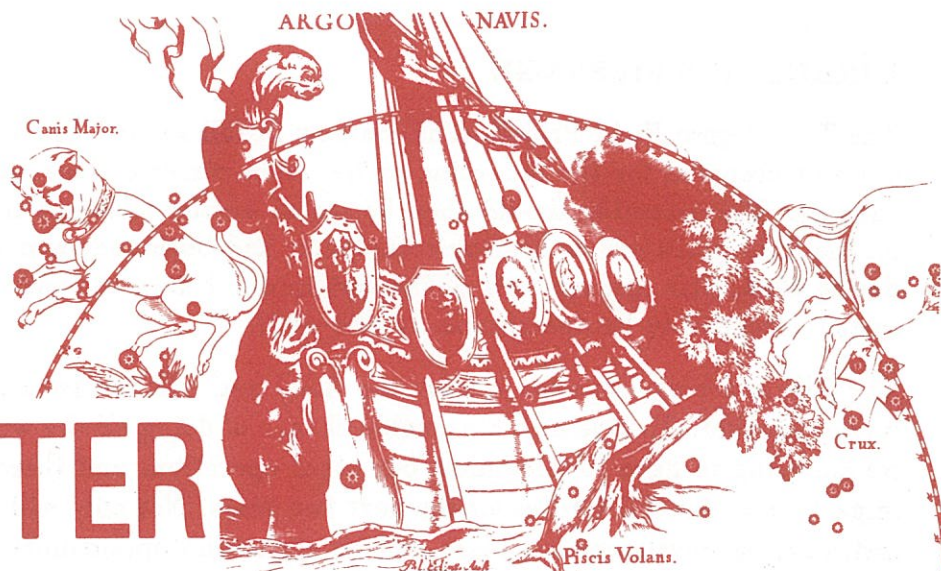
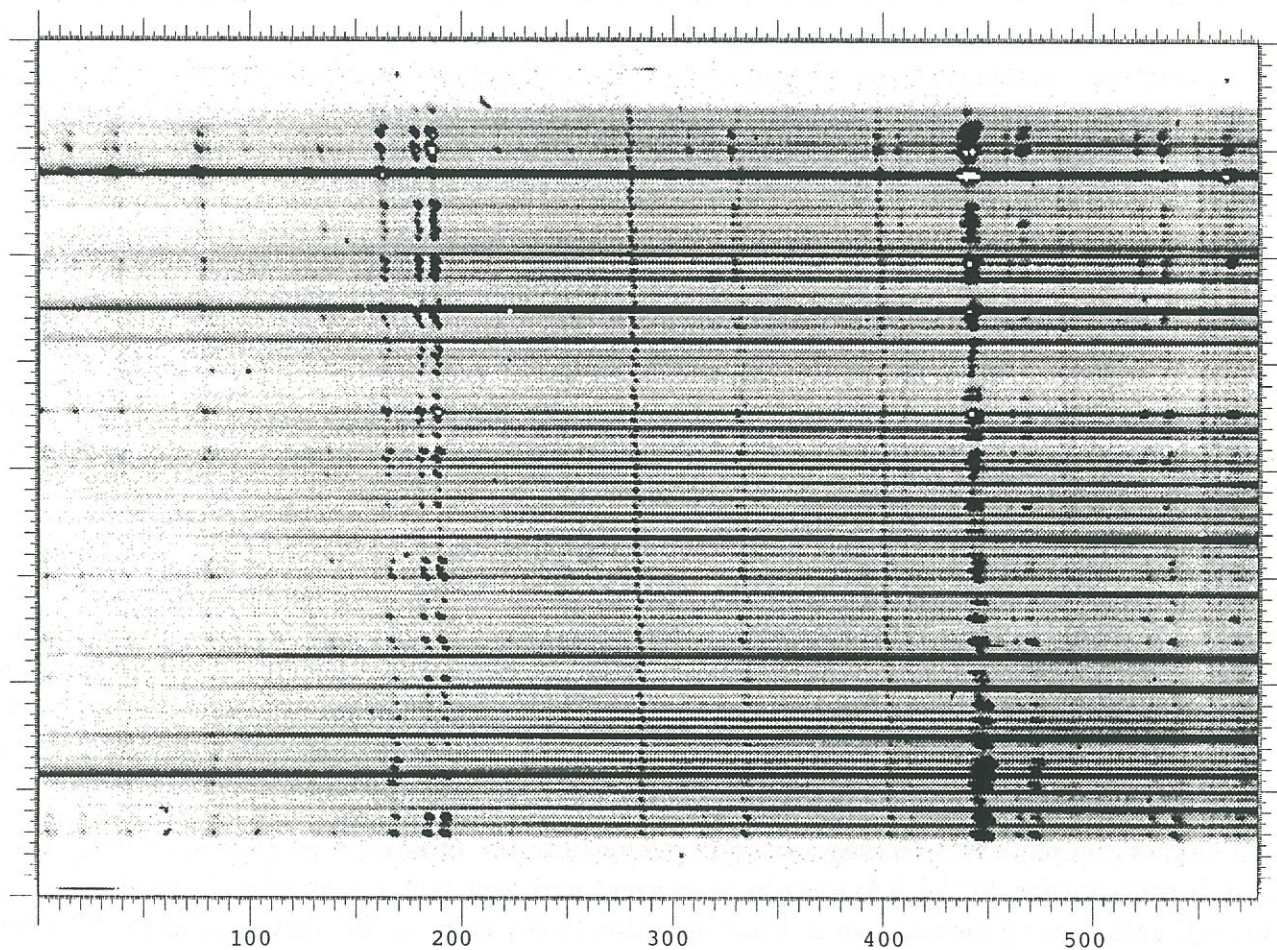


AAO NEWSLETTER



No 63

October 1992



This raw 1200s FLAIR-II frame of planetary nebulae in a crowded region of the Galactic bulge was taken for an abundance study by Mike Barlow, N. Walton and R. Clegg (UCL). The wavelength range is 3830–7370 Å (left to right) at 11.3 Å resolution and about 80 of the 92 spectra shown are planetaries, with the remaining fibres devoted to sky. Typical $H\beta$ fluxes are $10^{-14.5}$ to $10^{-12.5}$ erg/cm²/s. $H\beta$ and the two [OIII] emission lines can be seen between pixels 160–190, the strong [NII], $H\alpha$, [NII] complex around pixel 440 and night sky lines of [OI] 5577 Å, NaD and [OI] 6300 Å near pixels 280, 330 and 395.

DIRECTOR'S MESSAGE

The Two-degree Field Project (2dF) is now in full swing. The new top end is at site, being fitted out and prepared for the mounting of the main corrector lens optics which are due for delivery in January. The assembly should then be tested on the telescope in March. Meanwhile, design work on the fibre positioner is nearing completion and both that and the spectrographs should be built during 1993, with limited tests of the system due before the end of next year and the full 400-fibre system intended to be operational by mid-1994.

The 2dF is a very large project for the AAO and will involve almost everyone on the staff in one way or another. To give us a reasonable chance of doing all the work on schedule and within budget we are going to have to streamline our other operations and there is bound to be a very significant impact on all AAO activities for the next two years. Not only will there be very little scope for other instrumental developments, there will be almost no opportunity to enhance existing instruments. Since engineering and technical staff at the AAT will be much more involved in the 2dF from now on there will also be an impact on telescope operations. We will of course continue to operate the AAT and the Schmidt Telescope as efficiently as possible, and the fixing of faults will remain the top priority short-term task of our Siding Spring staff. However, it is clearly not feasible to continue with the full current load of day-to-day work while the same people are heavily involved in aspects of the construction, installation and testing of the 2dF. I therefore want to warn users that there will have to be some simplifications in the telescope operations, for example with fewer instruments guaranteed to be fully supported and less frequent instrument changes, until the 2dF is completed and fully commissioned.

Another recent development affects visitors to the telescopes, although any impact on scheduled observers should be minimal. Following a review of safety procedures at the AAT, we have implemented new rules about people visiting the telescopes. The main thrust of the changes is simply to make the work environment safer, to minimise the number of people who might be at risk, and to make everyone in the AAO buildings more safety-conscious. The specific change which affects AAT observers is that access to the dark areas of the dome at night may only be with the knowledge and approval of the Night Assistant.

In the previous Newsletter, David Allen mentioned the intention of the AAT Board to seek the views of our user communities about the long-term plans of the AAO, in the context of the UK (and possible Australian) involvement in Gemini as well as other astronomical and financial developments in the two countries. While such plans should and will be discussed with users, it became apparent at the Oxford AAT Board meeting in September that now was not the appropriate time for a thorough-going review of all AAO activities, given the many current uncertainties in the astronomical plans of both countries. Thus the promised (threatened?) position papers will not now be circulated.

Finally, I cannot complete this message without reference to the imminent retirement of Doug Cunliffe. Doug's contribution to the AAO has been so great and over such a long period that it deserves much more than a passing mention, so it is our intention to say more in the next issue of the Newsletter. Meanwhile it is a great pleasure to welcome Doug's successor as Executive Officer of the AAO, Ross Laing.

Russell Cannon

AAT BOARD NEWS

At the meeting in Oxford last September, Professor Michael Rowan-Robinson was appointed Deputy Chair of the Board, replacing Professor Boksenberg. Dr Bob Frater continues as Board Chair.

Sandra Harrison

AIRLINES TO COONABARABRAN

A few visitors, particularly those from the UK, have been booking flights from Sydney to Coonabarabran using Oxley Airlines. The difference in cost between Yanda and Oxley Airlines is very small when booked in Australia, but it appears some attractive deals have been negotiated with Oxley Airlines with overseas bookings.

On several occasions, Oxley Airlines has cancelled flights or bookings without informing passengers. Several passengers have been inconvenienced, and some only discovered their flights had been cancelled after they had arrived at the airport.

Yanda Airlines have proven to be reliable over a long period, and always keep their passengers informed about delays, cancellations etc. The current cost of a Yanda flight to Coona is \$316.00 return, and the timetable is given below. All flights are via Gunnedah, and in Sydney Yanda flights depart from the Ansett Airlines terminal.

Sally Dale

	Depart	Arrive	Flight no.
<u>SYDNEY TO COONA</u>			
Monday – Friday	0900	1055	851
	1730	1915	857
Saturday	0930	1115	865
Sunday	1720	1905	873
<u>COONA TO SYDNEY</u>			
Monday – Friday	0600	0745	850
	1500	1645	856
Saturday	0700	0845	864
Sunday	1500	1645	872

SEARCH FOR SKY ROCKS CONTINUES.....

In 1992 the Anglo–Australian Near–Earth Asteroid Survey has continued apace. All plates and films taken with the UK Schmidt Telescope are scanned using binocular microscopes within 24 hours of exposure to search for interesting asteroid (or comet) trails, the bulk of this work being conducted by Rob McNaught. Readers of the IAU Circulars will have noted that numerous supernovae have been discovered as a by-product of this program. Any “interesting” asteroids (potential Earth-crossers, Mars-crossers or unusual main belt objects) are then followed up using the Uppsala Southern Schmidt or the ANU 40–inch telescope at Siding Spring (or occasionally a UKST film for a faint, very fast moving object).

The 40–inch is now being used 4 or 5 nights a month for routine follow–up of asteroids discovered here and elsewhere. Largely through the efforts of Rob McNaught, and with excellent backup from ANU staff, around 100 astrometric positions can be obtained in a single night. Some asteroids detected had not been observed for several decades; in particular positions obtained for 1566 Icarus and 2062 Aten have been important in allowing their long–term orbital evolution to be investigated. Peculiar asteroid 1991 DA, discovered as part of this program last year and known to be in a bizarre orbit passing from Mars out to beyond Uranus, has also been picked up again, allowing its return in 2030 to be fixed with reasonable accuracy.

In association with Gareth Williams (Smithsonian Center for Astrophysics), McNaught has been identifying many poorly observed asteroids on old UKST plates, or re-observing them with the ANU

40-inch. This allows more accurate orbits for many unnumbered asteroids and maintains a high orbital accuracy for the numbered objects, some of which had not been observed for a decade or longer.

The use of the UKST in this program has been expanded at the discretion of the AAO Director and AIC of the UKST, thanks to the help of all the UKST staff. Up to now the UKST has not observed for about 8 days around full moon each month due to sky brightness, but Ken Russell realized that this was not a limiting problem for fast-moving asteroids, especially using the superior new 4415 film. Since moving objects track across the emulsion, nothing is gained by increasing the exposure time except that a longer trail is obtained. Thus by exposing for just 15–20 minutes a film has limited sky background, but a sufficiently-long trail for recognition may be obtained, at least in the case of the fast-moving objects we are interested in.

The importance of this program is accentuated by the fact that it has just been realized that Comet Swift-Tuttle may hit the Earth on 2126 August 14 (see IAU Circular 5636). Only observations over the next 5 or 6 years will enable us to discover whether this is likely to be the case well in advance of the next apparition. Since the comet moves into the southern sky in December, clearly an AAO contribution is essential, in particular as the comet passes beyond a heliocentric distance of 3 AU and water liberation (and thus the substantial non-gravitational force which is limiting orbit predictions) ceases.

Duncan Steel

(Advertisement)

“THE ASTRONOMERS” (6 × 60 minutes).

From the earliest mists of time, humankind’s fascination with the mysteries of the stars has been a passionate and forceful motivator of human endeavour. This fascination continues to drive the lives and work of scientists around the globe today, and now you can join them on a journey to the farthest reaches of the Universe in search of black holes, quasars, dark matter, gravity waves and evidence of planets outside our solar system. The Australian Broadcasting Corporation is offering for sale the set of six programs, as seen on ABC TV. For further information, please call ABC program sales on tel: (02) 950 3173/3174, fax: (02) 950 3169. *This offer is available for the territory of Australia only.*

AAO T-SHIRTS

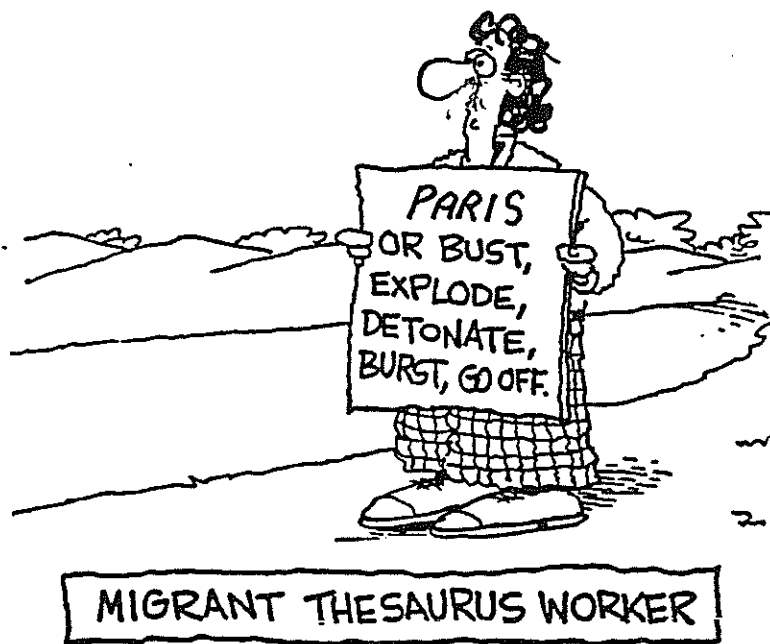
T-shirts with spectacular David Malin images may be ordered at any time. Images available are the *Horsehead Nebula*, *Pleiades*, *Helix Nebula*, *Star Trails*, *Spiral Galaxy NGC 2997* and *Cone Nebula* (new). Prices are A\$25 for short sleeve, A\$27 for long sleeve, plus postage. The shirts are available in white only, in sizes S, M, L and XL.

We also have posters, slide sets, glossy prints and postcards available. Please contact Coral Cooksley (cc@aaoepp) for further information and/or a catalogue.

LIBRARY NEWS

Gwen Crane must be congratulated on the super-efficient running of the AAO library whilst I was on two months leave. With just fifteen hours briefing before I left she had to learn the library housekeeping procedures and services, the CAIRS database including the backup procedures, the VAX files, access to various external databases, operation of the CCOD database and many other peculiarities and idiosyncrasies of the AAO (and staff). Several e-mail queries from the librarian on safari in foreign parts revealed that things were running smoothly – what more can one ask!

The Paris meeting convened by Shobbrook & Shobbrook with seventeen European astronomy librarians on July 27 was most successful. Many of the librarians had not met before, and fruitful discussions were held on many topics including the multi-lingual translation of the astronomy thesaurus. This meeting served as a useful indicator that other workshops and colloquia should be held to enable the cross-fertilisation of ideas, particularly in the application of new procedures and technology in our libraries. We hope that a second international astronomy librarians meeting will be held in Europe in 1994 near the IAU General Assembly.



The conference in Haguenau on "Astronomy from Large Databases II" was an appropriate meeting to announce the forthcoming IAU Astronomy Thesaurus. The thesaurus has been greeted with enthusiasm from all quarters of the globe. Many other uses are envisaged for the thesaurus apart from those required by astronomy librarians, these include: assisting in the updating of classification schedules; as a tool for indexers and abstractors of astronomy journals; checking passwords on computer systems at observatories; as a personal spell checker; searching textual databases with hypertext. Other new techniques involving intelligent and expert systems are being developed for information systems and these demand sophisticated knowledge bases not only in English but also in foreign languages. The full English edition of the thesaurus has been updated according to the many suggestions received over the past months and is ready now for any application. The proposed multi-lingual supplement is envisaged as a valuable component in the near future. A Russian translator has been found to add to the multi-lingual edition which is progressing well.

As well as these meetings, I visited nine observatory libraries during the two months overseas (though some of these visits were all too brief). Of the librarians I had the opportunity to meet all were enthusiastic about the new thesaurus. Funding for publication of the thesaurus has still to be found and although there are several options available it is hoped that the IAU will see fit to provide the money needed. A proposal has been submitted.

Robyn Shobbrook

Publications

A new CD-ROM series is announced (including 'The David Malin Collection').

Series 1 — Voyage to the Stars (2 discs)

Series 2 — Voyage to the Planets (4 discs)

Publisher: Astronomical Research Network,
206 Bellwood Ave., Maplewood Minn. 55117, USA.

Copyright AAO 1991 — ISO9660.

Note: The pack includes PC & Macintosh image processing software on each disk and a guide to installation.

A copy of the series will be found in the Epping and Site libraries. The usual loan record is required.

SCHMIDT TELESCOPE (UKST) NEWS

FLAIR-II comes of age

FLAIR, the multi-object fibre spectroscopy system at the Schmidt Telescope (ST), is now living up to its initial promise as a serious and powerful instrument able to operate routinely on consecutive nights. FLAIR has already demonstrated its capabilities as an efficient and accurate redshift engine for normal galaxies to $B \sim 17.5$, (e.g. Parker and Watson 1990, Watson et al. 1991) but, especially with the commissioning of the complete FLAIR-II system in March of this year, its repertoire has been increased to a wide variety of different object types including successful observations of planetary nebulae, IRAS sources, stars in the LMC (e.g. Morgan et al, 1992), AGN candidates and quasars, (the latter to $B \sim 18.5!$).

The enhanced performance is a consequence of the fully engineered Schmidt spectrograph, which offers improved blue sensitivity, and the increased fibre numbers given by the first FLAIR-II plateholder. The system now yields a large range of possible configurations with wider wavelength coverage at a given resolution by virtue of the well matched design features and the use of the existing RGO spectrograph gratings.

The first FLAIR-II plateholder, with $92 \times 100 \mu\text{m}$ (6.7arcsec) fibres and with consecutive nightly operation yields a six-fold increase in observing efficiency over the old FLAIR/PANACHE system, notwithstanding the improved sensitivity, resolution and wavelength range options. In many respects the system now easily out-performs single object spectroscopy systems on 2-m class telescopes. The somewhat modest aperture is compensated by the possibilities of exceedingly long exposure times (e.g. 9×3000 seconds). The wide field coverage (~ 40 square degrees) also makes FLAIR an ideal survey instrument for many applications. A montage of a selection of different types of object from recently supported FLAIR runs is given in the accompanying figure along with explanatory notes and credits.

The system will be further enhanced at the end of the year with the commissioning of the second FLAIR-II plateholder. This will be a hybrid with ~ 150 individual fibres split between both 50 and 100 micron fibre formats. The system's flexibility will be substantially improved as a result with the 50μ (3.3arcsec) fibres being better optimised to observations of point sources such as stars and quasars.

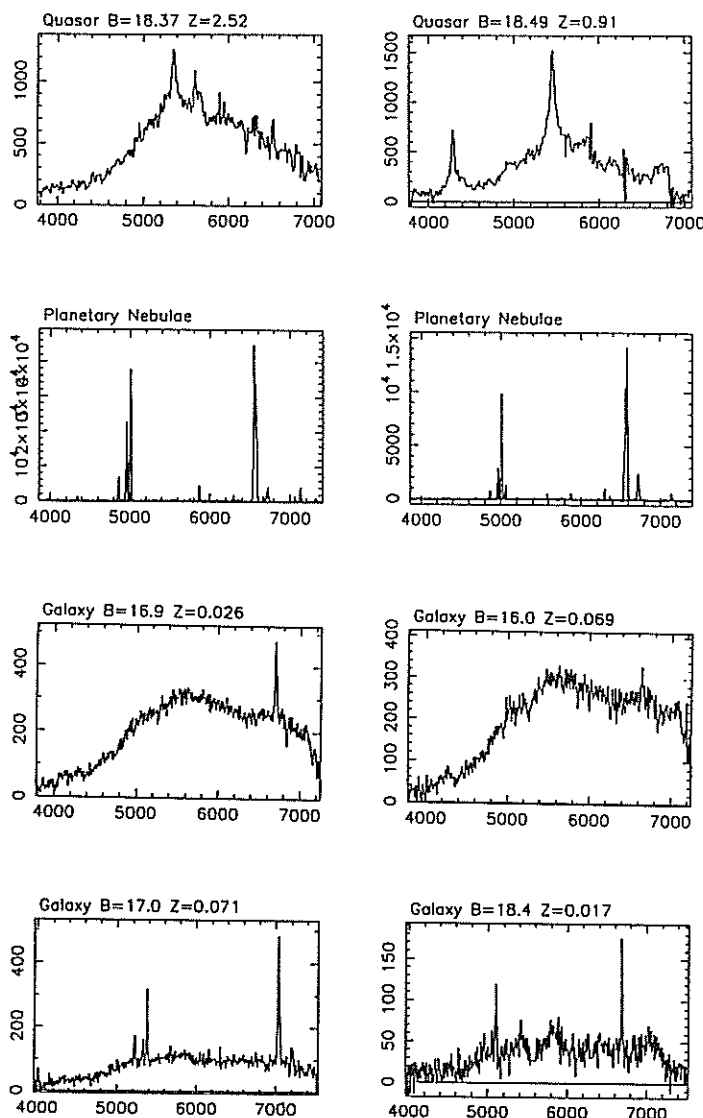
FLAIR is currently scheduled each lunation for between 5 and 7 nights and is operated in the same manner as any other common-user instrument on the AAT. Successful applicants are expected to be present at the telescope to assist with the marking-up of the FLAIR plates, fibering up of the fields and observations. Time is allocated twice a year with deadlines corresponding to the ATAC and PATT dates, and is split equally between the Australian and UK communities.

Application forms and further information concerning this facility may be obtained from QAP@aaocbn.oz.au at the Schmidt Telescope or Mike Read (MAR@star.roe.ac.uk) at ROE.

Quentin Parker

References

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- Watson, F.G. Oates, A.P. Shanks, T. & Hale-Sutton, D., 1991. "CCD multi-object spectroscopy of galaxies at the UKST", *MNRAS* 253, 222.
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The montage above shows spectra from four different FLAIR projects undertaken during 1992. All the spectra are shown in advance of publication by kind permission of the authors. The first two spectra are of new quasars identified in a large-area UVX survey to $B=18.5$ by Lance Miller and Pippa Goldschmidt (Royal Observatory Edinburgh). The total exposure time was about 7 hours. The next two spectra are examples of planetary nebulae in the Galactic bulge as described on the front cover. The third row shows two galaxies observed by Michael Drinkwater (AAO) and colleagues in a search for compact dwarf galaxies in the Virgo cluster (sampling to $B=17.0$, total exposure time 3.3 hours). The last two spectra are of faint galaxies observed by Brian Clarke and Paul Hewett (Cambridge) from a sample of AGN candidates selected from UKST prism plates and/or with UV excess. In this case the spectra had a total exposure time of 8.5 hours.

COONABARABRAN NEWS

Tom Cragg's Retirement

Tom has been with the AAO since 1976 as Chief Night Assistant. Most visitors know him for his role in tape copying and archiving of AAT data, and his card catalogue of all AAT observations has been a never-ending task. But Tom has a far longer involvement with astronomy. Before joining the AAT he spent 24 years at Mt. Wilson Observatory, and before that was at the Los Angeles Planetarium. Indeed, he has spent most of his life involved in astronomy, both working amongst professional astronomers and conducting observing programs with his own telescopes.

It is as an amateur astronomer that Tom is best known. All at the AAT know of his daily drawings of sunspots, which he has been making almost every clear day for nearly 50 years. His chief interest is variable stars, which he also observes at every opportunity. Since he started in 1945 he has made well over 120,000 such observations, an astronomical number of which most professional astronomers would be proud. He has been immortalized by the naming of an asteroid, 1990 TC, as (5068) Cragg, ensuring that astronomers of the future will remember him and his contributions.

Tom's other interests include chess and war games. We will remember him for his many anecdotes but more so for his famous sayings, such as "goddamned, lousy programmers" and his dislike of computers, double-bowl sinks and especially daylight saving time ("idiot time"), which coincidentally starts as he retires.

Steven Lee

EPPING NEWS

Gossip column

July marked the return of our leader from six months sabbatical at the IoA, Cambridge. Unfortunately what should have been a brief respite from Directorial rigours was marred by Russell's illness in June. However, the boss has now fully recovered. David Allen was the first in line to welcome the Director back to the fold.

Doug Cunliffe is soon to retire from the AAO, and Ken Gorham is arranging a farewell dinner for Doug and Pauline at (very appropriately) the Chatswood Golf Club. This is in addition to our traditional BBQ send-off. After Doug's departure on 3 November, you will find him on the golf course assiduously working at reducing his handicap.

Ross Laing is Doug's replacement. Ross launched into the Executive Officer's role with enthusiasm, attending the AAT Board meeting in the UK just a few weeks after joining AAO. Sean Ryan, from the University of Texas, has just arrived to take up the newly-created AAO/SERC Research Fellowship.

Two UK exchange students, Rowan Dundas from St. Andrews and Douglas Burke from Imperial College London, spent eight weeks with us assisting David Allen and Michael Burton. They applied themselves enthusiastically to their astronomical tasks. As with former exchange students, Rowan and Douglas spent the last two weeks of their stay seeking out tourist attractions in Queensland.

The last few months have seen David Malin operating at his usual very high public profile. Photo Bizarre 1992, with the theme "Space - The Final Frontier", was opened by "the world's best photographer". Who, you say? Why, none other than DFM. Next on David's itinerary was a public talk at Questacon, held at the National Science and Technology Centre in Canberra. This received good media coverage. Then on to address students at the Royal Melbourne Institute of Photographic Technology. And we even caught a fleeting glimpse of him on the ABC's Quantum show.

Annette Callow

INSTRUMENT NEWS

IRIS

Several new filters have been installed, as follows.

Kn ($2.0\text{--}2.3\ \mu\text{m}$) is a narrow-band K filter designed to have the low-background benefit of K' but to avoid the water vapour absorption around $1.9\ \mu\text{m}$. This is an excellent filter, virtually free from pinhole defects and having high transmission. It offers 0.4 mag better sensitivity than K, only slightly lower than K'.

1.64 [Fe II]. Has some fringing which vanishes when sky subtraction is performed.

1.65 redshifted [Fe II].

2.25 $\text{H}_2\ v=2-1\ S(1)$.

Recently arrived and about to be installed is a $1.08\ \mu\text{m}$ He I filter.

Extensive tests have now been undertaken to explore a suspected loss of light between pixels. Observations made in good seeing clearly show that stars are recorded fainter if their centroids fall near a corner of a pixel than at the centre. The loss depends on the size of the seeing disk in pixels, and is therefore greatest in the f/15 wide-field case ($1.9\ \text{arcsec}$ pixels) where it can exceed 0.1 mag. Tests in the IRIS31 window using 0.6-arcsec pixels (f/15 intermediate field) yield an rms below 0.01 mag if a correction is applied for this light loss, and somewhat higher if not.

The two grisms are now well-established. They offer long-slit spectroscopy at a resolution of about 300 over the $1.5\text{--}1.8$ and $2.0\text{--}2.4\ \mu\text{m}$ regions. The slit is $75\ \text{arcsec}$ long, but the image quality falls off towards the ends. We have a design for a J grism and would be interested to hear how much demand there is for it. The grisms operate at f/15, but can be used at f/36 where the resolution falls to 100 as the wavelength coverage increases.

At present the grisms have to be manually inserted from within the Cassegrain cage. Consequently we cannot conveniently view an object through the slit before inserting the dispersing optics. Since this has proved a powerful technique, plans are afoot to motorise the mechanisms.

Experiments using IRIS for area polarimetry were largely thwarted by cloud. However, Jim Hough (University of Hertfordshire) is developing a dedicated polarimetry add-on for IRIS that should become available in the first half of 1993.

David Allen

Fringing with the Tektronix CCD

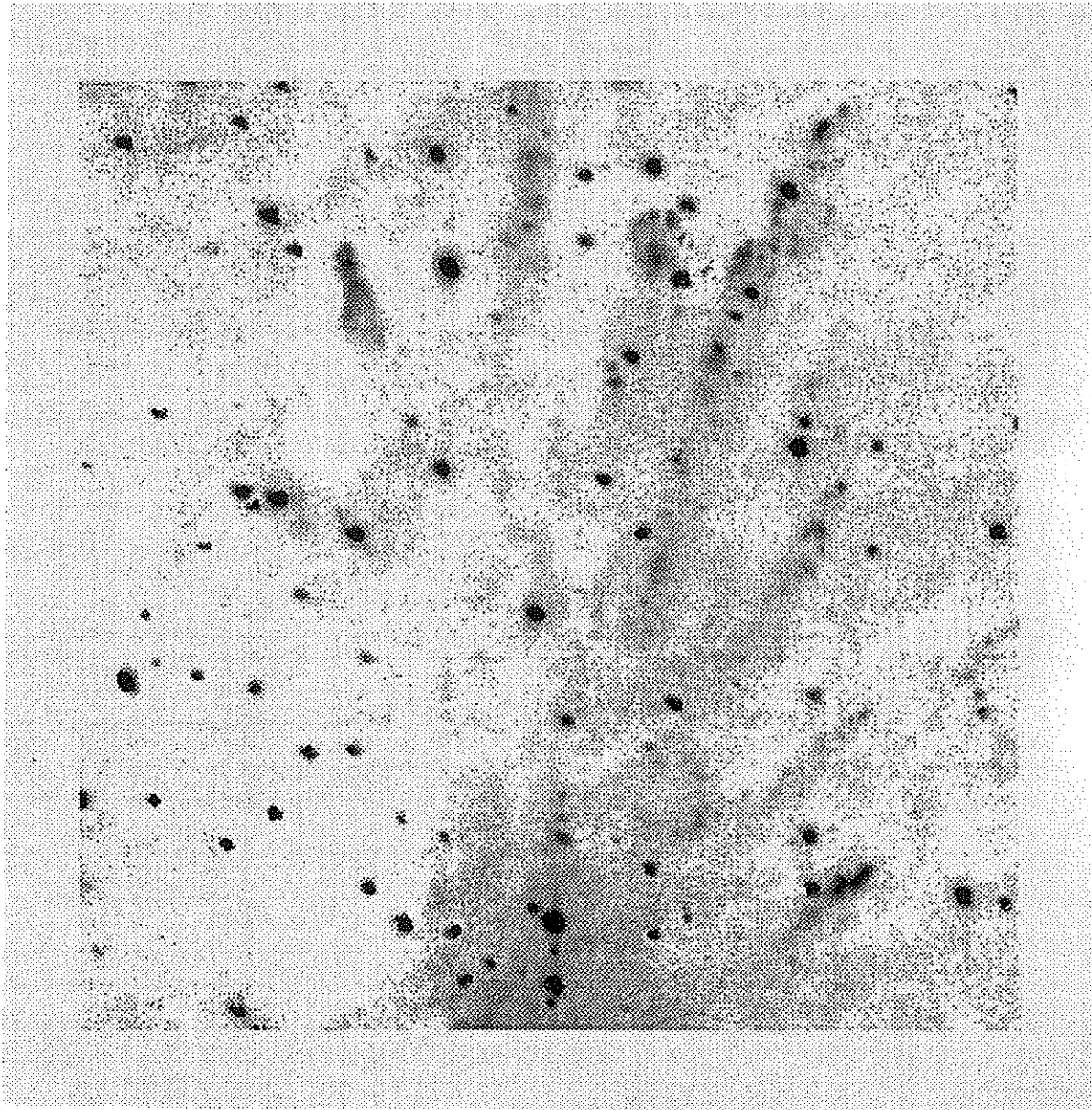
The Tek CCD has been used with great success over the last few months. Its main advantage is the high quantum efficiency, though CCD users have also found the increased wavelength range of use. The cosmic ray event rate is double that for the Thomson chip, so observations are best split into several exposures to facilitate removal of the cosmic rays.

Since the Tek is thinned, fringing is seen in the red and this is more severe for spectroscopy than for direct imaging. The level measured with the 25cm camera on the RGO spectrograph is from 1% at $7300\ \text{\AA}$ to 5% at $8600\ \text{\AA}$, jumping sharply to 10 – 16% above $9000\ \text{\AA}$. A tungsten flat shows the same fringes, and if care is taken to take a flat before any wavelength shift occurs, and particularly before the grating angle is changed, then fringes can be removed by flatfield division. In practice, flat fielding appears to reduce the residual fringing to 3% at $9500\ \text{\AA}$ and less than 1% at $8600\ \text{\AA}$. More information will become available as the initial users reduce their data.

Raylee Stathakis



Explosion in Orion. This IRIS mosaic of the Orion Nebula was made in the light of molecular hydrogen. The northern section gives the impression of a collection of wakes left behind by objects violently blown out from the region of recent star formation. The image on the next page shows the shrapnel of the explosion.



This mosaic of the northern section of Orion is in the radiation of [Fe II]. Whereas the H₂ emission shown in the previous picture monitors low-energy shocks, the [Fe II] isolates the most energetic region. Comparison of the two shows that a [Fe II] blob lies at the tip of almost every H₂ wake, so we are seeing the shrapnel from the explosion. This 16-frame mosaic was made with the 0.26 arcsec pixels of the f/36 intermediate field.

COMPUTER NEWS

VAX 11/780 at site retired...

The VAX 11/780 (node aat78a) was shut down for the last time on 8 October 1992. The 780's role at the AAT had been gradually taken over by the VAX 4000 installed in August 1991. In fact for the last week it simply acted as a network server (with logins disabled) providing an asynchronous DECnet link to the MicroVAX II at the AAO Schmidt. The installation of Ethernet bridges at the AAT and at the Schmidt providing both DECnet and TCPIP links finally heralded the demise of the VAX 11/780.

The VAX 11/780 was installed at site in February 1982. Its first few months of service at the AAT were marred by chronic backplane problems which were finally solved by AAT staff. The site VAX was one of the very few VAXes to be supported by "customer" staff. Site personnel undertook field service training with Digital Equipment Corp. and a complete set of spares were held on site. This "special" maintenance agreement with DEC proved very beneficial for the AAT with the VAX being repaired on numerous occasions during observing, resulting in the minimum of time lost.

Early in its life, the VAX was used for data reduction, general network communications and as a "giant cardreader" for the Interdata computers. Gradually, the data taking roles of the Interdata computers were transferred to the VAX, initially as Interdata/VAX hybrid systems.

Because of the physical size of the VAX 11/780 (plus the noise it created) it was installed a fair distance from its instrument interfacing. This required the design of special Unibus hardware – the Differential Extended Unibus. This was quite unique, and gained fame throughout the corridors of Digital Equipment Corporation worldwide!. The extended Unibus is still in operation today, now connected to the VAX 4000.

Bob Dean

(For a comparison of the VAX 11/780 with today's computers, see Lewis Waller's article in AAO Newsletter 59, October 1991 — Ed.)

LUNAR CHIAROSCURO

		Dark	Grey(1)	Bright	Grey(3)	Dark	Grey (1)	Bright
1992	Oct		1–2	3–16	17–19	20–28	29–31	
	Nov		1	2–15	16–18	19–27	28–30	
	Dec		1–2	3–15	16–19	20–29	30–31	
1993	Jan		1–2	3–15	16–18	19–29	30–31	
	Feb		1	2–13	14–16	17–28		
	Mar		1–3	4–14	15–17	18–29	30–31	
	Apr		1	2–12	13–16	17–27	28–30	
	May			1–11	12–15	16–26	27–29	30–31
	Jun			1–10	11–14	15–24	25–27	28–30
	Jul			1–9	10–13	14–23	24–26	27–31

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ISSN: 0728-5833

Published by Anglo-Australian Observatory, PO Box 296 Epping, NSW 2121 Australia

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