral 3K CCD and determining how well the fringing could be removed through flat fielding. There were some pleasant surprises. Figure 1 shows normalized dome flat spectra obtained at four different tilts of grating KPGLF. (A low-dispersion grating was selected for these tests since past experience suggests that "de-fringing" is most difficult at the lowest dispersions.) Note that, because of the fast beam of the Blue Air Schmidt camera, the fringing amplitude depends not only on the wavelength of the light, but also on how far off axis that wavelength is imaged. The fringing observed at 9000 A thus varies from 12% peak-to-peak when that wavelength is centered on the CCD to less than 5% when lying near the edge of the detector. Hence, for some projects, a judicious choice of the center wavelength may result in a substantial decrease in the fringing at the wavelengths of greatest interest. For example, if one were interested in obtaining high signal-to-noise with this grating in the wavelength region of the Ca II triplet lines (~8500-8700 A), a tilt centered at around ~7500 A would give a factor of 2 less fringing at 8600 A than would a tilt centered on the latter wavelength. (We have informally dubbed this effect as the "Crotts Effect" in honor of the first observer who called it to our attention, Arlin Crotts.)

Another interesting discovery made during this engineering run was that, contrary to our expectations, the fringe amplitude is not a strong function of the slit width. This is illustrated in Figure 2 where normalized dome flats for slit widths of 224 um (1.5"), 448 um (3"), and 1000 um (6.7") are compared. A close comparison of the 224 um and 1000 um slit width flats show that the fringe pattern and amplitude is the same to high precision. Hence, those of you who like to take both narrow and wide slit observations to obtain the highest spectrophotometric precision may not need to take two different sets of flat fields (at least for "de-fringing" purposes).

Although it may be possible to minimize the fringing of the Loral 3K chip for some projects, the ability to remove the fringes present in the raw data depends on the quality of the flat-fielding that one can achieve. Clearly if there is significant flexure in the spectrograph or camera, the fringing pattern will be slightly shifted with respect to the pattern present in the flat field images. Because of this, our initial guess was that "de-fringing" would be most effective if the flat field exposures were taken at the same telescope position as the observations. Hence, we took quartz lamp exposures using the comparison lamp projector system of the spectrograph, and attempted to use these to flat-field observations taken at the same telescope position. To our disappointment, these tests revealed that the fringe pattern of the quartz lamp exposures was significantly different than the fringing observed in exposures of the night sky taken at the same position. This is undoubtedly due to the fact that the comparison lamp projection system does not perfectly match the f/7.8 beam of the telescope.

[Figures not included]

We, therefore, were forced to flat field our observations using dome flat exposures of the white spot obtained during the afternoon preceding the observations. To our pleasant surprise, the dome flats proved to be remarkably effective at removing the fringing. A typical example is illustrated in Figure 3. The lower plot in this diagram shows the extracted spectrum of the nucleus of the Seyfert 2 galaxy IC 5063 with no flat field correction applied. The fringing in this spectrum, which covers the approximate wavelength range 7000-9300 A (grating tilt = 5140; cf. Figure 1), is clearly visible, with the amplitude peaking just blueward of the Ca II triplet. The upper plot shows the same spectrum after flat fielding with the dome flat. Note that the fringing has essentially disappeared. The signal-to-noise level achieved in the "de-fringed" spectrum near the Ca II triplet lines is approximately 100:1. The fact that the dome flats are so successful in removing the fringing is a tribute to CTIO mechanical engineer Gabriel Perez and his group, who worked very hard to minimize the flexure in the Blue Air Schmidt dewar which houses the Loral 3K CCD.

The conclusion, therefore, is that low-dispersion spectra taken with the Loral 3K CCD can be "de-fringed" to acceptable precision using standard dome flats. In the interest of decreasing the number of spectrograph/camera/CCD combinations that must be supported, we have therefore decided to withdraw the Tek 1K/Folded Schmidt camera as an option with the R-C Spectrograph. We will, however, continue to offer the Tek 1K/Folded Schmidt combination on the Echelle spectrograph until tests can be made comparing performance of this option with the Loral 3K/Blue Air Schmidt and the Tek 2K/Long Cameras combinations.

Mark Phillips (mphillips@noao.edu),
Steve Heathcote (sheathcote@noao.edu)

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Infrared Astronomer (1Dec95)

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Infrared Astronomer (1Dec95)
(from CTIO, NOAO Newsletter No. 44, December 1995)

Cerro Tololo Inter-American Observatory is seeking to hire a scientist to help in the support of its IR instrumentation program. This is a tenure-track position, commencing on or about 1 September 1996, and will be filled at the rank of Assistant or Associate Astronomer.

As a member of the CTIO scientific staff, the person in this position will be expected to engage in a vigorous program of astronomical research using the CTIO facilities. An equal responsibility of the position will be to collaborate with other scientific staff members in support of the CTIO infrared program; this will include instrument check-outs, visitor support, and participation in instrument development. Candidates must have prior experience with infrared instrumentation; the extent and variety of such experience is a primary factor in assessing qualifications and the level of appointment to be made. In addition, it is desirable that candidates have at least two or more years' experience after receipt of their doctorate.

The instrument development activities of the Observatory are located at CTIO's headquarters in the coastal city of La Serena, Chile (pop. 120,000), while the telescopes are located on Cerro Tololo, 1 hr 15 min inland at 2,200m altitude. NOAO/CTIO will be sharing some of its IR instrumentation with the Gemini South telescope. The new staff member will work primarily in La Serena with frequent visits to the mountain. The working language is English. Staff members have excellent benefits and living conditions, including US-style rental housing on the headquarters compound in La Serena, an overseas allowance, and annual travel to the point of hire.

By 15 December 1995, applicants should submit a vita, statement of current research and instrumentation interests and the names and addresses of three professional references to:

Revell Rayne, Human Resources Manager
National Optical Astronomy Observatories
PO Box 26732
Tucson, AZ 85726

We are an equal opportunity/affirmative action employer.

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Observing Request Statistics February - July 1996(1Dec95)

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Observing Request Statistics...(1Dec95)
February - July 1996
(from CTIO, NOAO Newsletter No. 44, December 1995)

4-meter Telescope: 120 nights available

Requests Dark	Requests Bright	Nights Requested Dark	Nights Requested Bright	Instrument	Nights	%
1	0	3	0	ASCAP	3	0.8
4	4	14	12	Argus	26	7.3
4	0	11	0	CF/CCD	11	3.1
18	5	58	17	CS/CCD	75	21.2
2	12	8	53	Ech/CCD	61	17.2
0	9	0	26	IR/Imager	26	7.3
0	12	0	45	IR/IRS	45	12.7
20	4	64	13	PF/CCD	77	21.8
3	2	13	7	RF-P	20	5.6
1	1	5	5	Visitor	10	2.8
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59	49	176	178		354	100%

	Now	Last Semester	Semester Before Last
No. of requests	102	119	96
No. of nights requested	354	415	321
Oversubscription	2.95	2.46	2.10
Average request	3.47	3.49	3.34

1.5-meter Telescope: 161 nights available

Requests Dark	Requests Bright	Nights Requested Dark	Nights Requested Bright	Instrument	Nights	%
2	1	7	8	ASCAP	15	5.7

11	4	49	14	CF/CCD	63	23.8
3	4	23	16	CS/CCD	39	14.7
1	6	5	24	Ech/CCD	29	10.9
0	19	0	88	IR/Imager	88	33.2
0	3	0	15	IR/IRS	15	5.7
2	1	9	7	RF-P	16	6.0
--	--	--	---		---	----
19	38	93	172		265	100%

	Now	Last Semester	Semester Before Last
No. of requests	57	72	55
No. of nights requested	265	368	272
Oversubscription	1.65	2.18	1.62
Average request	4.65	5.11	4.95

1-meter Telescope: 180 nights available

Requests		Nights Requested				
Dark	Bright	Dark	Bright	Instrument	Nights	%
6	8	89	93	ASCAP	182	95.3
0	1	0	9	IR/Imager	9	4.7
-	-	--	---		---	---
6	9	89	102		191	100%

	Now	Last Semester	Semester Before Last
No. of requests	15	11	14
No. of nights requested	191	115	151
Oversubscription	1.06	0.68	0.90
Average request	12.73	10.45	10.79

0.9 meter Telescope: 174 nights available

Requests		Nights Requested				
Dark	Bright	Dark	Bright	Instrument	Nights	%
20	6	166	37	CF/CCD	203	100%

	Now	Last Semester	Semester Before Last
No. of requests	26	31	39
No. of nights requested	203	215	281
Oversubscription	1.17	1.26	1.61
Average request	7.81	6.94	7.21

Schmidt Telescope: 117 nights available

CF/CCD 9 req. for 125 nights 100%

	Now	Last Semester	Semester Before Last
No. of requests	9	14	9
No. of nights requested	125	155	86
Oversubscription	1.07	0.84	0.80
Average request	13.89	11.07	9.56

0.6-meter Telescope: 181 nights available

ASCAP 2 req. for 37 nights 100%

	Now
No. of requests	2
No. of nights requested	37
Oversubscription	0.20
Average request	18.50

Mark Phillips

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WIYN Project Progress Report (1Dec95)

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WIYN Project Progress Report (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

The WIYN Observatory has been routinely conducting science operations since mid-July 1995. Since the last NOAO Newsletter, the major milestones have been the release of MOS/Hydra for science operations and the installation of the baseline Instrument Adaptor Sub-system (IAS).

MOS/Hydra was released to users in mid-August 1995. Since then, it has been in regular use with no significant operational problems. A 400 l/mm "blue" grating was added to the Bench Spectrograph grating complement in early September. Although a variety of minor issues are being cleaned up by the instrument team, the major uncompleted component is the all transmissive Red Camera, now scheduled to be released to users in March 1996.

The IAS was installed in early September 1995. The IAS provides the hardware necessary for auto-guiding, closed-loop focus control, faster wavefront measurement, atmospheric dispersion correction, and comparison lamp illumination on the Nasmyth port not used by MOS/Hydra. It also provides a mechanical interface between instruments and the telescope. Currently, the WIYN Imager is mounted to the IAS. IAS components are being installed and commissioned incrementally. This process is expected to be completed in December 1995.

Primary responsibility for managing on-site operations and improvement projects, as well as tracking telescope performance and taking appropriate action as necessary, has mostly been transfered from the Project staff to the Operations staff led by the WIYN Site Manager, Dave Sawyer. The WIYN Project lives on to accomplish three goals: (1) complete and commission the IAS; (2) close out the Project financial accounts; and (3) conduct an Operations Readiness Review.

The main goal of the February 1996 Operations Readiness Review (ORR) is to provide an "as-built" snapshot of the WIYN Observatory. As with many projects, the WIYN Project started off with a set of the WIYN Scientific Advisory Committee (SAC) approved specifications, not all of which have been achieved by the real system. The ORR will develop a list of such unmet specifications for SAC review. The SAC will then decide whether the Observatory should try to meet those specifications in the future or accept them as they are, on a case-by-case basis. At the same time, issues such as the availability of spare parts, status of documentation, and level of training for operations and maintenance will also be reviewed. Such a review is necessary as part of the formal conclusion of the Project.

Assuming that the SAC is satisfied with the ORR outcome, it is expected that the WIYN Project will be officially concluded during the March 1996, WIYN Board meeting in Tucson.

Dave Silva

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Two Years of Electronic Submissions! (1Dec95)

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Two Years of Electronic Submissions! (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

The spring 1996 proposal cycle marked the fourth semester of our "experiment" in accepting proposals via e-mail of the LaTeX proposal form. Of the 249 proposals received this semester, 223 (90%) were submitted electronically. This may be compared to that of previous semesters:

March 1994	(F94 semester):	73%
September 1994	(S95 semester):	77%

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    March 1995          (F95 semester):    86%
    September 1995      (S96 semester):    90%
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In going through the proposal stack, one finds that most of the remaining 10% who are submitting proposals via paper copies are in-house staff, who doubtless find it easier just to walk the copy down the hallway! There were also 185 figures e-mailed for the latest round.

Problems encountered on this end basically fell into two camps this time around:

1) A number of nagging little LaTeX problems suggests that not all users are bothering to print their final proposal template through LaTeX before submitting it. We have continued to fix these problems (often missing "$" signs), but this is a time-consuming process that occurs right as we are trying our hardest to get the proposals mailed out to the TAC. (Over half of the proposals are invariably submitted on the last day.) We ask that you help by checking your hard copy before submitting the proposal. We reiterate that it is up to the proposer to make sure that the finished product looks the way that you want the TAC to see it!

2) A number of institutions have apparently updated to "LaTeX2e," resulting in a different size type font being loaded by default. We will modify the form for the next round to ensure that the printout here is idendical to that at your home institution.

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

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Atmospheric Dispersion Correction at the 4-m: The Risleys Are Back! (1Dec95)

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Atmospheric Dispersion Correction at the 4-m: ...(1Dec95)
The Risleys Are Back!
(from KPNO, NOAO Newsletter No. 44, December 1995)

Alexei Filippenko deserves credit for having reminded us all of the significance of differential refraction in doing spectroscopy (1982 PASP 94, 715). Even at a modest 1.5 airmasses, an image at 4000 A is displaced by 1.1" from the image at 6000 A. If you are trying to observe over this wavelength range using a 2" slit, you will be suffering a large amount of light-loss unless the slit happens to be aligned at the parallactic angle; i.e., the position angle on the sky that results in the slit being perpendicular to the horizon. At the 4-m it is relatively easy to set the slit to the parallactic angle, although such rotation requires moving near the zenith. Sometimes this is inconvenient and, at other times, impossible--such as in the case of multi-slit slitlet masks, which are designed for a specific position angle. However, a little-known fact is that the 4-m is also equiped with atmospheric dispersion correctors, which can be moved into the beam at f/8 or f/15: the so-called Risley prisms.

Previous tests of this ancient device (NOAO Newsletter No. 32) were not encouraging, but this summer we had a chance to both clean and adjust the prisms mechanically, as well as to install new software, which should do a more accurate job of controlling the prisms. Tests conducted this summer showed that the ADCs are now doing their job correctly. The Risleys have now been used sucessfully for three staff runs with both the R-C spectrograph and CryoCam.

In the accompanying figure we show how well the Risleys do their atmospheric compensation. The boxes denote the standard star fluxes for a spectrophotometric standard. We then show two observations of this star, both obtained at airmass of 1.8, and both obtained in the worst possible scenario of the slit being 90d to the parallactic angle (parallel to the horizon). We see that the observation obtained with the Risley prisms follows that of the known flux distribution of the star, while that obtained without the Risleys was down by a factor of 3 in the blue. We note that if you are doing spectrophotometry with the Risleys, you must observe your standards with the Risleys as well, to properly calibrate the small but wavelength-dependent light losses of the Risleys themselves.

Of course, everything comes with some price, and indeed there are some light losses with the Risleys (5-8% at wavelengths &gt 4000 A). But this hit is considerably smaller than the losses you may expence due to differential refraction!

[Figure not included]

Phil Massey, Jim DeVeny, Buell Jannuzi

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Imaging CCDs Optimized to Minimize Effects of Saturated Stars (1Dec95)

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Imaging CCDs Optimized to Minimize Effects of Saturated Stars (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

As our imaging CCDs have gotten larger, more bright stars appear in a given CCD frame. Stars that produce signals well beyond saturation in one or more pixels have long been a problem for CCD observers, particularly in previous generations of CCDs that had shallower well depths and therefore bled more easily. The Tektronix/SITe CCDs that we currently use for imaging are much more robust, but we do receive occasional comments and questions from observers on the effects of saturated stars on their data. The most common issue is a "trail" or "streak" to the right of a saturated star (along rows). The amplitude of this trail is usually small (typically a few ADU relative to the sky level), but it can be worrisome. This phenomenon is caused by the saturation of a component in the CCD electronics due to the large amount of charge in the saturated star and the subsequent recovery time. This effect has been referred to as "overshooting" or "streaking" or "shadowing."

We have undertaken a project to minimize the effects of bright stars on CCD imaging data. During the summer shutdown, the video circuitry in the CCD electronics was adjusted in order to minimize the effects of overshooting for each of our imaging CCDs. This optimization had to be done for a particular gain value. We chose this gain value such that the digitization limit (32,767 ADU) encompassed as much of the linearity range of the CCD as possible, while avoiding gross undersampling (in e^- /ADU) of the readnoise. No other properties of the CCD besides the overshooting phenomenon (such as read noise, linearity, etc.) were changed by this optimization. The optimized gains for each imaging CCD are given in the table below (and in the Direct Imaging Manual, available on the KPNO home page on the World Wide Web).

The ICE software has been updated to reflect these newly optimized gains. The default gains in ICE for these CCDs are the optimized gains. After an obsinit, even if one does not edit the detpars parameter set, one will by default be using the optimized gain.

We recommend that all users concerned with the effects of saturated stars on their imaging data use the optimal gains. Also, in terms of grossly saturated stars (&gt &gt 200,000 e^- per pixel), we remind the reader that many of the bleeding/trailing phenomena associated with these are unavoidable, so the observer should consider the benefits and costs of moving these stars off the frame or shortening the exposure times if they are causing problems with program objects. Finally, we suggest the use of row and column plots in the analysis of such phenomena seen on the image display, as this provides a more quantitative assessment of the effect. While the effect may look like trouble from the image display, measuring the amplitude and comparing this to other sources of noise is critical for evaluating the effect that any residual overshooting may have on the data.

CCD	Optimized Gain	Optimized ICE Gain Index
S2KA	3.8 e^-/ADU	2
T2KA	5.4 e^-/ADU	3
T2KB	3.2 e^-/ADU	4
T1KA	4.5 e^-/ADU	3

Taft Armandroff, Rich Reed, Phil Massey

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NICMASS at the Feed--Update (1Dec95)

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NICMASS at the Feed--Update (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

As reported in the September 1995 NOAO Newsletter No. 43, the University of Massachusetts NICMASS HgCdTe camera has been utilized successfully for high-resolution spectroscopy at the Coude Feed Spectrograph. A well-blocked narrowband filter at 1.624u used with either grating B (R = 7000) or grating E (R = 43000) restricts the thermal background to that within the filter bandpass, and integration times up to 6000 s are possible.

Although the quantum efficiency of HgCdTe falls significantly with decreasing wavelength, it is still in the range 0.15-0.2 at 1.083u, more than an order of magnitude greater than that of a Si CCD. Until the commissioning of the high-resolution InSb spectrograph PHOENIX (see accompanying article), NICMASS on the Coude Feed will provide R = 43000 capability at this wavelength.

Because one operates in 52nd order with grating E at 1.083u, a narrow order separation filter is required to isolate the order and block thermal radiation from the spectrograph. The filter presently in NICMASS suffers from significant extraband leakage; the leakage problem has been solved by use of a series blocking filter, but at a cost of a full magnitude in transmission. A custom well-blocked filter is on order.

Notwithstanding the modest detector quantum efficiency and present filter transmission, small telescope aperture, and high spectral resolution, our limited experience at 1.083u suggests that this instrument can be a powerful scientific tool for relatively bright objects in this wavelength regime.

We will continue to offer this system for shared-risk observing at the Coude Feed Spectrograph. Prospective observers should familiarize themselves with the system and its operation by reference to the description on the World Wide Web at http://scruffy.phast.umass.edu/Irlab/NICMASS/nicuser.html or by contacting the undersigned, rjoyce@noao.edu or khinkle@noao.edu, for information regarding a specific application.

[Figures not included]

Spectrum of the late-type giant HD 6833 (V = 6.75; J = 4.64) using the echelle grating at a resolving power of 43,000 (Sneden et al., in preparation). This is the average of four 1-hr integrations.

Spectrum of HR 1105, a bright S-type emission line star, showing the P-Cygni profile of the He I line at a resolving power of 43,000.

Dick Joyce, Ken Hinkle

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Photographic Plate Surveys at NOAO (1Dec95)

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Photographic Plate Surveys at NOAO (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

We presently have the following sky surveys or atlases for use at NOAO: the 1950 Palomar Sky Survey (POSS); the ESO/SRC blue and red atlases, on both film and glass; the SRC infrared atlas on film; and the equatorial ESO/SRC atlas on glass. In addition, we are in the process of acquiring the new Palomar survey.

These surveys, as well as original plates obtained at the Kitt Peak telescopes, are stored in an environmentally controlled vault in the NOAO office building to preserve, as best as possible, the photographic emulsion. There are also print copies of the Palomar survey available at two locations on Kitt Peak and one in the downtown office. Brief descriptions of the surveys follow:

The Palomar Survey

This is the survey completed in the 1950s with the Palomar Schmidt telescope, covering the sky in the declination range 0d to 90d in 894 fields, and the equatorial extension covering the declination range -15d to 0d in 287 fields. We have a complete set of glass plates (both red and blue), which may be used by those needing the dimensional stability of the plates for astrometry. These plates are mounted within cover glasses to protect the emulsion. In addition, there is a set of prints in a file cabinet in the measuring engine room and two sets of prints on Kitt Peak, one in the 4-m telescope building and the other in the reading room in the Administration Building. A set of Ohio overlay grids is stored with each set of prints.

The ESO/SRC Atlas

We have both film and glass plate copies of the red and blue southern sky atlas. The blue plates were exposed at the Royal Observatory Edinburgh Scientific Research Council (SRC) observatory at Siding Springs, Australia. The red plates were taken at the European Southern Observatory (ESO) in Chile. The plates were copied at ESO headquarters in Munich, Germany. The film copies, which were ordered first, were mounted within a glass sandwich in a manner similar to the Palomar survey to permit safe handling for measurement or reproduction. At a later time, the glass plates were ordered as they became available. These are also mounted with a cover glass to protect the emulsion. Both the film and plate sets of the atlas are now complete.

The SRC Equatorial Atlas

The SRC has made a recent survey of the declination range -15d to 0d in both red and blue plates. The quality of the plates in the Palomar survey in this declination range was only fair, due to the large zenith distance. We have ordered a glass copy set, which is now nearly complete.

The ESO Quick Blue Survey

These were the first plates made in Chile using the ESO Schmidt and were done quickly to provide coverage of the southern sky. We have a set of glass plate copies.

The New Palomar Survey

This is a new northern hemisphere survey presently underway to repeat the original 1950 survey, using the Oschin telescope (Palomar Schmidt). We are purchasing only the film copies of the blue, red, and I survey, with one set to be at the NOAO building and the other at CTIO. A number of these have been received and are available for use.

Use of the Plates

The atlases are available for use by anyone. Outside users need only write to the NOAO Director for permission to use them. The room adjacent to the plate vault contains a two-axis Grant measuring engine and a Polaroid camera for making finding charts. We can make arrangements to assist in the use of these facilities. Index charts of the northern and southern sky show the plates available. High quality prints of an area on a plate can be made in the NOAO photo lab.

The original telescope plates are available for scientific research purposes with permission from the NOAO Director. We can supply prints or, under special arrangement, send the original plates to the requester for a limited period of time. An index of the 4-m and many of the other telescope plates may be accessed on the World Wide Web.

Bill Schoening

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A Graduate Student in Residence (1Dec95)

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A Graduate Student in Residence (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

In the March 1995 NOAO Newsletter, KPNO invited thesis students to participate in and assist with Observatory related tasks while making an extended visit to Kitt Peak. KPNO is able to 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.

Lewis Jones (University of North Carolina) has just completed a visit, and here is his report:

"Greetings to my fellow graduate students. I have recently returned from a month at Kitt Peak as an intern in what is now being called the "Graduate Student in Residence" program. Spending virtually all of my time on the mountain, I was able to become involved in a variety of both daytime and nighttime activities. I was involved in the realuminization of the 0.9-m, instrument changes at the 2.1-m and 4-m telescopes, and commissioning the WIYN, as well as serving in the role of general mountain help. With previous observing experience I also had the opportunity to take responsibility for some observer support and general troubleshooting at the telescopes.

My experiences at Kitt Peak were educational, enjoyable, and most certainly useful. The understanding staff, the valuable practical experience, and the generous amount of time I had for my own work made it an all around pleasure. I strongly recommend this opportunity to all graduate students."

Other students who wish to participate in this program should send requests via e-mail to paterson@noao.edu, and we will see if we can fit you in.

Sidney C. Wolff

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Mayall 4-m Shutter Failure(1Dec95)

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Mayall 4-m Shutter Failure(1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

The gearbox on the 4-meter dome shutter failed in mid-October, and we have been forced to close operations at the 4-meter while we make repairs. The failure occurred during a period of exceptionally clear weather, and we left the dome open for nearly two weeks so that observers could continue to collect data. It was only after the rains became heavy that we closed the dome, and we cannot safely open it again until the repairs are completed.

We have now developed a plan and a schedule for the repair. Based on what we know now, the repair will take about eight weeks and we are projecting resuming operations near Christmas. The length of the closure is set by the long time required to fabricate a complete set of gears for the shutter mechanism.

The failure was discovered on 18 October. The gear train that operates the 4-m dome shutter was found to be damaged to such an extent that it would be unsafe to continue to operate the shutter on a daily basis. Further use had the potential of leading to complete breakage of the gearbox with possible loss of the shutter off of the end of the rails. We decided to keep the dome open day and night until we were forced to close by bad weather.

Finally after ten clear nights and one mostly cloudy, the night of 29/30 October saw the first storm of fall arriving on the tropical jet stream. We stayed open and did not close the shutter for two drizzling rains which came after midnight. In the morning we wrapped a tarp around the Cassegrain cage and stowed the telescope so that the top-end was sheltered under the dome.

We felt that we could ride out a few more drizzles and maybe a shower or two. The forecast was for rain showers and then clear weather for five days before the next storm. However, around noon on Monday, 30 October, the storm intensified, and we decided our luck had run out. We turned out to be right. The storm earned an alert on the Weather Channel, which designated it a strong storm with embedded thunderstorms, and that is what we actually got all afternoon. Significant water damage would have resulted had the 4-meter dome not been closed.

The cause of the failure of the gears remains unknown and will only be ascertained when the gearbox is removed from the dome and disassembled. Because the origin of the damage may not be in the gearbox, the motors, clutch and brake assemblies will be refurbished during the time we are closed. This whole mechanism is almost 30 years old and, while well maintained, will now be checked over thoroughly. Actual work for removal of the gearbox and other components in the mechanism began as soon as we closed the shutter.

A new set of gears has been ordered, with a delivery time estimated to be six weeks. Two additional weeks have been set aside for assembly, testing, and installation of the gearbox. A firm date for reopening will be set when the repairs are further along. The affected observers have been notified and will be kept informed of progress.

Sidney C. Wolff

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Who's Who Among the Kitt Peak Postdocs (1Dec95)

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Who's Who Among the Kitt Peak Postdocs (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

KPNO has a lively post-doctoral research program as evidenced by the accompanying photograph of the postdoctoral fellows resident at KPNO for the 1995-1996 academic year. Each year KPNO is typically able to offer one or two postdoctoral appointments supported directly by NOAO funds. We are also pleased to be able to host Hubble fellows as well as a number of other researchers supported by external grants.

This year we are pleased to welcome Arjun Dey to the program. Dey is an NOAO postdoc who comes to us after having completed his thesis as a student in the Department of Astronomy at the University of California, Berkeley. With the start of a new year, we thought that this would be a good time to summarize the research activities of all of our postdocs.

Edward Ajhar is a postdoc supported by the HST WFPC-I team, and is working with Tod Lauer on several HST programs. This work includes investigations of the diverse nature of galaxy cores as well as the globular cluster systems around elliptical galaxies in Coma and Virgo, as they relate to the distance scale and their formation history. Ajhar recently completed a color-magnitude diagram study of four M31 globular clusters to calibrate the RR Lyrae metallicity relation. He is also completing work with his former thesis advisor John Tonry and other collaborators that uses surface brightness fluctuation distances as a probe of nearby large-scale flows.

Stephane Charlot is an NOAO postdoctoral fellow working on setting constraints on the formation and evolution of galaxies from their observed properties. This work includes models of stellar populations, radiative transfer, and the connection between galaxies and absorption-line systems of distant quasars. Charlot is leaving NOAO this November to take a permanent research position at the Institut d'Astrophysique du CNRS in Paris, France.

Michael Corbin is supported by the HST Archive program, and is working with Todd Boroson on the analysis of the combined UV and optical spectra of a sample of low-redshift QSOs, using HST, IUE, and ground-based spectra. Also in collaboration with Boroson, Corbin is completing a spectroscopic survey of all bright low-redshift QSOs in the Northern and Southern hemispheres. These data will be used to compare the emission lines of radio-loud and radio-quiet objects and to test unified models of the former.

Stephane Courteau is an NOAO postdoctoral fellow conducting research on large-scale structure in the Universe and determination of cosmological parameters. He also works on determining the mass distribution, dust content, stellar population, and formation scenarios for spiral galaxies. Courteau's recent work includes a self-consistent analysis of existing Tully-Fisher redshift-distance samples that confirms the existence of cosmic bulk flows on large-scales. He is also developing new techniques to apply the Tully-Fisher distance indicator at high redshifts.

Arjun Dey is an NOAO postdoctoral fellow whose primary research interests are the evolution of galaxies and AGN, and observational cosmology. His current research is focused on understanding the physical properties of the highest redshift radio galaxies and quasars with the aim of utilizing these luminous objects as cosmological probes. In addition, Dey and his collaborators are studying the stellar content and ages of distant ($z \sim 1-2$) elliptical galaxies. He is also working on observational tests of AGN unification models. This work includes studying the importance of dust in distant, powerful AGN.

Beatrice Mueller is a postdoc supported by the Galileo mission and a grant from the Swiss Science Foundation (until the end of 1995). She is working with Mike Belton (PI of the Galileo imaging team) on the Galileo Solid-State Imager data. Mueller is also conducting observational programs for investigating cometary rotation, evolution of cometary activity, and the link between asteroids and comets.

Nalin Samarasinha is a postdoc supported by NASA working on complex rotational states of comets, long-term evolution of cometary rotational states, non-gravitational forces, and modeling of comae of different comets. Samarasinha's work performed during the last year includes explaining the complex rotation and near-constant non-gravitational effects of comet Halley, plausible rotational states of the Rosetta mission target 46P/Wirtanen and implication for the mission, and trying to understand the dust coma of 95P/Chiron and the cyanogen coma of 1P/Halley.

Ata Sarajedini is a Hubble Fellow conducting research on the stellar populations of the Local Group. In particular, he is trying to understand the formation and evolution of the Local Group by studying the ages and abundances of the globular clusters in its member galaxies. In addition, he is studying the stellar populations of the dwarf galaxies in the Local Group and comparing them with those of the globular clusters. Sarajedini has devised and refined a number of methods that allow more precise determinations of cluster ages, reddenings, and metallicities.

Paola Sartoretti is supported partly by the Galileo imaging team through KPNO staff member Mike Belton and partly by the Space Telescope Science Institute through staff member Robert Brown. She is studying, through HST imaging data, the dynamic and the vertical structure of Jupiter's atmosphere, with particular attention to the regions that are expected to be sounded by the Galileo atmospheric probe. Sartoretti is also analyzing HST I-band images of a sample of weak T-Tauri stars in searching for planetary companions.

Ted von Hippel is a long-term visitor at NOAO from the University of Wisconsin, where he is the McKinney Assistant Scientist. He supports Wisconsin observers at the newly operational WIYN Telescope. His areas of research are stellar populations and the age question, with particular emphasis on using White Dwarfs as chronometers, both in the Galactic disk and in open clusters. Von Hippel also works on the automated classification of stellar spectra.

[Photo not included]

These are the postdoctoral fellows resident at KPNO for the 1995-1996 academic year. Moving from left to right, they are: Nalin Samarasinha, Stephane Charlot, Stephane Courteau, Michael Corbin, Ata Sarajedini, Edward Ajhar, Beatrice Mueller, Paola Sartoretti, Arjun Dey (rear), and Ted von Hippel.

Tod Lauer

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News from the Kitt Peak Support Office (1Dec95)

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News from the Kitt Peak Support Office (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

Some changes have been made to streamline the activities in the Kitt Peak Support Office (KPS) and to make it easier for the observer to send in observing preparation information.

Electronic ORP

The Observing Run Preparation (ORP) form can be found on the Web so principal investigators can fill it out and submit it to KPS electronically. It will be a very user-friendly form, which includes pull-down boxes to click and choose. Once submitted, an automatic acknowledgement will be e-mailed back to you. As usual, the form should be submitted at least six weeks before the start of each observing run. Upon receipt, the electronic ORP will be checked for correctness, and distributed electronically to the staff responsible for your run. Look for the ORP under KPNO on the NOAO home page on the World Wide Web at http://www.noao.edu.

We are also planning to put additional forms on the World Wide Web in the near future. These include the Observing Run Evaluation Form and a modified version of the GSA driver's license application.

Hotel Reservations

Due to a reduction in KPS staff, beginning 1 April 1996, hotel reservations for observers will no longer be made by the KPS office.

Hotel phone numbers are provided in the User Handbook (already available on the Web), and discounted rates at some hotels will be available to observers by mentioning NOAO. Many of the hotels have (800) numbers.

We are providing lots of advance notice of this change so observers can plan ahead. Tucson is a winter vacation spot and University town. Hotel rooms are difficult to find from September through December with University activities selling out rooms, and the January-March months are sold out due to "snowbirds" visiting Tucson during the Gem & Mineral Show and the rodeo. The good news? There are plenty of hotel rooms in Tucson at unbelievably low rates from May-August.

GSA Driver's License

This a reminder to all observers who go to Kitt Peak. You need a government driver's license to drive an NOAO car to Kitt Peak. Please be prepared to drive an NOAO vehicle at all times by checking whether you need to obtain a GSA license and submitting a GSA driver's license application to KPS, and carrying the license with you when you come to Tucson. A driver is provided only for the 6:40 am and 2:00 pm shuttles from downtown to Kitt Peak (see the schedule in NOAO Newsletter No. 41), and occasionally, the driver is not available for the 2:00 pm vehicle.

You are always encouraged to stop in the Kitt Peak Support Office when you arrive in Tucson for any messages or additional information we may need to communicate to you. As always, questions or suggestions can be sent via e-mail to kpno@noao.edu.

Pat Patterson

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Phoenix Progress (1Dec95)

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Phoenix Progress (1Dec95)
(from KPNO, NOAO Newsletter No. 44, December 1995)

[Photo not included]

Steve Rath, senior instrument maker, is shown assembling the Phoenix foreoptics. Phoenix, a high resolution 1-5 um infrared spectrograph, is scheduled for first light at the 2.1-meter in May 1996. Following a period of test and evaluation Phoenix will be offered at both the 2.1-m and 4-m.

Ken Hinkle

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From the NSO Director's Office (1Dec95)

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From the NSO Director's Office (1Dec95)
(from NSO, NOAO Newsletter No. 44, December 1995)

GONG is Alive!

On Thursday, 4 October, the "N" in "GONG" became fully operational with the commissioning of the sixth instrument in Udaipur, India. It is our pleasure to extend congratulations on behalf of NSO to the entire GONG project, and to our sponsors at the NSF, for achieving an ambitious goal that is widely recognized as providing a major tool for exploring the solar interior and testing the foundations of astrophysics. A full report is given elsewhere in this Newsletter.

Budget Issues

Previous Newsletters outlined the expected situation for FY 1996: a 5% reduction in real dollars from FY 1995. Now that the new fiscal year is upon us, the other shoe has dropped: NSO experienced a reduction in force by four positions on 30 September. Also, at the end of this calendar year, the solar-stellar synoptic program at the McMath-Pierce Telescope will cease operations. Since Jacques Beckers announced the termination of the program in January of this year, it has been maintained with temporary NOAO and NSO funding, which is now exhausted.

Painful as these reductions are, we know that most scientific organizations in the US are facing a similar challenge. In the near term, we will maintain solar telescope operations and services to visitors at their previous levels. We are actively working with the solar physics community and our Users Committee, the Observatories Council Solar Subcommittee (described in the last Newsletter), and with NOAO to define a program that can thrive in these difficult times. We will do everything we can to improve the scientific productivity of our existing unique telescopes, but, in the longer term, much will depend on the success of new initiatives: the extension of GONG for a full solar cycle; the operation of RISE/PSPT; the CLEAR concept for a large-aperture solar telescope; and the SOLIS concept for a new generation of synoptic instruments.

CLEAR and SOLIS

The Coronagraphic and Low Emissivity Astronomical Reflector is a concept for a 4-m class solar telescope that can observe both the corona and the disk with broad wavelength coverage (330-25000 nm) and high angular resolution using adaptive optics. CLEAR will also have secondary applications at night for stellar, planetary, and cosmological studies where low scattered light and low emissivity are at a premium. Versatile and powerful, CLEAR is conceived as a flagship telescope for the first decades of the 21st century.

Ground-based solar astronomy in the US is at a crossroads. Our major telescopes are over 20 years old; we struggle for a significant presence in university departments of astronomy and physics; base funding in both the grants programs and the national centers is on a downward slope. We continue to do good science by exploiting novel techniques and state-of-the-art instrumentation at the focal planes of our telescopes, but we face strong (and welcome) competition from much newer facilities in Europe and Asia. In contrast, ground-based nighttime astronomy is entering a golden age of multiple 10-m class telescopes complementing HST and other space observatories. Despite funding pressures of its own, space-based solar physics is poised for major advances with the launch of SoHO (Solar and Heliospheric Observatory) and TRACE (Transition Region and Coronal Explorer), along with balloon and rocket programs and the hugely successful Yohkoh satellite.

Will ground-based solar astronomy fully participate in and contribute to this exciting era? To do so, we must act now--not hastily, but urgently. To ensure that the CLEAR concept is defined and subjected to scrutiny as quickly and economically as possible, NSO Director Jacques Beckers is devoting as much of his attention as he can to its design study. The appointment of Doug Rabin as Acting Director for this year relieves Jacques of most of the tasks related to the short-term functioning of the observatory, allowing him more time to focus on the long-term planning, which includes the CLEAR study. It is an audacious step in difficult budgetary circumstances; but nothing less may suffice. The CLEAR effort is now proceeding vigorously: the Science Working Group chaired by Jeff Kuhn had its first meeting in November, and the technical and engineering team headed by Jacques Beckers meets regularly. The nominal goal is to submit a proposal for the construction phase in 1997.

The SOLIS (Synoptic Optical Long-Term Investigations of the Sun) concept complements CLEAR by proposing a new generation of synoptic instruments that will replace the full-disk magnetograph on Kitt Peak and the full-disk patrol telescopes and coronal photometer on Sac

Peak. You probably haven't heard about SOLIS because it was developed on a heroically short timescale (thanks to Jack Harvey, Larry November, Christoph Keller, and many other contributors) in response to a request from NOAO to propose large-scale projects as part of the overall NOAO restructuring program described by Sidney Wolff in the last Newsletter. SOLIS comprises four instruments: a full-disk vector spectro-magnetograph with a dedicated 50-cm telescope; a full-disk patrol telescope of 15-cm aperture mated to a tunable Lyot filter to obtain H-alpha, K-line, and continuum images as well as morphological magnetograms; a coronal imager capable of 1" angular resolution, accurate subtraction of sky background, and spectral coverage from 500 to 1100 nm; and a spectrometer to measure the integrated (Sun-as-a-star) solar spectrum with high precision and spectral resolution. The draft text of the proposal for SOLIS is available for viewing or downloading via the NSO home page, http://argo.tuc.noao.edu/.

The CLEAR and SOLIS concepts are not final. Their ultimate form--or indeed, whether they survive at all--will depend in large measure on how deeply the solar physics community is engaged in their definition and, ultimately, their advocacy. We welcome your suggestions, criticism, and assistance.

Jacques Beckers (Director), Doug Rabin

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SQIIDing at the McMath-Pierce (1Dec95)

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SQIIDing at the McMath-Pierce (1Dec95)
(from NSO, NOAO Newsletter No. 44, December 1995)

In late September and early October, NOAO's Simultaneous Quad-Color Infrared Imaging Device (SQIID) was used for solar observations for the first time. For several years, SQIID has been highly effective in its principal role as a wideband (JHKL') imager at night. At the inspiration of Ian Gatley and with help from many quarters (including Tim Ellis, Bruce Bohannan, Nick Buchholz, Jerry Heim, Dick Joyce, and Mike Merrill), SQIID trekked over to the McMath-Pierce Telescope to carry out multiwavelength photometric imaging of solar magnetic flux concentrations (or faculae). Because the magnetic pressure in kilogauss flux tubes is comparable to the photospheric gas pressure, flux tubes are largely evacuated (to maintain lateral pressure balance) and have a temperature-vs-height profile very different from the non-magnetic atmosphere. Infrared photometry can elucidate this structure at the deepest observable layers.

After what felt like a titanic struggle with stray light, ghost images, and consequent flat-fielding problems, we obtained science-quality images in three narrow (10-50 nm) bands centered at 1075, 1640, and 2100 nm; the longest wavelength channel had to be sacrificed to get reasonably balanced signals in the other three channels. In addition to the scientific results it is expected to provide, this SQIID run was a proof-of-concept that nighttime NOAO instruments based on closed-cycle cryogenic cooling and the WILDFIRE array controller--including the next generation of instruments based on the large-format Aladdin InSb arrays--can be used effectively and practically for solar observations.

[Photo not included]

SQIID (dark cylinder in the middle surmounted by a heat shield) astride the McMath-Pierce main spectrograph table.

Doug Rabin, Dave Jaksha

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Cross-calibration of the NSO/KP Magnetographs (1Dec95)

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Cross-calibration of the NSO/KP Magnetographs (1Dec95)
(from NSO, NOAO Newsletter No. 44, December 1995)

From the beginning of the NSO/KP full-disk synoptic program until the early spring of 1992, magnetograms were obtained with the 512-channel Diode Array Magnetograph (DM). Since that time, the data have been acquired with the NSO/NASA Spectro-magnetograph (SM)--a term originally coined to describe this specific instrument but which has subsequently been used as a generic label for spectrograph-based magnetographs. The transition between the two data sets was not smooth due to the failure of two of the three available Kerr cells used to modulate circular polarization. The SM, with its two-dimensional detection of long-slit spectra instead of the fixed dual bandpass system of the DM, can operate effectively at a shorter wavelength (550.7 nm instead of 868.8 nm) and hence a lower Kerr-cell voltage. Thus, to preserve the life of the remaining Kerr cell, the SM was pressed into service before the originally planned cross-calibration program could be undertaken. Subsequently, the Kerr cell was replaced with a liquid crystal modulator and the SPM now operates on the original Fe I, 868.8 nm line. A cross-calibration program of closely spaced observations with both instruments was then carried out. The data have now been analyzed and the results are as follows:

$$B_{DM}(868.8) = (1.46 \pm 0.06)\, B_{SM}(868.8)$$
$$= (1.26 \pm 0.05)\, B_{SM}(550.7).$$

The different constants result from the way the calibration procedures account for polarization cross-talk together with some software limitations. Error bars are twice the standard error of the mean averaged over about a month of comparative data. The overall scale of the DM is the better basis for absolute flux estimates, although the SM data are substantially less noisy and do not saturate in sunspots.

The magnetogram from 6 April 1992 is the last reasonably reliable DM synoptic observation; data from 7-20 April 1992 do not have a reliable flux scale; data from 21 April-19 November 1992 were obtained with the SM in the 550.7 nm line of Fe I; subsequent magnetograms have been acquired in the original 868.8 nm line with the SM. Disk-integrated flux indices from the magnetograms show continuous and consistent variation when adjusted with the above calibration constants. The file of these daily measurements of flux and absolute flux integrated across the disk has been recently updated and is available by anonymous ftp from argo.tuc.noao.edu, in directory kpvt/daily/stats from the anonymous login. The file includes corrections that put all the measurements onto the DM scale.

Harry Jones, Jack Harvey

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Summer Shutdown '95 (1Dec95)

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Summer Shutdown '95 (1Dec95)
(from NSO, NOAO Newsletter No. 44, December 1995)

The #1 and #2 mirrors at the KPVT were aluminized in late August. Servicing of the optics inside the KPVT vacuum tank was postponed in order to support the SPARTAN 201 experiment on shuttle mission STS-69. The work inside the tank will be performed during the fall quarter.

The interior of the above-ground section of the McMath-Pierce windscreen was washed in early September. The McMath-Pierce main, east and west heliostats were aluminized in late September.

The large unused diffusion pump in the oil-pump pit south of the solar FTS instrument was removed in early September. An improved vacuum plumbing and valve system was installed shortly thereafter.

Thanks to everyone involved in the shutdown work, especially Larry Reddell and Roger Nesbitt.

Jeremy Wagner, Claude Plymate,
Teresa Bippert-Plymate

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Full Stokes Infrared Spectropolarimetry at the VTT (1Dec95)

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Full Stokes Infrared Spectropolarimetry at the VTT (1Dec95)
(from NSO, NOAO Newsletter No. 44, December 1995)

A new near-IR polarimetry system was successfully deployed at the NSO/SP Vacuum Tower Telescope. Using liquid crystal variable retarders, a system for analyzing the full (I,Q,U,V) polarization in the 1-2.4 um wavelength band has been implemented by Haosheng Lin.

During the first observing run with the new system, spectroscopic data near the He I line at 1083 nm and Fe lines near 1565 nm were obtained using the VTT correlation tracker with subarcsecond seeing. This run turned out to be especially fortuitous because two flaring regions were observed and the Stokes polarization of the He I line was sampled during and after the flare. Spectropolarimetric observations of filaments also yielded preliminary measurements of prominence magnetic fields. This new instrumentation greatly improves our ability to measure vector magnetic fields in the high chromosphere dark a region where the dynamics and evolution of the field are interesting and important.

H. Lin, J. R. Kuhn

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16th NSO/SP Workshop: Solar Drivers of Interplanetary and Terrestrial Disturbances (1Dec95)

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16th NSO/SP Workshop ...... (1Dec95)
of Solar Drivers of Interplanetary and Terrestrial Disturbances
(from NSO, NOAO Newsletter No. 44, December 1995)

During the week of 16-20 October, the Air Force Solar Group at Sacramento Peak and NSO co-hosted with NSO a workshop that brought together personnel from the space-weather forecasting community and the research community to discuss the state of the art in space weather forecasting from the Sun to the Earth. A major goal of the workshop was to define areas that must progress to meet the challenges of increased reliance on space and space assets in the 21st century. Scientists from the solar, interplanetary, and terrestrial disciplines covering the full range of space weather were present, including the Air Force Pentagon Weather Planning office, the Space Forecast Center of the Air Force 50th Space Wing, the NOAA Space Environment Center, the Geophysics Directorate of the Air Force Phillips Laboratory, the Naval Research Laboratory, the High Altitude Observatory of the National Center for Atmospheric Research, the National Research Council, the National Science Foundation, NASA, and a number of universities from Europe and Asia as well as the US.

This very successful workshop began with an overview of requirements for solar-driven space weather prediction. This session was followed by several sessions discussing our present knowledge of solar events leading to particle, radiation, and magnetic disturbances, including flares, solar mass ejections, eruptive prominences and solar wind modulation. Properties and models of the interplanetary medium responsible for transporting solar disturbances from the Sun to the Earth and their relationship to solar drivers were discussed. The following sessions were devoted to the interface between solar disturbances and the Earth's magnetosphere, the effects of solar disturbances in the terrestrial atmosphere, and the possibility of producing an end-to-end (Sun-to-Earth) forecast model. The final session addressed the effects of solar spectral irradiance variations on the Earth's atmosphere and the possibility of predicting such variations. Throughout the workshop, discussion focussed on the need for replacing statistical models with physical models.

Proceedings of the workshop will appear in the ASP Conference Series. These proceedings should serve as a key guide to user needs for solar-driven space weather prediction and as a reference for our current and planned abilities to meet those needs. The workshop was sponsored by the Air Force Office of Scientific Research, the National Science Foundation, the National Optical Astronomy Observatories, and NASA.

Ray Smartt, Steve Keil, K.S. Balasubramaniam

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NSO Telescope/Instrument Combinations (1Dec95)

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NSO Telescope/Instrument Combinations (1Dec95)
(from NSO, NOAO Newsletter No. 44, December 1995)

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

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-alpha 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
Near Infrared Magnetograph
1-m Fourier Transform Spectrometer
3 Semi-Permanent Observing Stations for visitor equipment

Vacuum Telescope (KP):
Spectromagnetograph
High-l Helioseismograph

Razdow (KP):
H-alpha patrol instrument

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Global Oscillation Network Group (1Dec95)

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Global Oscillation Network Group (1Dec95)
(from GONG, NOAO Newsletter No. 44, December 1995)

The Global Oscillation Network Group (GONG) Project is a community-based activity to operate a six-site helioseismic observing network, 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 is resulting. GONG data are available to any qualified investigator whose proposal has been accepted, however active membership in a GONG Scientific Team encourages early access to the data and the collaborative scientific analysis that the Teams have already initiated. The GONG Newsletter provides status reports on all aspects of the Project and related helioseismic science.

Overview

The GONG network is completely deployed and operational, and the DMAC has network data available!!!

[Photo not included]

The Big Bear, California site with the Big Bear Solar Observatory "floating" in the background.

It took 16 months of hard work from the first groundbreaking, at Learmonth, to the last camera alignment, at Udaipur, to complete the deployment of the network; not to mention the decade of design, development, and production that preceded it. Thank you, dear reader, for your patient support while the Project has been working to achieve this, and thanks to the Project staff, all of our collaborators, and hosts around the world for all of their effort on behalf of GONG.

The deployment sequence was chosen to achieve a three-site network, with roughly 120 separation at the earliest possible moment, to get data into the hands of the members to help understand the performance as rapidly as possible. The duty cycle for the first GONG month of three stations was a quite respectable 70%, and the data have been pushed all the way through the DMAC pipeline. All of the data products--including our first-cut frequencies--are now available through the DSDS. If you do not already have an account with the DSDS, the simplest way to set one up is through our WWW server (http://helios.tuc.noao.edu).

The Science Teams are shifting into high gear, and they are scheduling working sessions in Tucson to work toward three near-term goals for the presentation of their work: 1) a summary presentation at the Winter meeting of the American Astronomical Society in mid-January, 2) a special issue of the journal Science to appear in late Spring, and 3) a joint meeting with the AAS and its Solar Physics Division in June 1996.

Deployment

Deployment is behind us at last. It took about 10 months from the very beginning to the very end when Frank Hill and the Red Team departed from New Delhi in early October. There were many anxious moments (many more of those than real problems), many successes, and many good times along the way. The short version of the story is this: all of the stations arrived where we intended them to go, none were damaged beyond repair, and they were all working when we left. Now, the rest of the story.

The activity officially began in Tucson last December when the Teide station was lifted by crane onto the back of a flat bed truck, beginning its personal odyssey to the Canary Islands. The stories it could tell, if only it could talk! There was the day that one end of the external cable raceway and the doorknob were crushed beyond recognition at the hands of some nameless stevedore somewhere between Los Angeles, California and Santa Cruz de Tenerife. During that same period, salt water flooded over the station, corroding every lock and hinge that hadn't already been crushed, almost (if not completely) beyond use. This, however, was hardly sufficient to discourage either Frank Hill and the rest of GONG's Red Team, or the truly excellent IAC staff at El Teide. The cable raceway was rebuilt by the observatory shops, the doorknob was replaced, and judicious application of bolt cutters, oil, clean water, and paint rendered the shelter indistinguishable from the condition it was in when it left the Arizona desert. The instrument itself went back together just like the manuals said it would, and the first data were obtained on 17 February. The installation process took six weeks, which was exactly what had been scheduled. Special thanks go out to Pere Pall, Jess Patrn, Otilia de la Rosa, Antonio Pimienta, and many others at the IAC who helped us make our first deployment a success.

Next stop: Learmonth, Western Australia. Ed Stover and Rob Hubbard, the vanguard of the Blue Team, left Tucson on 15 March, and caught up with the shelter in Learmonth on 20 March. To our surprise the shelter was in exactly the same condition as the El Teide station. The cable raceway was crushed to the same unrecognizable pulp in exactly the same place, as was the doorknob. Were we dealing with the same evil stevedore, singling out the GONG project for this special attention, or were we missing something fundamental? While in Australia, Duane Miller, the blue team's instrument maker, saw a brief image on local television that provided the answer. The equipment that is used world wide to move standard shipping containers around ports has a hydraulic ram that conflicts in several places with some of the modifications we had made to the container to make it into a GONG instrument shelter. Although we had asked for special handling, our "big white box" just looked too much like a standard shipping container, and was routinely being treated as such.

When the balance of the Blue team arrived in Learmonth, Master Sergeant Coffman, a member of the United States Air Force contingent at the observatory, gave us our official "in brief." The message was simple: drive on the left, pedestrians don't have the right of way, and almost everything that crawls or swims is deadly. If we would just keep our hands in our pockets and not leave our rooms, we would be safe. Coming from rattlesnake country, we were not so easily frightened. We did adopt the temporary site password deathadder, however, just as a reminder of our mortality. The bite of this particular serpent renders its victim dead within about 30 minutes in most cases. In the final analysis, the only death adder we saw was a dead death adder. The people and the critters alike were wonderful to us, and we had the second GONG network site up and running when the last of the team returned home on 28 April. Here the acknowledgments have to include John Kennewell, Alex Liu, Major Jeff Carson, Jenny House, and the rest of the Australian and USAF observatory staff.

No rest for the wicked, however. After three weeks at home to get to know our families again, the Blue team was back in the air, preparing to install the Mauna Loa station. By now we had learned what pieces of the station should be removed prior to shipping, and the Mauna Loa station arrived in Hilo in far better condition than the first two. Most of the team left together this time, arriving in Hilo on 22 May.

We had come to participate in a deployment in a tropical paradise, but instead we found ourselves--within a very few hours of making landfall--up at an altitude of 11,000 feet on a desolate volcano in the rain and fog. Every day we commuted two hours from Hilo to Mauna Loa Observatory, and two more hours home at day's end. We called our work site Mars, because it was slightly more colorful (though no less lifeless) than the moon. Our offerings to Pele, the goddess of the volcano, forestalled the next major eruption of Mauna Loa long enough for us to complete the task at hand. As proof that we do learn from our experiences, this deployment was completed in only four weeks. And just in case anyone out there is feeling too sorry for the Blue Team, Hilo may not be the greatest place in the world to look for beaches, but we found out where to drive to places that are. We actually suffered very little during our stay on the Big Island. Our heartfelt thanks in this case go out to Charlie Garcia, Eric Yasukawa, Darryl Koon, Russ Schnell and Judy Pereira for making this one a lot of fun.

Next came Cerro Tololo and a chance for the Red Team to try their hand for the second time. The activity began with the departure of Frank and most of the others on 24 June. Once again, the support afforded our team by the local staff was nothing short of amazing. The shelter had arrived in excellent condition this time, and assembly proceeded very smoothly. Even the weather cooperated, yielding almost summer-like conditions for some days in the midst of the Chilean winter. It was reported that an unnamed instrument maker associated with the Red Team contingent lay prostrate on the ground for an extended period one day in an attempt to lure condors, but this cannot be confirmed. Nor can we categorically deny that his bunk mates staked him there. The end result was that the fourth GONG network site was left to the CTIO staff and the condors on 22 July, another four-week installation. All kinds of thanks go out to Oscar S a, Ricardo Venegas, and all of the great people working at our sister observatory in the Chilean Andes.

The last hurrah for the Blue Team was Big Bear Observatory in southern California. Our adventure began on 24 July. We had had more than enough of airplanes and transoceanic flights by this time, so the team just loaded up our gear, piled into two cars in Tucson, and headed west on Interstate 10. Although we were faced with eight hours of some of the hottest interstate driving anywhere in the US (it was 50C when we stopped for lunch in Blythe, California), the cool, clean air and spectacular scenery awaiting us at Big Bear Lake made it well worth the little bit of effort to get there. The shelter, too, had no boat rides to contend with, traveling on the same interstate about a day behind us. We saw it go by the window of the cafe at which we were enjoying a leisurely breakfast after a morning of shoveling sand in preparation for its arrival. No paint job was required this time. The shelter looked--not surprisingly--just like it had when it left Tucson a day earlier. What a fine place to work! The locals complained of the oppressive heat (it got up to almost 30C one day), but those of us used to the desert in July and August in Tucson could hardly relate to their complaints. We had the instrument up and running in about three weeks, but several of us remained a few extra days to train the Big Bear staff in the operation of the instrument, and to breathe just a little more pine-scented air. We grudgingly returned home on 18 August, ending our deployment adventures. Many thanks for help and fond memories go out to Bill Marquette, Jeff Nenow, John Varsik, Karen Carlson, Randy Fear, and Melinda Hope.

The final test of the Red Team began with the Udaipur deployment on 27 August. The Udaipur Solar Observatory staff at their new facility just outside of Udaipur already had the shelter and generator roughly in position when the team arrived. There were some delays initially, as two large install kits sent to India by air freight ultimately lagged behind the instrument shipment. The team and the USO staff did a great job of "getting along without" until the gear showed up about half way through the deployment.

Although frustrating, these delays did allow the team to take a day off to explore the countryside and do some site seeing. They visited a beautiful Jain Temple near Udaipur, where one of our number was confronted by an angry monkey. During what seemed like an innocent photo opportunity, the primate dropped down from its perch and assumed a fighting stance reminiscent of an antagonist skilled in the martial arts. Sang Nguyen--himself having earned a black belt in Tae Kwon Do--instinctively adopted a threatening posture of his own which so intimidated the ape that it opted to stand down and live to fight another day. Many skills are needed on a well rounded GONG install team.

Other than colds and flu that most likely accompanied the team all the way from Tucson, the balance of the deployment went smoothly. On 3 October, that instrument came on line, and the network was complete.

As always, there are many folks to thank, but we should certainly name Arvind Bhatnagar, Ashok Ambastha, Sushant Tripathy, Sudhir Gupta, Naresh Jain, Raj Mal Jain, and the team's driver, Chaman Lal Tak.

If we learned anything from our globe trotting experiences, it would include the following:

- The only thing one can be sure about if ships are involved is that they will arrive late, and the people in country will know about it before we do.

- Any GONG deployment team member is by nature and training more dangerous to his or her colleagues than any indigenous insects, reptiles, or sea creatures.

- The weather will always be good until it needs to be.

- When the going gets tough, trust the local people. They'll know what to do!

Operations

The highest priority of the new Network Operations group is keeping the data flowing. As one might expect, the most critical people in this regard are the dedicated folks working with us at the host sites. We have provided them with remote status boards, usually located in an area at the host site where the technical people spend most of their daylight hours. For example, at Big Bear, the status terminal is located in one of the offices in the dome, while in Learmonth, it's located in the radio (RSTN) building. What the local folks see is a video simulation of green, yellow and red lights indicating the status of the instrument. Green means the instrument is operational and all monitored parameters are within operating limits; yellow means a parameter has become marginal, but the bits are still flowing (or could if the Sun were out); red means that the site is no longer operational. The display also shows an intensity image derived from the digital data and updated every minute, and a magnetogram derived from the most recent hourly observation. A graphical user interface allows the on-site personnel to inquire as to the state of about 100 monitored instrument and weather parameters, and generally determine the exact source of trouble, should problems arise.

What we have noticed so far, in nearly six months of operating instruments in the field, is just how good the people at our host sites are. We have had very few serious problems so far, and in many cases the scientists and technicians at the site have been able to fix things without our help at all! But when serious problems arise, the first step is to contact the GONG Network Operations Duty Responder (known locally as the "Duty Dude"). That is an individual within the Network Operations group, whose job it is to monitor the Internet, the phone, and fax machine for trouble and service requests. Only two of our sites are not currently on the Internet, and they expect to be soon. Thus, electronic mail has proved to be the best way to contact us and get the group here working on the problem.

So what does the traffic from the sites look like so far? A review of the activity over the last 30 days looks something like this:

Issue	Service Requests
Routine Correspondence	6
Tape problems	4
Modem problems	2
Network Connections	2
Computer hung	1
Image Display	1
Shelter Thermostat	1

The "Routine Correspondence" items include things like shortages of supplies, and other notes and comments on the routine operation of the instrument. We have had some problems with the modems at two of the sites, requiring in both cases some intervention by local experts. The so called "Network Connections" problems involve failure of the local-area network at two of the sites, which temporarily kept us from obtaining status and operations traffic over the Internet. (The modems are the fall back in this situation.) The "Hung Computer" was the SPARC station (not actually part of the data path), and was fixed with a reboot; the cause is still unknown.

The biggest problem is data taping, and this one-month score card somewhat understates the problems that we have been having with tapes and tape drives. Two of the service requests during the last month relate to Exabyte tape drives that had to be replaced at two different sites with new units shipped from Tucson. Prior to this, we have had a number of other problems with the taping task, requiring operator intervention in most cases. These were also caused by tape related problems, though not the fault of the Exabyte drives themselves. Fortunately each site has four drives in service, and two more available as additional backups. For this reason, we have lost only about six hours of data from a single site as a result of these various failures since the first station came on line in March. Still, we're sure that taping issues are the biggest source of frustration for the on-site personnel, to say nothing of the operations group here! We are anxious to have a look at our data-taping software to see if we can't make it more robust to hardware failure, and see if we cannot take better advantage of the redundancy that we have at our disposal at each site.

In addition to this sort of "passive" support of the GONG network (that is, sitting by and waiting for the phone to ring), we also have some active procedures in place. Every morning (Tucson time) someone remotely connects to each station, looks at the status, and reads any messages sent to us by our hosts, or by the operating software. Next, we download the last 24 operating hours of instrumental engineering parameters. These minute-by-minute values, such as power supply voltages and motor currents, are analyzed daily back in Tucson for unusual behavior, and become part of a data base allowing longer-term analysis for trends and signs of fatigue and imminent failure.

Data Management and Analysis Center

The DMAC has successfully integrated the algorithms for refining the limb geometry and extracting MTFs and for merging multi-site data using a MTF-derived weighting scheme into the data reduction pipeline. The DMAC reduced network data acquired by seven deployed network instruments (including the prototype in Tucson), test data acquired to verify the successful installation of six instruments, and test data acquired as construction of the observing instruments was completed at the University of Arizona farm site before the units were disassembled for shipment. The project also generated data products from the first GONG month (36 days) of network data that was acquired by the three-site mini-network of Teide, Learmonth, and the Big Bear station in Tucson. This included month time series, power spectra, and mode frequency information that were made available to the participants in the inversion workshop that was held in Boulder.

With the onset of network operations, the data reduction activity in the DMAC has increased dramatically. For example, the number of site days calibrated per calendar month has increased from 25 in February to 142 in September. The upstream data reduction stages that perform site-dependent processing (VMICAL, GEOMPIPE, DNSPIPE, and AVER) have ramped-up more quickly than anticipated. Except for AVER, these reduction stages have been maintaining backlogs of about 50 site-days.

A key technical hurdle for merging multi-site images was the precise determination of the orientation of the cameras in the observing stations. A procedure developed and implemented by the instrument team successfully satisfied this requirement. This information was integrated into the data reduction software that registers the velocity images into heliographic coordinates.

The DSDS has moved the user interface for the catalog query and data product request functions from CURSES to HTML. The DSDS also recently conducted a survey of its users regarding various technical aspects of using the projects facility for accessing data products. The DSDS received 25 responses from the 64 GONG members to whom the survey was e-mailed.

With the ramp-up of network operations, the frequency and volume of data requests has also increased. Eleven data distributions totaling 9.7 GB were made in July; six distributions totaling 19.2 GB were made in August; nine distributions totaling 423 MB were made in September. This compares to zero distributions in February and two distributions totaling 101 MB in March.

The DMAC Users' Committee met at HAO in Boulder in August, and will meet in Tucson during December. In August, Tatia DeKeyser joined the project. Tatia operates the data reduction stage that refines the geometry of the solar images and extracts the MTF.

Project Management

Our annual budget struggle was resolved favorably in February with a $2.6M figure for FY 95. This has been adequate to allow us to deploy the field stations at a rate of about one every six weeks, since the first station arrived on Tenerife in January. It should be borne in mind that, since then, we have been simultaneously completing the integration and testing of the remaining stations, completing site land preparations, deploying stations, and operating them as they came on line. This has been an interesting challenge since the deployments have necessarily meant that we were carrying on these many tasks with half or more of our instrument staff thousands of miles away from home base. Nevertheless, the deployments were completed on schedule and under budget.

As the project has completed its original development mission and has made the transition to a network of operational observatories, a sadder activity has been saying goodbye to some old friends. In the past few months, Mark Trueblood has joined the US Gemini Project as its Project Engineer, Bret Goodrich has also joined Gemini, Bob Hartlmeier has retired, Don Farris, Arden Petri, and Dee Stover have transferred back to ETS, Jerry Gonzales, Jeff Vernon, and Tom Bajerski have all left NOAO for other employment. Their contributions to the GONG program have been essential and we wish them every success.

As usual, our FY 1996 budget is unclear. Our original request included funds to vigorously pursue a new development program to produce a 1024 x 1024 square-pixel camera that might be installed as a retrofit into the existing field stations to produce even higher quality data. However, this request was rejected in favor of a more modest one that included little more than the basic funding required to operate and maintain the network and data management facilities. Nevertheless, it amounts to some $2.1M, and if this figure survives the Federal process, and the network is blessed with relatively trouble-free operation, we may be able to at least begin a modest exploration of the new camera concept. All in all, we are looking forward to our first year of "normal" operations with great anticipation.

John Leibacher and the GONG Project Team

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US Gemini Program (1Dec95)

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US Gemini Program (1Dec95)
(from USGP, NOAO Newsletter No. 44, December 1995)

The reader is referred to the Gemini Project Newsletter, which accompanies the NOAO Newsletter this quarter, for a complete update on recent Gemini developments.

Watch Gemini Take Shape on Mauna Kea

Tune in to the Gemini World Wide Web homepage, (http://www.gemini.edu) to view real-time photos of the construction of the Gemini observatory on Mauna Kea, Hawaii. Photos are taken with a digital camera mounted on the CFHT and updated every 15 minutes. The construction photo shows the Hawaii 88" Telescope looming over the foundations of the Gemini support building and telescope pier.

[Photo not included]

United States Gemini Science Advisory Committee

The US Gemini Science Advisory Committee (SAC) met in Tucson in September to consider the proposed Operations Plan for observatory management and other items of programmatic and scientific concern to the US Gemini Program and the US astronomical community. The Operations Plan, discussed in more detail in the Gemini Newsletter, will be considered at the November meeting of the Gemini Board (after the writing of this article). The plan defines both the level of resources to operate the telescopes and those to be used for future instrumentation and upgrades.

Among the other items discussed at the SAC meeting was the status of the instruments and related detectors and electronics that are being supplied by the US to the international Gemini partnership. The US office is responsible for procuring and managing the development of a host of first light instruments as well as for planning to enable the US to participate in future Gemini instrumentation (see below).

The following new members were welcomed to the ranks of the US SAC:

- Suzanne Hawley (Michigan State)
- Buell Jannuzi (NOAO)
- Bob Joseph (Hawaii)
- John Tonry (MIT).

New US Gemini Board Member

Robert Gehrz (Minnesota) was selected to serve the nominal two-year term as a US representative to the Gemini Board of Directors. He will act as Chairman of the Board during the two years the rotating role of chairman is delegated to the US. Bob has had a long association with Gemini, serving as Review Chairman for the Primary Mirror Critical Design Review and of the first Gemini Systems Review as well as having served on various Gemini science advisory committees.

James Houck (Cornell) completes his term on the Board at the end of this year. His guidance and support has been most appreciated during these crucial formative years of the Project. The other US Board members are Alan Dressler (Carnegie), Bob Kirshner (Harvard), and Wayne van Citters (NSF). The Gemini Board of Directors is the international governing body of the Gemini Project and is composed of representatives from the Gemini partner countries according to their share in the Project.

Gemini Workshop in Montevideo, Uruguay

The US Gemini Program was awarded a grant from the International Division of the National Science Foundation to conduct a Gemini workshop at the Latin-American Regional Meeting of the IAU held in Montevideo, Uruguay in late November 1995. The workshop was organized as a joint effort with the Gemini partner countries in South America (Argentina, Brazil, and Chile) for the purpose of fostering closer cooperation among the Gemini partners, to inform South American astronomers about the Gemini Project, and to better understand the scientific aspirations of the South American partners. US attendees to the workshop included scientific and engineering representatives of the US Gemini Program and the Gemini Project, US Gemini Board members Jim Houck and Bob Gehrz, and Barbara Jenkins of the University of Florida, the selected graduate student representative.

US Gemini Instrumentation Status

Approximately one-half of the initial complement of instruments for the Gemini 8-meter telescopes was assigned to the United States by a motion approved at the April 1994 meeting of the Gemini Board. The US-assigned instruments include all of the infrared instruments (Near-IR Imager, Near-IR Spectrograph, Mid-IR Imager, Near-IR Arrays and controllers), as well as the science CCDs for the optical spectrographs. While not all of these have been started (the schedule for delivery extends all the way to 2001), the following is a review of progress on several of these efforts.

The Near-IR Imager was assigned by the NSF to the University of Hawaii. Klaus Hodapp is the lead scientist on this instrument, which passed its conceptual design review last March. This imager will be the first instrument delivered and will be used in the commissioning of the Gemini north telescope. The user will be able to select among three focal plane scales, 0.02", 0.05", and 0.12" per pixel, each imaged by a 1024 x 1024 InSb array. The preliminary design review for the Near-IR Imager is scheduled for June 1996.

The Near-IR Spectrograph will be designed and built by NOAO's Instrument Projects Group. Jay Elias (CTIO) is the instrument scientist for this effort. The baseline capabilities proposed for this instrument include coverage of the 1-5 um range using two cameras and a focal plane scale of 0.05"/pixel. A fairly detailed conceptual design was done as a part of the proposal for this instrument, and it will be reviewed, together with potential enhancements and modifications, at a conceptual design review in March 1996.

As has been mentioned in the last two Newsletters, the USGP will soon be issuing an announcement of opportunity (AO) to the US community to supply the Mid-IR Imager for Gemini. This AO will precede a procurement which will run in two stages, the first for the conceptual design only. The details of the procurement plan are currently being reviewed by AURA and the National Science Foundation.

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1995 Software Conference Update (1Dec95)

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1995 Software Conference Update (1Dec95)
(from CCS, NOAO Newsletter No. 44, December 1995)

The Fifth Annual Conference on Astronomical Data Analysis Software and Systems (ADASS) was held in Tucson on 22-25 October 1995 and was hosted by the National Optical Astronomy Observatories. 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 ADASS Conference would like to thank the following sponsors for their support: the Infrared Processing and Analysis Center, the International Gemini 8-Meter Telescopes Project, the National Aeronautics and Space Administration, the National Optical Astronomy Observatories, the National Radio Astronomy Observatory, the National Research Council of Canada, the Smithsonian Astrophysical Observatory, the Space Telescope Science Institute, the University of Arizona Steward Observatory, and the Vatican Observatory. We would also like to extend our thanks to the following corporate sponsors for their generous support: Co Comp, Inc.; NCD, Inc.; Research Systems, Inc.; and Sun Microsystems, Inc.

The Program Organizing Committee for ADASS V had the following members: Rudi Albrecht (ST-ECF/ESO), Roger Brissenden (SAO), Tim Cornwell (NRAO), Dennis Crabtree (DAO/CADC), Bob Hanisch - Chair (STScI), Gareth Hunt (NRAO), George Jacoby (NOAO), Barry Madore (IPAC), Dick Shaw (STScI), Karen Strom (U. Massachusetts), and Doug Tody (NOAO). The Local Organizing Committee was chaired by Jeannette Barnes (softconf@noao.edu).

The Conference was attended by 285 participants with 68 attendees representing 16 countries from outside the US. This continuing participation of non-US attendees has made the ADASS Conferences true international meetings! There were 12 invited talks and 30 contributed talks during the General Sessions covering the topics Science Software Applications, Tools and Resources, Software Development Methods, Archives, Real-Time Systems, Electronic Information Systems, Software Utilities and Systems, and Proposal Processing and Scheduling. The invited speakers and their topics were:

Peter Boyce (AAS), Electronic Publishing at the American Astronomical Society

James Coggins (UNC), Subject-Oriented Programming

Dennis Crabtree (DAO/CADC), Archives of Data for Ground-based Observatories

Dick Crutcher (UIUC), The AIPSview Astronomy Visualization Tool

Bob Garwood (NRAO), AIPS++ and the GBT

Kim Gillies (NOAO), The Design of the Gemini Observatory Control System

Brian Glendenning (NRAO), Creating an Object-Oriented Software System--the AIPS++ Experience

George Jacoby (NOAO/KPNO), Software Demands Imposed By HO Studies

Mark Johnston (STScI), Automated Proposal Handling

Tod Lauer (NOAO/KPNO), Measuring the Motion of the Local Group

John McGraw (UNM), A Friendly Command, Control, and Information System for Astronomy

Fabio Pasian (Trieste), Archiving TNG Data

Also on display during the meeting were 99 poster papers and 14 computer demos. There were seven Birds of a Feather (BOF) sessions held on the following topics: Electronic Publications, an IRAF User's Meeting, a Linux User's Meeting, an IDL User's Group Meeting, a session on EPICS, one on FITS, and at the end of the conference a discussion of Software System Futures. A tutorial on Object Oriented software development was held on Sunday prior to the Conference and was presented by Allan Farris (STScI), with contributions by James Coggins and Brian Glendenning. An IRAF Developer's Workshop followed the Conference on Thursday. A Kitt Peak tour was available to those arriving early on Sunday with visits to the 4-meter, WIYN, McMath-Pierce Solar Facility, and the NRAO telescopes.

The Proceedings for the ADASS V Conference will be published as part of the Astronomical Society of the Pacific Conference Series and will also appear on the Web, as have the last two Conference Proceedings (see the URL: http://iraf.noao.edu/ADASS/adass_conf/adass_conf.html).

ADASS '96 will be hosted by the National Radio Astronomy Observatory in Charlottesville, Virginia, 22-25 September 1996. Make plans now to attend! See the Web pages for more details as they become available: http://www.cv.nrao.edu/adass/.

Jeannette Barnes, George Jacoby, Doug Tody

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Starlink SLALIB Library Available in IRAF V2.11 (1Dec95)

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Starlink SLALIB Library Available in IRAF V2.11 (1Dec95)
(from CCS, NOAO Newsletter No. 44, December 1995)

During the course of developing a set of WCS-based image registration tools for IRAF, it became clear that a set of accurate celestial coordinate transformation routines capable of supporting the equatorial (FK4, FK4-NO-E, FK5, and GAPPT), ecliptic, galactic, and supergalactic celestial coordinate systems was required. Although a subset of the required routines was available in various IRAF tasks and packages, a complete and consistent set was not. The required functionality (and much more), however, did exist in the Starlink Fortran SLALIB library. It would solve our problems if the library could be included in IRAF distributions.

SLALIB is a library of routines intended to make accurate and reliable positional-astronomy applications easier to write. Most SLALIB routines are concerned with position and time, but a number of them have wider application for trigonometrical or numerical applications. SLALIB currently contains 164 routines covering the following topics: string decoding, sexagesimal conversions, angles, vectors and rotation matrices, calendars and timescales, precession and nutation, proper motion, FK4/5 and elliptic aberration, geocentric coordinates, apparent and observed place, azimuth and elevation, refraction and airmass, ecliptic, galactic, and supergalactic coordinates, ephemerides, astrometry, and numerical methods. SLALIB is written in Fortran 77 and currently runs independently under VAX/VMS, Unix, and several PC platforms (a C version is also available).

The Starlink project has agreed to permit IRAF to include SLALIB in future releases of IRAF. Beginning with IRAF V2.11, the SLALIB routines will be available in the IRAF core system math libraries, where they will be available for use in all IRAF software. Prior to the release of IRAF V2.11, the SLALIB routines may be included as part of any external packages currently under development which require them. We feel that these routines are potentially useful in many astronomical applications and hope that IRAF programmers will make good use of them.

Lindsey Davis, Patrick Wallace

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IRAF Update (1Dec95)

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(from CCS, NOAO Newsletter No. 44, December 1995)

The first bug fix patch for V2.10.4 was released in mid-September for SunOS, Sun Solaris, and OSF/1. Most of the bug fixes were minor, although a serious world coordinate system bug fix was included that affected writing QPOE files in the PROS/XRAY package. All sites running V2.10.4 are encouraged to install the patch, which can be found in the appropriate IRAF network distribution archives on iraf.noao.edu. Refer to the README file in the distribution directory for instructions on applying the patch. The patch does not modify any site dependent files, hence is easily applied.

IRAF V2.10.4 for PCs running Linux was released in early September (the initial release included the patch mentioned above). The IRAF V2.10.4 port to Linux was done using the Slackware 2.3 Linux distribution and the version 1.2.11 Linux kernel. The initial testing for the port was done on two platforms, a high end Pentium system (P5-90, Adaptec 2940 PCI/SCSI bus, 32 Mb RAM, 17 inch monitor, HP DAT tape drive), and a more modest 486DX2 66 MHz system (IDE/SCSI 16 Mb). The distribution includes Linux versions of xgterm and ximtool as well as an option to run gzexe-compressed executables on those systems with limited diskspace. Our records show this to be a very popular port, with 165 distributions downloaded in the first six weeks or so. Equivalent distributions for Solaris x86 and BSD are in preparation and should follow shortly. We are very pleased with the performance of IRAF on modern PCs, which should offer an attractive and cost effective alternative to workstations, especially for personal use.

Use of the global Internet is exploding and our overseas users are reporting problems accessing the IRAF server in Tucson to download files or browse the IRAF Web pages. The problem is likely to get worse before the network providers can increase the bandwidth enough to handle the explosion of traffic. We are looking into setting up overseas mirrors of the IRAF archives to help alleviate this problem. Thanks to the Starlink group at RAL, we are experimenting initially with a mirror site for the UK. If this proves successful, we will try to establish other mirrors at sites scattered around the world (ordering a CDROM distribution is another way around this problem: see the discussion below). The intention is that the mirrors will be duplicates of the main IRAF archive, supporting both FTP and Web access, and will be updated periodically by some automated means.

In other systems work, Mike Fitzpatrick and Doug Tody have been adding several new enhancements to ximtool as part of continuing work on the X11IRAF project. These include an integrated hardcopy print capability as well as disk file load and save options, and support for 8 bit operation on 24 bit displays. This new version of ximtool should be released shortly. Additional enhancements planned for the near future include support for a number of other PC image formats, as well as datastream compression for faster operation when displaying remotely over a slow network.

Lindsey Davis has continued working on the problem of WCS-driven image registration. As part of that effort she has written a general celestial coordinate transformation task based on the Starlink FORTRAN astrometry library SLALIB, which supports equatorial (FK4, FK4-NO-E, FK5, GAPPT), ecliptic, galactic, and supergalactic coordinates, as well as the IRAF MWCS (logical, physical, world) systems. This facility will enable users to register images that have equatorial system WCS with different equinoxes and epochs, e.g., FK4 B1950.0 and

FK5 J2000.0, or images that have different celestial coordinate systems, e.g., equatorial and galactic. An experimental implementation of all the sky projection functions proposed by Greisen and Calabretta in their draft FITS proposal entitled "Representations of Celestial Coordinates in FITS" has also been implemented. Aside from supporting the new projection types, the WCS representation used by IRAF has not changed as the new WCS representation is still under development and is incompatible with older representations, including that currently used by IRAF.

Frank Valdes has been working on a new task, AUTOIDENTIFY, that automatically identifies arc lines and derives a dispersion function. The task allows various types of constraining information such as approximate central wavelength and dispersion. A minimum input to the task would be the arc line spectrum, a line list, and an optional wavelength-calibrated template spectrum. The template spectrum is used to select the significant lines, but it need not have the same detailed line strengths as the data spectrum. The separation of line strength information from the line list itself, allows users to provide more appropriate templates having similar detector response characteristics.

IRAF V2.10.4 is now available for distribution on a CDROM that includes all V2.10.4 distributions, all IRAF documentation (mostly as PostScript files), selected NOAO layered packages, and other miscellaneous items. The CDROM is a simple mirror image of portions of the IRAF FTP network archive. IRAF is installed from the CDROM to disk, i.e., you can not run IRAF from the CDROM. The CDROM may be customized for other distributions upon request. We plan to produce more fully featured CDROMs in the future and will be experimenting with capabilities such as browsable and searchable documentation and IRAF distributions that can be run directly from the CDROM, e.g., for the PC-IRAF distribution. These initial CDROMs are intended mainly as an alternative to tape or network distributions.

Members of the IRAF Group attended the ADASS '95 Conference in Tucson in late October, and presented various papers on current IRAF projects: "World Coordinate System Based Image Registration Tools for IRAF" by Lindsey Davis, "Datastream Compression for IRAF Image Display" by Mike Fitzpatrick and Doug Tody, "Remote Observing and Automatic FTP on Kitt Peak" by Rob Seaman and Bruce Bohannan (KPNO), "PC-IRAF: The Choice of a GNU Generation" by Doug Tody and Mike Fitzpatrick, and "Automated Arc Line Identifications in IRAF" by Frank Valdes. An IRAF computer demo was also available at the meeting so the IRAF group could discuss the latest IRAF developments with the conference participants. Everyone we talked to felt that this ADASS, the fifth in the series, was one of the best ever. The oral and poster sessions were excellent, and the BOFs and tag-along workshops were popular and well attended.

The IRAF BOF held on Monday during the conference had a new format this year, emphasizing IRAF development by user sites. A number of interesting contributed talks were given, followed by a presentation on IRAF system development, and concluding with a group discussion of IRAF priorities and plans. Written status reports on IRAF and the major layered packages (STSDAS, PROS, EUV) are available for those who could not attend the BOF.

An IRAF Developer's Workshop was held on Thursday following the conference and was attended by over 60 participants. Software developers from around the world attended the workshop to discuss their various IRAF projects. Special topics for this year included Pipeline Software, Archiving, and Data Structures. The workshop concluded with a group discussion of future directions and priorities for IRAF development.

For further information about the IRAF project please see the IRAF Web pages at http://iraf.noao.edu/ or send e-mail to iraf@noao.edu. The adass.iraf newsgroups on USENET provide timely information on IRAF developments and are available for the discussion of IRAF related issues.

Doug Tody, Jeannette Barnes

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NOAO FTP Archives (1Dec95)

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(from CCS, NOAO Newsletter No. 44, December 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 some astronomical catalogues: Jacoby et al. catalog, "A Library of Stellar Spectra," the "Catalogue of Principal Galaxies," the "Hipparcos Input Catalogue" and the Northern Proper Motion Catalog.

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

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

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

iraf (iraf.noao.edu) - IRAF network archive containing the IRAF distributions, documentation, layered software, and other IRAF related files. It is best to ftp 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: currently only some PostScript tools.

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

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

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

```
argo.tuc.noao.edu      =  140.252.1.21
ctios1.ctio.noao.edu   =  139.229.2.1
ftp.noao.edu           =  140.252.1.24
gemini.tuc.noao.edu    =  140.252.1.11
helios.tuc.noao.edu    =  140.252.8.105
iraf.noao.edu          =  140.252.1.1
mira.tuc.noao.edu      =  140.252.3.85
orion.tuc.noao.edu     =  140.252.1.22
ftp.sunspot.noao.edu   =  146.5.2.1
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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 NOAO and its associated projects see the World Wide Web URL: http://www.noao.edu/.

Jeannette Barnes

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