



On 27/4/99 staff at Siding Springs celebrated the Twenty-fifth Anniversary of first light at the AAT. In this issue we look back to those early commissioning days (page 7). Here we see the commissioning team putting the f/8 top end together.

3	The Origin of Mercury's Exosphere (Alan Fitzsimmons et al.)
4	Gamma-ray Burst Supernova 1998bw (Ray Stathakis)
5	Discovery of Comet 1999 H1 (Steve Lee)
7	AAT News: Twenty-fifth Anniversary of First Light at the AAT (Peter Gillingham et al.)
12	AAT News: IRIS2 - The AAO's Next Big Thing (Chris Tinney)
16	Schmidt news
17	Local News

DIRECTOR'S MESSAGE

Since the last Newsletter, the AAO has passed a number of notable milestones. 2dF has completed its basic commissioning at the beginning of the year, IRIS2 successfully passed its final design review in March, OzPoz passed the preliminary design review held at ESO Garching in April and the AATB gave the go-ahead to initiate the concept design study for ATLAS, the new Cassegrain spectrograph for the AAO. The March AATB meeting was very successful on many levels. The Board endorsed the AAO's external projects initiative as a key strategy to maintain and enhance the AAO's position as a world-leader in astronomical instrumentation. In particular the Board was keen for the AAO to participate in projects that would jointly benefit both the UK and Australian communities.

External projects have undoubtedly had a highly beneficial effect on the AAO's in-house instrumentation program. The larger resource pool now provides the AAO with much greater flexibility in matching expertise to specific tasks, and allows the AAO to get over periods of peak demand in specific projects when they occur. A case in point has been IRIS2. The current status of the IRIS2 project is reported by Chris Tinney in this Newsletter. IRIS2 will be a unique instrument capable of carrying out highly competitive science. In addition to its wide-field imaging and spectroscopic capabilities, the IRIS2 team are now also looking at the possibility of providing multi-object spectroscopy and/or an integral field unit as soon as possible following commissioning next year. The provision of a multi-object capability in the near infrared would again place the AAO in the vanguard of infrared astronomy. The focus on infrared wide-field survey science with IRIS2 offers many new scientific opportunities. Chris Tinney highlights the effectiveness of broadband infrared surveys with IRIS2, particularly when co-ordinated with similar optical imaging surveys using the wide field imager (WFI). With the imminent commissioning of WFI, now is the time for the community to be actively considering any strategies for co-ordinated survey campaigns on WFI and IRIS2.

Finally, the AAT recently marked 25 years since first light on April 27 1974. The article in this Newsletter by three of the key people involved in the project at this time: Peter Gillingham, Pat Wallace and Ben Gascoigne recounts some of the stories behind those momentous times. In 1974, the AAT set new standards for telescope control and performance and the success of the AAO owes much to the talents of the engineers and scientists who built and commissioned the telescope and its systems. Over the past 25 years the AAO has continued to focus on technical and scientific excellence through the continued provision of state-of-the-art instrumentation capable of producing outstanding science. With the current focus on wide-field astronomy with instrumentation such as 2dF, IRIS2, and 6dF, and the success of the external projects initiative, the AAO remains well-placed to meet the challenges of the future, even after 25 years' operation. Happy Birthday AAO, 25 years young.

Brian Boyle

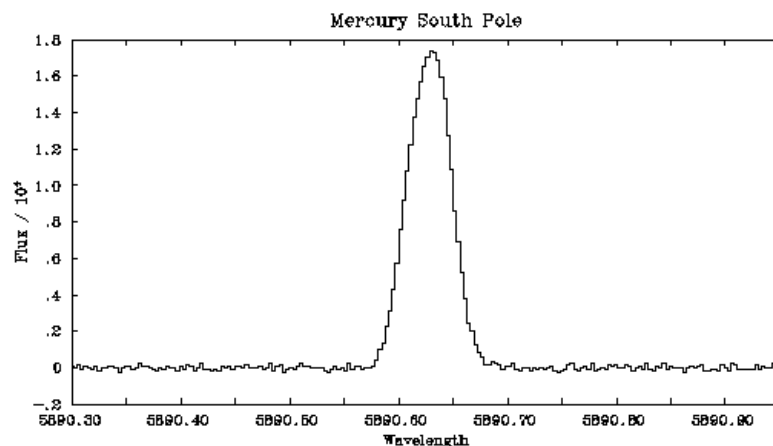


Figure 1: UHRF spectrum of Na I D₂ emission from the South Pole of Mercury on January 6th 1998. The strong background from both the day light sky and the surface of Mercury have been subtracted, leaving just the exospheric emission.

THE ORIGIN OF MERCURY'S EXOSPHERE

Alan Fitzsimmons & Simon Collander-Brown (QUB), Rosemary Killen (SwRI, Texas), Drew Potter (LPI, Texas) & Thomas Morgan (NASA)

Being the closest planet to the Sun, Mercury has always proved difficult to study from the Earth. Much of our detailed knowledge comes from the Mariner 10 spacecraft, which performed 3 fly-bys of the planet in 1974 and 1975. Surprisingly, it was found to possess a thin atmosphere containing He, H and O at surface densities of $\sim 10^3 - 10^4 \text{ cm}^{-3}$ (Broadfoot et al. 1974). Strong line emission of Na I (5889, 5895 Å) and K I (7698 Å) from the atmosphere was subsequently discovered using ground-based echelle spectroscopy (Potter and Morgan 1985, Potter and Morgan 1986). Assuming a temperature similar to the surface, the total density of all observed species equates to a pressure of just 10^{-15} bars.

For all these gases, the density is so low that the planet's surface forms the exobase boundary. In other words, the atmosphere is essentially collisionless and atoms are emitted from the surface on ballistic trajectories. But what exactly is the source mechanism? The four main contenders are micro-meteorite vaporisation, photon or electron sputtering of the surface rocks, ion or chemical desorption, and simple outgassing due to thermal heating. All these mechanisms should result in distinct initial velocity distributions for this exosphere, but there has been contradictory evidence for both low and high temperature Na I within the atmosphere.

The previous highest resolution spectrum of the Na I D₂ line exhibited a barely resolved FWHM of 55 mÅ corresponding to a temperature of 500 K (Potter and Morgan 1987). This was close to the temperature of the surface of the planet and supported production via thermal desorption. Opposing this conclusion were low-resolution Na I maps constructed from echelle data obtained by the same investigators (Potter and Morgan 1997). This revealed Na I emission extending up to altitudes of >5000 km, implying suprathreshold kinetic temperatures of ~ 6500 K, hence suggesting that the bulk of the Na I may be produced via sputtering of the Hermean surface via solar-wind ion impact. Coupled with this, the emission line strengths and hence column densities of observed species vary by as much as 50% on timescales of ≤ 1 day (Killen et al. 1990). Narrow-band imaging implies that this variation may be due to magnetospheric effects (Potter and Morgan 1990).

The best way of discriminating between source mechanisms is by directly measuring the kinetic temperature of the sodium atoms. Hence we received time to study Mercury with the UHRF in its highest resolution mode, in order to directly measure the line profile of the sodium emission at high SNR. The observations themselves were severely constrained, as Mercury was only 23 degrees from the Sun. This meant that we had to observe in the daytime and take care not to expose the telescope to direct sunlight, which would warm the telescope and possibly affect the night time observers. Due to unseasonal weather only one morning was clear for us. However on that morning all worked well, and we were successful in obtaining the best spectra so far of Mercury's atmosphere. The Na I D₂ line was fully resolved at high SNR with a resolution of 890,000 as measured from the comparison laser.

As a first pass, we have analysed the profiles using the non-isotropic solar radiation field and assuming Maxwellian velocity distributions within a model exosphere. This then had to be convolved with the seeing and the entrance aperture, as the planet was only 7 arcsec in diameter at this time. We found that the sodium was hotter than the surface of the planet by roughly 700 K (Killen et al. 1999). This immediately rules out thermal desorption from surface rocks. At the same time we did not see any high temperature component due to meteorite vaporisation, although this process may well be stochastic in nature. Interestingly some spectra require a two component velocity distribution for an accurate fit - this may point to competing sources for the sodium. Whatever the case, we have already narrowed the origin of the bulk of the sodium down to either photon or electron-stimulated desorption, or ion or chemical sputtering.

We are now engaged in the next steps required to unravel the mystery of Mercury's atmosphere. Firstly, we obtained another 3 mornings of UHRF spectra of both the Na I D₁ and Na I D₂ lines in November 1998. This will allow us to account for the variability of the atmosphere much better than in the single morning run of the previous January. Secondly, we are now working on modelling the data with physically realistic non-Maxwellian velocity distributions. These arise because of both the possible sputtering mechanisms (Madey et al. 1998), and the effect of loss of high-energy atoms due to both the weak gravitational field and the large radiation pressure. At the end of this process we should have a fuller understanding not only of Mercury's atmosphere, but also of the similar atmospheres around our Moon and the Jovian satellites. More directly, this programme has realised the potential of the UHRF to study planetary atmospheres.

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γ -RAY BURST SUPERNOVA 1998bw?

Ray Stathakis

Two of the most energetic events in the universe are γ -ray bursts (GRBs) and supernovae (SNe). The majority of SNe are now relatively well understood as either the explosion of a white dwarf which has accreted mass above the Chandrasekhar limit (Type Ia), or the core collapse and envelope ejection of a massive supergiant (Type II, Ib/c). The origin of GRBs was a mystery until the first optical afterglows were observed in 1997 (van Paradijs et al. 1997; Metzger et al. 1997; Kulkarni et al. 1998a). Those GRBs with optical redshifts are at large distances and consequently have extremely high absolute energies - typically a few $\times 10^{52}$ ergs in γ -rays.

These results disagreed with the interpretation of the GRB event as the coalescence of neutron stars, and favoured more energetic models. Paczynski (1998) suggests a hypernova model, where a highly massive rapidly rotating star collapses to a black hole with a torus, forming a microquasar which emits a GRB. Woosley (1993) describes a similar model where a single, rapidly rotating WR star collapses to a black hole (a failed Ib/c SN). It seemed clear, however, that standard SNe could not produce sufficient energy to power GRBs.

Yet, when the optical afterglow of GRB 980425 was searched for, supernova 1998bw was discovered in the error box. There is always the possibility of coincidence, but Galama et al. (1998) and others have shown that the coincidence probability is extremely small – 10^{-4} . The case for an association between the GRB and SN became very strong when it was discovered that the SN was highly unusual - brighter in M_V than most SNe, early spectra unlike any standard SN class, and three times brighter in the radio than any previous SN. In fact, radio observations indicate a relativistic shock wave (Kulkarni et al. 1998b). Assuming the association, the GRB was

also unusual, much closer and at 10^{49} ergs about 100 times fainter than expected.

SN 1998bw is a southern object, and a cooperative monitoring programme was carried out during May to November 1998 at the AAT, UKST and MSSSO 2.3m to follow the spectral evolution of this unusual object. Unfortunately the weather did not cooperate, with the wettest season of the decade. Nevertheless we were able to obtain regular spectral coverage between 23 and 106 days after the GRB (Back Page). The observed spectral evolution is consistent with the classification of SN 1998bw as an unusual Type Ic SN, and bears a striking resemblance to SN 1997ef (Iwamoto et al. 1998).

A number of interesting questions are raised if we accept the association between SN 1998bw and GRB 980425. Are all GRBs produced by Ic SNe? How do you get 10^{52} ergs in optical emission from a Ic SN? How do you produce the GRBs? Was there a relativistic shock? Why was GRB 980425 so much weaker than other GRBs? How do you explain the unusual spectral evolution? It's far too early in the proceedings to expect the canonical solution, but already there are a number of models in the literature.

Models tend to fall into two classes – intrinsically energetic events or hypernovae (e.g. Iwamoto et al 1998, Woosley et al. 1999) and more normal SNe artificially brightened by beaming (Wang & Wheeler, Cen 1998, Hoflich et al. 1999a,b). All models agree in requiring some form of non-symmetric geometry and probably an asymmetric explosion. Woosley et al. (1999) also investigate a collapsar model where a relativistic jet was beamed from a newly created black hole.

The GRB and radio emission may have been emitted in the collision of a relativistic shock wave with the surrounding circumstellar medium (CSM) (e.g. Kulkarni et al. 1998b) or with a binary companion (Protheroe & Bednarek 1999). Li & Chevalier (1999) find that radio observations are not consistent with the interaction of a smoothly expanding SN ejecta with the CSM, and suggest that material has been ejected irregularly in discrete shells.

The association of SNe with GRBs is unclear due to the low numbers of well-observed Ib/c SNe and the large positional error of most GRBs. Wang & Wheeler (1998) find that all Ib/c could produce GRBs, but due to beaming we would only see a fraction. Kippen et al. (1998) found no evidence for an association between SNe and strong GRBs, and Bloom et al. (1998) model the radio signature and suggest that 1% of GRBs are SNe.

The saga continues...

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THE DISCOVERY OF COMET 1999 H1

Steve Lee

Over the new moon weekend in April I was attending a star party in Mudgee with members of the Sutherland Astronomical Society. I was there partly as a member (I used to live in the district before moving to Coonabarabran and have kept up my membership) and partly because of my professional connections - I had been invited to give a talk on what the current news was from the AAT. Several of the slides I was going to show were on NGC 5189 (a visually peculiar PN in Musca) and I wanted to make sure that people were aware of its appearance through a telescope before I showed them how it looked through several of the AAT instruments.

The discovery of the comet was remarkably quick and simple. I was looking for NGC 5189 in a 40-cm reflector when I bumped into the comet. I knew the area well enough to know that there was no object which looked

like that for several degrees around and so it had to be a comet. A few minutes of observations showed that it was moving and so was definitely a comet. A quick check showed no known comets in that part of the sky and so it was probably new. Its rapid movement through the sky also implied that it was probably close to the Earth. Figure 1 shows an image taken on the night of the 20th at the AAT. David Malin and I already had two nights for imaging scheduled and I managed to sneak this 90 second V-band exposure into the program.

SCIPUB REPORT

David Malin

It was a kind of dream, really, certainly quite surreal. We had been asked to turn up at a pub, drink as much free beer as we wanted and talk about life, the Universe, everything. I remember doing that as a youth, several nights a week, and for many years in a row, often with a game of darts —er — thrown in. It was a lot of fun at a time when leisure was in fashion. (Leisure was something one did from 5 'til 9). This time, one of my friends would be there too, on the same, self-indulgent mission.

That is how Fred Watson and I came to be involved in "Science in the Pub" in late March. Fred says he can also remember leisure, vaguely, and we may even have shared some in the same northern English pub, many years ago. Of course, it was not quite as relaxing as our distant memories of the smoky pubs of our youth. For a start there was an audience — well, a crowd — and a compere and microphones. There was also a formidable front bench of astronomers, several of whom were able to make a middy last all night. They were clearly buying their own beer. And unlike our youthful banter over chips and darts the chat this evening was not quite spontaneous since we participants had



Figure 1: Comet 1999 H1 imaged at the AAT.

provided (completely fictitious) biographies and a supposedly witty poem which outlined in advance where we expected the conversation to meander. And meander it did.

The idea is brilliant but improbable, to turn a casual yarn over a glass or two of beer into a public event. The casual yarn was occasionally interrupted by questions from the floor and prodding from the compere. Despite this, it seems to work and it worked much better because Fred brought his guitar and kept things bubbling along with a couple of amusing songs. The intention is to show that scientists are quite at home in a pub and have to go to the loo like everyone else. SciPub was started as a National Science Week initiative by the Australian Science Communicators of NSW and (heavily edited) bits of it are sometimes broadcast by ABC Radio.

Our topic was "Astronomy and Culture", which was so suitably vague that we could talk about almost anything we wanted. We were kept in hand by the compere, Paul Willis, who seemed determined to have as much fun as we did, but it was Mike Burton who brought the whole thing together. It was certainly an odd experience, an unscripted, two-hour casual chat in public with musical interludes, but Fred and I enjoyed it and would be willing to risk it again, with suitable liquid inducements.

THOUGHTS FROM A VISITOR

Dave Hanes

As a former AAT Research Astronomer (July 1980 - December 1983), and especially as the sometime editor of the AAO Newsletter, I was delighted to be asked by Ray Stathakis to provide a brief article for this issue. The opportunity arises because of my return to the AAO for the second half of a full-year research leave from my home institution of Queen's University, in Kingston, Canada. Ray gave me carte blanche to put down whatever I fancied, and on reflection I thought it might be interesting to comment on my impressions of the AAT after an absence of over fifteen years.

First, though, a few words of introduction. Some of you in the UK and Australian communities will remember me as a support astronomer here in Don Morton's time, when the AAO seemed largely to be staffed by astronomers named 'Dave' - Aitken, Allen, Carter, Hanes and Malin. My research interests were then, and continue to be, the nature of globular cluster systems in external galaxies, although my emphasis has drifted considerably from their use as cosmological distance indicators to applications in which they serve as dynamical test particles diagnostic of the processes of galaxy

formation, merger and interaction. As a Professor at Queen's University, I have the usual set of teaching and administrative responsibilities, so a sabbatical year is a welcome chance to return to full-time research.

This visit to the AAO also finds me and Ros with three children in tow, something we didn't have in the early 80's. So life is very different now! But how different is the AAO itself? Well, the world of astronomy being what it is, I have first to admit that I have made occasional return visits to Australia (although most of my observing is now focussed on the geographically smaller island of Hawaii); for instance, I enjoyed an AAT observing run as recently as 1992, while on an earlier sabbatical in Durham. Thus it can't truly be said that I have completely lost any touch with developments - both social and technical - in Epping and Coonabarabran. Still, returning to my native Canada effectively displaced me from the once-familiar UK-Australia axis. How, then, does it feel to be back?

The short answer is that it feels great! Some of the best years of my life were spent here, under Don Morton's far-seeing Directorship, and they were heady days: AAO had some of the best instruments (IPCS, IRPS) and certainly the best telescope on the planet, and in many ways helped to define exactly how a world-class astronomical facility should be operated. It seems strange now to remember the relatively primitive tools available to us then: CCDs, for example, were new to the telescope in 1980, and we used convenient 1600 BPI reel-to-reel tapes (and the Interdata computers for data reduction!). There was no email: morning-after reports were telexed to Epping, and the internet was just a dream.

What made the operation outstanding was the complement of people, in equal measure through their technical skills and their enthusiastic spirit of cooperation. Some of them are long gone, of course, although their contributions live on: Pat Wallace, Graham Bothwell, and many others. But it is a delight to find so many familiar faces, and to learn again that longevity has not bred any sense of complacency!

In Canada as well as here, we face the pressing question of redefining the role of the 4-meter telescope in the Gemini era. (Indeed, Canada is undergoing a "decadal review" even as I write these words.) AAO has faced up to the challenge with its new initiatives, the most obvious of which is the 2dF project, and has the upbeat atmosphere of a scientific establishment of proven accomplishment and future promise. I am delighted to be back, thanks to Brian Boyle's generous invitation, and am enjoying a really productive sabbatical year - would that I could stay longer!

TWENTY-FIFTH ANNIVERSARY OF FIRST LIGHT AT THE AAT: STORIES FROM THE DREAMTIME

Peter Gillingham (AAO), Pat Wallace
(STARLINK) & Ben Gascoigne

The first images of the night sky were formed by the AAT's (unaluminized) primary mirror on the night of April 27th 1974. This was the first partly clear night after the primary mirror was installed in place of the concrete and steel dummy which had served to confirm that nothing nasty occurred when the telescope was driven over its working range. The primary mirror had been sitting on the ground floor of the AAT building for about 4 months, awaiting completion by Mitsubishi Electric Corporation of the mounting, with its drive and control systems. Installing all the cabling had taken longer than expected and a few shortcomings in the drive system had been uncovered and largely overcome.

Fred's crossing

The mirror installation had been supervised by Fred Jackson of Grubb Parsons, in whose honour the Castlereagh River ford next to Miniland (long since replaced by a bridge) was sign-posted "Fred's Crossing". Fred, with his few Geordie tradesmen, had braved the crossing on several occasions (in their Ford Falcon wagon, supplied by the AAT Project) when the raging torrent had turned all others back.

Famous first words

Ben Gascoigne, as Commissioning Astronomer, was first to look at the sky via the primary mirror. When asked what he saw, Gascoigne replied "Oh, some stars". Pat Wallace believes this to be exactly the same response reported at the equivalent occasion on the Palomar 200 inch, but Ben was not aware of this parallel.

How the arch girder came to have a cross

When, on 27th April, it cleared after a few cloudy nights, it was noticed that the overhead crane had been left near its extreme travel toward the front of the dome, rather than to the rear. It didn't block the dome opening altogether but did restrict the angles of view. At some time in the evening, John Pope and Peter Gillingham climbed to the crane platform, while Ben Gascoigne was in the PF cage. They meant to determine whether the crane could safely be moved clear of the aperture, without unduly delaying proceedings. When Peter was returning in the gloom from the crane carriage, he failed to note how low the archgirder was and struck it a sharp blow with his forehead. Subsequently, to his

consternation, he noted blood dripping onto the pristine polished wood at the 6th floor level as he approached the control room. Next working day, Don Collins, the AAT's resident engineer, instructed Fred Grigg to mark the arch girder at the appropriate place to make it more visible. Fred's big white X still marks the spot on the brown girder.

"Correcting" the polar axis elevation

Despite the fuss over the crane, a few useful exposures were made on the 27th April, including one to indicate the error in alignment of the polar axis. Although its azimuth was good, measurement of the plate showed that the axis pointed high by a couple of arcmin. The day following first light was Sunday; Professor Redman advised patience (and felt it was inauspicious in any case to make adjustments on the sabbath). But Pope and Gillingham were keen to get the polar axis right and when Sunday night was too cloudy to open the dome, they proceeded with the adjustment indicated by Gascoigne's measurement of the pole plate.

There was only one hydraulic pump on hand to lower the SE and SW corners of the base frame. Unfortunately, this pump happened to be at the SE corner and so it was decided to lower that corner first, forgetting that the vertical "earthquake struts" near the N foot of the base frame over-constrained the base frame. So, when the SE corner was lowered, the base frame twisted and the HA encoder pinion was forced much tighter into mesh with the large HA gear than was ever intended!

At the time Pope and Gillingham were pumping away at the hydraulic jack, John Straede was riding in the PF cage with Pat Wallace driving (or maybe the reverse). There was suddenly an alarm from a gap sensor on one of the North hydraulic pads and the telescope drive tripped out. After Straede (or Wallace) had been trapped for a half hour or so in the cage, while the engineers lowered the SW corner of the base frame, the drive fault cleared. The dome wasn't opened that night so the fact that the axis had originally been low, not high, and now had twice the error was not apparent 'til later.

Mercifully, for his peace of mind during his holiday, Gillingham went off to North Queensland first thing Monday morning and learned only two weeks later the extent of the damage wreaked that night! For a few months, the telescope ran with a "dummy" encoder pinion, having no anti-backlash provision, in place of the damaged encoder pinion.

Early indications of the AAT's quality

Some of the early nights with a still uncoated primary mirror were blessed with remarkably good seeing. A

INSTRUMENT										DATE	OBSERVER	
File No.	Chart	RA	Dec	Decl	Filter	Exposure	U.T. Start	U.T. End	Exp.	Plate No.	Plate No.	Remarks
1	POLE	14 ^h 30 ^m	-89 ^o 30'	15.0					30"	5.7"		Q-0

Figure 1: The first log entry at the AAT, 27/4/74.

couple of occasions, one at prime focus and one at Cassegrain, stood out for providing Voyager-like images of Jupiter. And lunar craters imaged at Cassegrain onto Jack Rothwell's bald head were extraordinarily impressive, with the surreal effect heightened by the moonbeams made visible by smoke from Jack's pipe.

Ben Gascoigne, at first light, enthused over how stiff and vibration free the telescope was, as evidenced by the motion of star images as one made small offsets of the telescope position. Ben had spread the tale of how, in the Lick 120 inch prime focus cage, an observer wishing to scratch his left ear was obliged to scratch his right buttock at the same time if he was not to set up a troublesome oscillation. But in the AAT, even a sneeze was permissible.

Very soon after Joe Wampler came to the AAO as its first Director, he asked why the AAT's zenith angle limit was set so high and whether anything could be done to lower it. Joe said the Lick 120 inch had been designed to be able to observe right down to the horizon, so it need not miss any one-off observing opportunities. Pat Wallace, without a moment's hesitation, asked Joe if this was with or without allowance for flexure. Joe's point was demonstrated to be a very valid one in 1987, when we were able to observe SN1987A below the pole only after resetting the South declination drive limits.

Pointing performance

On its very first pointing test, the AAT returned a residual error of about 2.5 arcsec rms, fully up to expectations and better than any competing telescopes. There was then very rapid progress to implement a computer controlled pointing test, in which stars were automatically selected in turn to give a good spread of measures over the whole accessible sky.

On the first such computer controlled test at Cassegrain, Gordon Schafer was the observer. His job was to peer through one of the guider eyepieces and make the necessary adjustments to centre each star on the graticule, then shout "ploggo" over the intercom (for "pointing log GO"). At the console, a couple of key-strokes would send the telescope to the next star. During this test, Pat Wallace noted that Sirius was not too far

from where the pointing test would terminate. Immediately there was an indication that the test had exhausted the available pointing stars, Pat managed to enter Sirius's coordinates without alerting Gordon. There was some discussion at the console as to whether Gordon's retina might be permanently damaged, but considering that only one eye was threatened, it was decided to accept the risk. So there was slight disappointment along with some relief when, on seeing a star about 300 000 times brighter than expected, Gordon said (very slowly) "Gee, that's a bright one".

Gascoigne's leap

Soon after first light, a long curved beam supporting a handrail, which was to run around the southern section of the inner catwalk, was delivered by Coonabarabran Engineering. Without this handrail, the gates on the inside of the catwalk could open directly onto a drop from the 6th floor level to the 4th floor level of the dome. Everyone using the dome, especially those doing so at night, had been warned of this temporary danger.

A day or two after delivery of the rail, while it still rested on the ground floor, Roderick Willstrop was working at prime focus. Ben Gascoigne left the control room to



Figure 2: Thanks to Chris McCowage for this virtual birthday cake. See also his web page under 'NEW' at: <http://www.aao.gov.au>.

check on the weather. He went onto the inside catwalk, then through the next door to the outside catwalk and set out walking clockwise around the dome. It seems likely he walked through 450 degrees but imagined he'd done only 360 degrees, so he re-joined the inside catwalk 90 degrees from where he left it.

When he re-entered the dome, he was very conscious of the fact that Willstrop was exposing a red-sensitive emulsion, much more sensitive to torch-light than the more common blue-sensitive plates. So Ben made do without switching on his torch, feeling his way to the gate from the inside catwalk. However, while he imagined he was about to step onto the floor adjacent to the control room, he was, in fact, due South in the dome, with the floor nearly 6 m below.

Willstrop gave the alarm over the intercom when he saw the beam from a torch sweep across the dome lining and heard a clatter from down below. Peter Gillingham, who then lived on the mountain, was 'phoned by John Rock, acting as Night Assistant, with the news that it seemed Ben had fallen. Rock, Gillingham, and Derek Fern (the Resident Engineer for Freeman Fox and Partners, who lived in Coona but was visiting the mountain that night) found Gascoigne prone on the wooden flooring within the frame of the primary mirror handling trolley. Miraculously, he'd missed hitting any of the very solid angular steel projections of the trolley which surrounded the roughly 2 metre square section of floor. Although he was very shaken, it appeared Ben's main complaint was an injured elbow and he was lifted onto a chair and conveyed to Fern's car for the journey to Coona Hospital.

Next morning, when Gillingham 'phoned the hospital and asked after Gascoigne's condition, he was immensely relieved when the nurse not only said Ben was doing well but also asked if he wished to speak to Ben. Ben was now completely lucid and furthermore his stammer was much less evident than usual. The stammer was not, however, completely cured. Julie Lommon, the radiographer at Coona Hospital and the Gillinghams' neighbour on the mountain, reported that one of the nurses had said how sad it was that the dear gentleman from the observatory had suffered such a bad fall and how it had affected his speech so severely.

Gascoigne used the worker's compensation payment for his elbow injury to buy a Hewlett Packard desk-top programmable calculator. With advice from a tax consultant, he found he could take advantage of an investment incentive and, for no additional net expense, buy the plotter to complement the calculator. Ben said later that, if he could be sure the outcome would be so beneficial a second time, he'd be prepared to jump again.

First electronic observations

The first electronic detector used on the AAT was a photometer from one of the ANU telescopes which Olin Eggen arranged to fit at prime focus. This required Eggen riding in the cage and for some reason he elected to have the Night Assistant trim the telescope position to centre the star rather than use the handset in the cage. As this was proceeding, Ben Gascoigne came into the control room to begin a characteristically cross-purposes conversation about what was going on. As everyone, including the Night Assistant, joined in the argument, Olin's voice could be heard in the background saying "Up... up... stop.... down a bit... more... left... left... stop... OK, that's centered up".

Editor's Note: While we salute the brave chaps who worked in those exciting times, we wish to assure current observers at the AAT that safety guidelines are now well in place!

SPIRAL PHASE B

David Lee

SPIRAL (Segmented Pupil/Image Reformatting Array Lens) is a system to perform integral field spectroscopy on the AAT. Integral field spectroscopy is a technique which provides a spectrum for each spatial element in an extended two-dimensional field, as shown schematically in Figure 1.

Light from the AAT's *f*/8 Cassegrain focus enters a reimaging system which produces a magnified image of the telescope focal plane. A two-dimensional array of small lenses then samples the enlarged image (Fig.1), with each lens feeding the light to an optical fibre. Optical fibres allow the two-dimensional input array to be reformatted into a one-dimensional slit which feeds a purpose-built Littrow spectrograph. A spectrum is therefore produced for each lens at the input. An 18 m length of fibre is used to transfer the light from the Cassegrain to the spectrograph situated on the dome floor. Placing the spectrograph on the dome floor provides much better stability.

The phase A prototype version of SPIRAL was built jointly by the Institute of Astronomy in Cambridge, and the AAO, and was successfully commissioned in 1997 (Kenworthy 1997). SPIRAL A provided a field of view of approximately 3.5 arcseconds by 3 arcseconds by using an array of 37 small hexagonal lenslets (Parry 1997). Each lenslet is 4 mm across and corresponds to a sampling element of 0.5 arcseconds. The main difference between SPIRAL A and SPIRAL B is the field of view. SPIRAL B will use a microlens array with 32x16 1 mm square lenses. The sampling interval has also

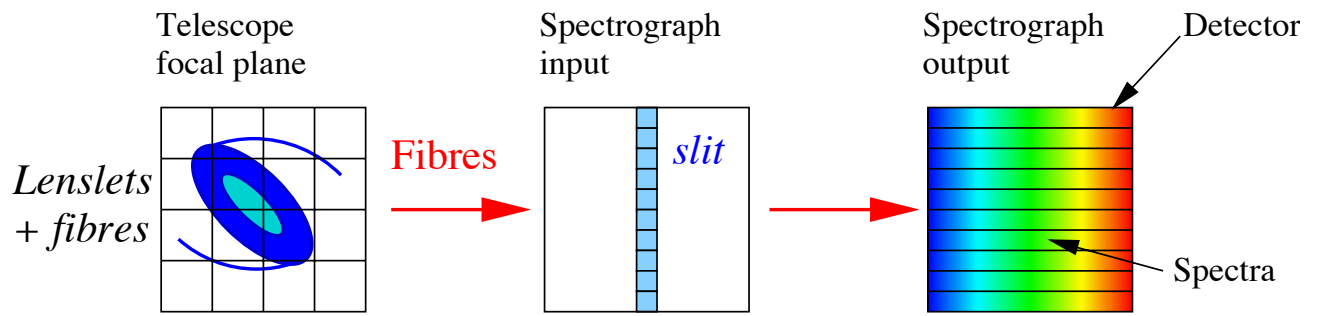


Figure 1: Schematic of the operation of the SPIRAL integral field spectrograph.

been increased to 0.7 arcseconds per lens so that the total field of view of SPIRAL B is 22x11 arcseconds squared.

SPIRAL B will use a crossed cylindrical microlens array. It consists of two arrays of cylindrical lenses which when placed together, with one array perpendicular to the other, form an array of square lenses. The array was custom made by Limo GmbH in Germany. The microlens array is shown in Fig. 2. We must also position 512 optical fibres each at the focus of a microlens to an accuracy of about $\pm 10 \mu\text{m}$. This will be done with a specially made brass plate which contains an array of accurately drilled holes. The holes are difficult to produce as the drill must be only 200 μm in diameter! Fibres can then be inserted into the holes, the array polished, and the fibre array glued to the lens array. In total 10 km of optical fibre is needed for the entire fibre bundle.

The total system throughput of SPIRAL B is expected to be around 12%. Predicted values of resolution ($\lambda/\Delta\lambda$), dispersion and wavelength coverage for SPIRAL B at a wavelength centre of 500 nm:

Grating (g/mm)	Resolution	Dispersion (nm/pixel)	Coverage (nm)
270	1145	0.154	421-579
600	2568	0.069	465-535
1200	5327	0.033	483-517

SPIRAL B is expected to be commissioned in late 1999. More information about SPIRAL can be found at: <http://www.ast.cam.ac.uk/~optics/spiral/spiral.htm> or from the author, email: dl@aaoepp.aao.gov.au.

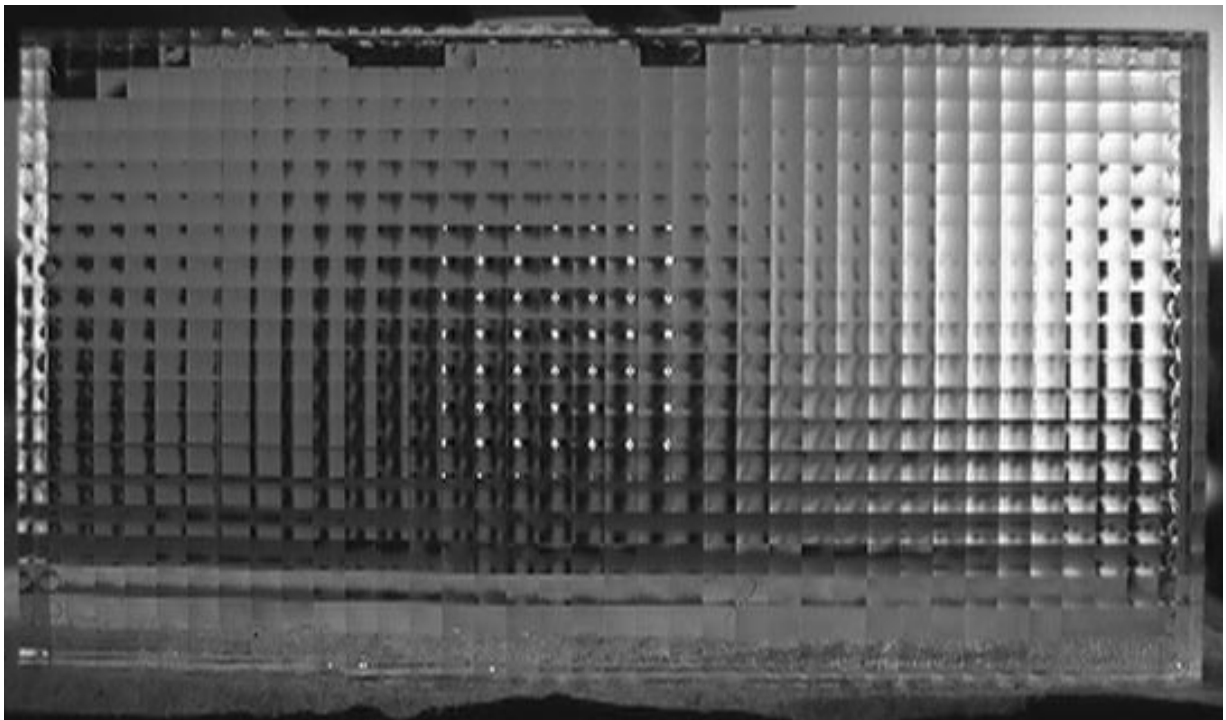


Fig. 2: A photograph of the SPIRAL B crossed cylindrical microlens array containing 512 1mm square lenses.

References

- Parry, I. R., Kenworthy, M. K., & Taylor, K., 1997. Proc. SPIE 2871, p1325
 Kenworthy, M. K., & Parry, I. R., 1997. AAO newsletter, No. 81, p11

ELECTRONIC LOG

Garry Kitley

AAT logbook pages can now be generated on the web after an observing night has finished. There is a link to http://site.aao.gov.au/AATdatabase/aat/log_book.html from the local observers' page, visitors' home page and the archive database query page.

This is an interim solution to obtaining log pages after the observing run. The full solution, which will provide full access through the AAT database, is expected to be available in a few months.

DIFFRACTION GRATINGS

Ray Stathakis

The efficiency curves of the diffraction gratings used in 2dF, RGO, FLAIR and SPIRAL are now available online at <http://local.aao.gov.au/AAO/local/www/ras/gratings/gratings.html>. These figures are the 1986 laboratory measurements carried out by Johnston et al. (AAO UM19). In addition a more recent comparison of the 300B and 250B gratings is included.

New measurements of the grating efficiencies are underway and preliminary results are consistent with the older figures, with an overall loss of 5-10% for the older gratings.

2DF NEWS

Ian Lewis, Terry Bridges and Russell Cannon

It has been a while since the last specific 2dF news item but be assured 2dF has not been idle – in fact it is currently our most scheduled instrument. With the improvement in weather since last winter (April-October 1998) the data rates achieved with 2dF have been amazing. The 2dF galaxy redshift survey has now obtained over 40 000 quality redshifts with almost 20 000 observed during the most recent two lunations.

The performance of 2dF is steadily improving with configuration times dropping to about 60 minutes and

general reliability steadily improving. The halation seen in camera #2 is still a cause for concern and minimising that is our highest priority during the very short periods for which 2dF is not on the telescope. Unfortunately the side effect of this is that realignment and commissioning of 2nd order with the spectrographs has been deferred until the cameras are functioning properly.

As of semester 99B we hope to have a pair of low resolution red gratings available. We have always had a single 270R grating but the original master for this grating no longer existed so we were unable to obtain a matching pair. We have just received a new 316R grating which may be paired with the original 270R grating. Comparisons between the available low resolution gratings will hopefully follow in the next newsletter.

2dF has been available for 3 service nights so far in the past two semesters and these have proved very successful, with service applications outstripping available time (see <http://www.aao.gov.au/local/www/service/service.html>). However, the large number of possible grating and wavelength choices is proving to be a problem. Grating and wavelength changes are costly in time (about 2 hours for the change and refocussing), so we prefer to schedule 2dF nights with a single grating setup. With a larger pool of service applications we would be able to schedule service nights more easily, so please, **get those service proposals in** (next deadline June 15). Alternatively we will have to restrict the choice of grating and wavelength ranges. Using a common grating setup or being flexible in what choices are acceptable will enhance your chances!

Remember that general 2dF information is regularly updated on the 2dF home pages (<http://www.aao.gov.au/2df/>).

UK 2DF OBSERVING UPDATE

Terry Bridges

I thought this was a good opportunity to introduce myself as the new UK 2dF Fellow, and to say a bit about what my (newly-created) position means for UK 2dF observers. For those who don't know me, before joining the AAO (Feb 99), I was at the RGO in Cambridge for 4 years, where I took over as Project Scientist for the WYFFOS multi-fibre spectrograph on the WHT. I transferred to the IoA in April 1998, when the RGO was closed. My research interests are in the areas of globular clusters and other stellar populations, and in the dynamics, formation and evolution of elliptical galaxies and galaxy clusters.

The position of UK 2dF Fellow is a new initiative to provide a local observer to carry out the observing for (most) UK 2dF programmes. The experienced, dedicated observer (me!) will be completely familiar with 2dF observing, and will work hard to get the most out of your scheduled nights. Since 2dF is a very complex instrument, having such a dedicated observer should make UK 2dF observing more efficient. The trade-off is that UK 2dF observers will no longer be able to get PATT money to come observing. However, students, and any other observers who can find alternative funding, are still more than welcome! (Note that non-UK PATT and ATAC 2dF observers are still expected to send at least one person for their observing runs.)

I will also be taking over as 2dF Instrument Scientist from Karl Glazebrook, and will become the principal contact for all 2dF observers. Since I'm only one person, it will not be possible for me to observe for *all* UK 2dF runs, but in this case another AAO observer/astronomer will be scheduled in addition to the AAO *support* astronomer always present.

As is outlined in more detail on this WWW page (<http://www.aao.gov.au/local/www/tjb/2df/policy.html>), I (or in some cases another designated AAO astronomer) will work closely with you before, during, and after your observing run. We will give such support as: helping with questions about input astrometry, configuring input files, developing an observing strategy (timeline, calibrations, etc), doing the actual observing (including supplying you with reduced data from at least one field as a check), post-run help with data reduction, and receiving feedback on the whole process. I realize that many of you will be apprehensive about somebody else carrying out your observing for you, and we will work hard to make the process work. Please be patient with us during the early stages of this arrangement, as we iron out problems that will inevitably arise.

I very much welcome input from *you* about my role, and what you expect from the AAO as a UK 2dF observer – you can email (tjb@aaopepp.aao.gov.au), or phone (61-2-9372-4839) me at any time. In particular I would appreciate feedback on the following issues:

—would you like the AAO to reduce *all* 2dF data? How many of you would make use of this (and not re-reduce it yourself!)?

— would you like to see an AAO archive containing fully-reduced 2dF data (older than the proprietary date)?
— what information would you like to see on the 2dF WWW pages? Would you like to see 2dF science results on the WWW? (and would any of you like to supply some?!)

IRIS2 - THE AAO'S NEXT BIG THING

Chris Tinney, on behalf of the IRIS2 team.

The IRIS2 infrared imager and spectrograph* is the AAO's current major instrumental project. It is expected to provide the AAO with a "workhorse" infrared facility with an extended lifetime. The primary scientific requirements IRIS2 was designed to address are:

- Wide field imaging (~8'x8')
- Moderate resolution ($R > 2500$) spectroscopy

with secondary goals of:

- Low dispersion spectroscopy covering JHK in one exposure
- Well sampled imaging in the best conditions (though not necessarily over the full field)
- The possibility of implementing a range of upgrades, including
 - A larger 2048x2048 array
 - IFU capabilities
 - Multi-slit capabilities
 - A tip-tilt correction system
 - Imaging polarimetry (see below)
 - Spectro-polarimetry (see below)

Detector & Optics

The instrument is based around a 1024x1024 18.5 μm pixel HAWAII (HgCdTe) array, which is illuminated by a straight-through 9 element collimator-camera optical system (or 10 elements when the single dewar window is included). The final camera delivers an $f/2.2$ beam to the detector, resulting in the following pixel scales.

Top end	Pixel scale	Field of view
$f/8$	0.45"/pixel	7.7' x 7.7'
$f/15$	0.24"/pixel	4.1' x 4.1'
$f/36$	0.10"/pixel	1.7' x 1.7'

All optical surfaces will be AR-coated to better than 2% reflectivity from 1-2.5 μm . In order to maintain simplicity, scale changes are achieved by changing top-ends. So changes can be made between, but not during, nights.

* IRIS2 seeks to redress the regrettable trend toward giving instruments names based on improbable and unlikely acronyms - at least to the extent that it just re-uses the existing IRIS (Infra-Red Imaging Spectrograph) acronym.

Cryogenics & Layout

The instrument layout is shown on p14. The instrument will be cooled by a closed-cycle refrigeration system. In order to ensure minimal thermal cycling of the fragile (and valuable) detector, the instrument will have two dewars. The **main dewar** contains all the collimator-camera optics, the detector and the pupil, filter and grism wheels. This dewar will have an extremely long cycle time, and it is hoped that once commissioned, this dewar would be kept cold and untouched permanently.

The **fore-dewar** contains the aperture wheel, and room for future expansions to include a multi-slit juke-box, IFU elements and polarimetry analysers. It will be able to be cycled on a one-day time-scale, so user provided filters, masks etc, will go here.

Wheels

The IRIS2 wheels are fairly self explanatory. The **aperture wheel** or **slit wheel** will have: fully clear and fully opaque apertures; 1" and 5" long slits for spectroscopy at $f/8$; a 1" short slit for a spectro-polarimetry upgrade; and two interchangeable cartridges, into which cut aperture masks can be loaded. One of the interchangeable positions is foreseen for use with an imaging polarimetry mask for a polarimetry upgrade, and the second for loading masks from a juke-box containing 10-20 masks for a multi-slit upgrade. However, in the initial phase, these two masks will be available for loading user-cut multi-slit masks, and a matrix mask for astrometric calibration and camera focus.

The 10 position **pupil wheel** or **cold stop wheel** sits at the re-imaged telescope pupil, and will be loaded with cold-stops for use in applications where thermal background is critical. Because this will leave several slots free, it will also be used for narrow-band filters at short wavelengths, where the instrument can be used without a cold stop. Lastly, a slot is reserved for a spectro-polarimetric Wollaston prism for a possible future upgrade.

The 12 position **filter wheel** will contain filters for use with the cold stop. The **grism wheel** will contain up to five locations for mounting spectroscopic or Wollaston prisms, as well as an opaque position for obtaining detector darks. All filters (in both the pupil and filter wheels) must be 60 mm in diameter for unvignetted operation at $f/8$.

The filters on order are: J, H, K, Ks, Z, a methane filter pair, H₂ (1-0), Br gamma, H₂ (2-0), K narrow band continuum, CO(2-0), HeI, J narrow band continuum, Pa beta, H narrow band continuum and [Fe II].

Imaging Performance

In imaging performance, IRIS2 will have more elements than IRIS1, but with better coatings, resulting in equivalent throughput performance. It will however have a much larger field of view, and experience with the HAWAII arrays elsewhere would suggest better cosmetics and stability.

Spectroscopic Performance

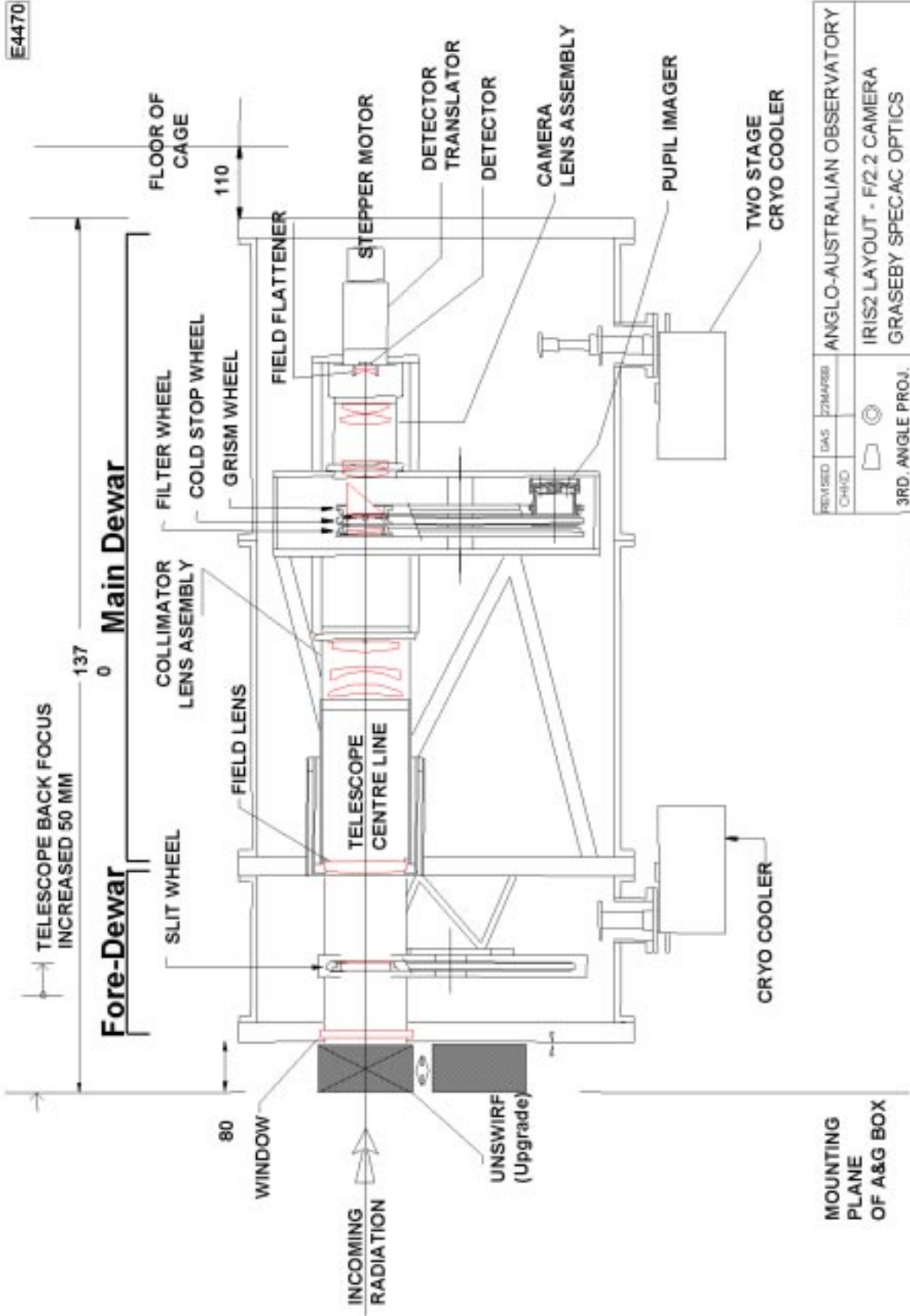
Spectroscopy will almost always be carried out at $f/8$, where a 2-pixel slit is 1" in size (though use at $f/15$ might be considered if excellent seeing could be predicted). Replicated resin grisms will be acquired to provide the following capabilities

- J, H & K bandpasses at $R \sim 1500-2000$
- IJ, HK bandpasses at $R \sim 800$

However, neither of these meet the desirable goal of $R > 2500$, at which the bright OH night sky lines can be resolved and efficiently sky subtracted. VLT+ISAAC has dramatically demonstrated that at such resolutions, extremely dark gaps between the OH lines can be obtained - in fact at such resolutions IRIS2 is a **dark time instrument!** (ESO Messenger, 95, 4)

Unfortunately, in the IRIS2 design large dispersions require large angular deviations within the prism part of a grism. This means both the use of steep (30-40 degree prisms) and high refractive index ($n > 2$) materials. One such technology (the direct ruling of the soft, high refractive index glass KRS5) has been eliminated because the large IRIS2 pupil precludes ruling a steep enough prism on the available ruling machines.

A second option involves bonding a volume-phase holographic (VPH) diffraction element to a ZnSe prism. This path is being pursued with Kaiser Optical (the manufacturers of the VPH elements) and Kitt Peak National Observatory. An element has been fabricated for careful cryogenic cooling at KPNO. If this survival test is passed, we expect to test an element at cryogenic temperatures for performance in the infrared in IRIS1 later this year. Though this path involves some risk, it is worth pointing out that this is a problem which no observatory currently knows how to solve. A solution developed at the AAO which provided $R \sim 3500$ will be of wide ranging interest. Moreover, VPH elements offer several significant advantages over ruled elements: they can be anti-reflection coated; they have high throughput; they are cheap; and they would permit a "multiplex" element which could cover the entire IJHK bandpass to be constructed.



0 20 40 80 160
MILLIMETRES

REVISED	DAS	22MAY98	ANGLO-AUSTRALIAN OBSERVATORY
CHANGED			IRIS2 LAYOUT - F/2.2 CAMERA
			GRASEBY SPECAC OPTICS
3RD. ANGLE PROJ.		IRIS2	
ASS'Y DRAWING		A-2	PROJECT
		DRAWING	E4470
			REV. D

Detector Control

The HAWAII array will be the first device at the AAO to be controlled by the next generation AAO2 CCD controllers. Developed in-house by John Barton and Lew Waller, these controllers will provide significantly enhanced functionality over currently available commercial controllers. We expect this functionality to play a significant role in the advanced performance of IRIS2.

The AAO2 controllers give us great flexibility in detector control, allowing (among other things) non-destructive readouts (NDRs) at unevenly spaced periods (which we expect to make us of for the recovery of saturated pixels in NDR exposures), and the implementation of "NDR interleaving" for rapid beam-switching and improved sky-subtraction (see below).

Upgrade Paths

Perhaps the most salient feature of IRIS2 is that its simple optical design and high throughput offers the possibility of a wide range of upgrade paths.

Polarimetric functions were initially proposed as part of the core functionality of IRIS2. However careful costing of the instrument as part of the design review process revealed that they simply could not be implemented within the available budget. Sadly, they have had to be moved to the list of proposed upgrade paths.

Multi-object spectroscopy (MOS) has long been seen as a powerful upgrade path for IRIS2. In essence, implementation of this "merely" requires a jukebox for loading enough masks to perform 2-3 nights' worth of observing. I say "merely" because doing that at cryogenic temperatures and in vacuum is non trivial. Despite this, the science goals of MOS are seen as so strong that the AAT Board has already approved a concept design study for this upgrade.

The recent spectacular success of LDSS++ and its micro-slit "nod-and-shuffle" mode (AAO Newsletter, 87, 11) has set the IRIS2 team to thinking of ways to implement a similar system in the infrared (where Poisson-limited sky subtraction due to rapid nodding would represent a major astronomical development). Because the architecture of IR devices is different from that of CCDs, charge shuffling cannot provide rapid storage of data without a read noise penalty. However, a scheme is being developed using non-destructive reads (NDRs) and a multi-component fit to the NDR data cube post-observation. This would permit rapid telescope nodding to obtain interleaved object and sky spectra, without a significant noise penalty. This development is particularly exciting because such a system would

produce sky-subtracted spectra free of systematic effects. And, in the absence of systematic errors, the 4m AAT is potentially competitive with 8m multi-object spectrographs - it just takes more time to obtain similar quality data. But more time is what 4m telescopes have!

Integral-field units are being explored in two forms which look like being sufficiently simple that they can be implemented within the current IRIS2 budget. The first would be a simple bare-fibre image slicer, mounted at the $f/8$ focal plane, and re-formatting roughly 16×16 0.7" diameter fibres into a slit. This would give a field of about $11'' \times 11''$, with a 50-70% filling factor.

A second option is based on a idea developed by Tom Herbst of MPIfA, Heidelberg for the Calar Alto 3.6m. It involves placing a 100×100 array of $675 \mu\text{m} \times 675 \mu\text{m}$ micro-lenses at the $f/36$ focus of the telescope. These then produce 100×100 tiny ($150 \mu\text{m}$) pupil images at the entrance focal plane of IRIS2, which can then be dispersed using standard grisms and narrow band filters. This would provide 100×100 10-20 pixel spectra in a format à la TIGER. Because the micro-lens array for such a system is cheap, and it requires nothing other than equipment already going into IRIS2, it offers the possibility of one-shot UNSWIRF-style line measurements for extended objects at 1" sampling, with no filling factor losses.

The final upgrade to mention is that IRIS2 has been designed with an upgrade to a **2048x2048 detector** in mind. This will involve replacing the last four optical elements with an $f/4$ camera. The result will be only a marginally larger field, but smaller pixels and higher spectroscopic dispersions at $f/8$. (It would also make the micro-lens IFU much more attractive with better separation of the spectrum-lets.)

Milestones

IRIS2 has now passed all its design reviews and construction is proceeding apace. The milestones we are targeting for next year are

- Commissioning starts : May 2000
- Shared risks observing starts : July 2000
- Available for general observing : Sep 2000

with the project completing in February 2001.

Science with IRIS2

It is clear that IRIS2 will open up a host of new scientific paths at the AAO. In the coming era of 8m telescopes, facilities like the AAT are clearly going to spend more and more of their time acquiring target lists and doing preliminary spectroscopy, in preparation for deep 8m

programs. In light of this, we can expect a significant fraction of IRIS2's time to be spent on medium to large survey projects - both imaging and spectroscopic.

In imaging mode, IRIS2 should conservatively be able to obtain imaging data at a rate of 0.35 sq.deg./hour to $K'=18.0$ or $J=19.1$. This will be complemented by the 8K WFI on the AAT, which can image at a rate of 0.4 sq.deg./hour to $I=24$ or $V=25.5$. The AAT will be able to compete easily in the production of wide field surveys intermediate in area and depth between those of the 2MASS and DENIS all-sky surveys ($K\sim 14$, $J\sim 16$), and the coming generation of 8m/HST pencil beam surveys. The reason why we remain competitive, even with sites with better seeing is, of course, IRIS2's wide (7.7') field of view.

For example, one could imagine a survey covering 50 sq.deg. to $K'=18$, $I=24$, $V=25.5$ in 40 nights being carried out at the AAT with IRIS2 and WFI. Alternatively, one could conceive a 50 sq.deg. IRIS2-only survey to $K'=18$, $H=18.9$, $J=19.1$ in 43 nights, combined with ugriz data from the SDSS south strip. Either project would be ideal for probing the nature of L^* galaxies at redshifts ~ 2 , (intermediate between the HDF and 2MASS surveys), and seeking $z\sim 7-8$ quasars. To put the volume probed by such surveys into context, they would represent *one fifth of a 2MASS survey volume!*

Similarly, imaging surveys targeting extremely cool methane brown dwarfs in both young clusters and the field become feasible; as do large scale spectroscopic surveys targeted at specific classes of objects of interest. Surveys targeting large fractions of the LMC/SMC also become feasible. So, just as 2dF made the Galaxy Redshift Survey possible, IRIS2 will make possible a new range of surveys on the AAT. To ensure the maximum possible utility of such surveys, we must ensure that they reinforce each other, by being able to use each other's data. *In other words, now is the time to prepare coherent strategies for the maximum utilisation of IRIS2.*

We therefore ask that investigators interested in such large surveys contact the IRIS2 project scientist Chris Tinney (cgt@aaoepp.aao.gov.au) so that the process of merging many of the likely projects IRIS2 can tackle, can start as soon as possible. In particular, we're interested in compiling a list of scientific goals, and the survey parameters (area, depth, passbands and locations) which would achieve those goals. So get those grey cells working! See WWW page: <http://www.aao.gov.au/local/www/cgt/iris2/iris2.html> provides more information and periodic updates.

THE CHANGING FACE OF SCHMIDTERY

Fred Watson

Some things don't change. For example, the fact that the operating statistics for the UK Schmidt have always shown a greater loss to weather than those for the AAT is at the heart of AAO folklore. While FLAIR can make use of indifferent conditions, photography is a harsher critic of the atmosphere, so a ten percent difference between statistics for the two telescopes is commonplace.

But some things do change, and the first half of Semester 99A has brought to the telescope a transformation greater than any in its 25-year history. With Quentin Parker's last noisy farewells still echoing in its corridors, the Schmidt is now down to a new staffing level of three specialists: Malcolm Hartley, Ken Russell and Paul Cass. Additional observing support comes from Russell Cannon, Fred Watson and, for the time being, French postdoc Delphine Russeil. Whilst the reduction in core staff is not something any of us welcomed, it would be a mistake to imagine that it signals an operation slowing down to meet an uncertain future.

The Schmidt's future combines a new style of photographic operation (using mostly Tech Pan film) with the robotic dexterity of 6dF, the fibre positioner now growing into reality at Epping. Once the 6dF galaxy survey gets under way towards the end of next year, the telescope will be as busy as it ever has been. There is also the promise of a 4K x 4K CCD camera being brought to the Schmidt by Bruce Peterson and his collaborators within the next few months.

A different kind of change, this time half a world away, has brought sadness to all associated with the Schmidt telescope. With the untimely death of Barry Lasker of STScI, the world lost one of the great champions of wide-field astronomy, and the UKST a good friend. Barry was the driving force behind the DSS, which made digitised UKST survey material available to astronomers everywhere. He will be much missed.

Finally, how has the Schmidt performed during its first three months under the new operating regime? Well, some things don't change - like the willingness of AAO staff to do all they possibly can to get the very best out of excellent conditions. The telescope's statistics show almost 60% useable time - sure enough, about ten percent less than the AAT - but with exemplary productivity in response to the good weather.

For example, the number of photographic exposures obtained during the three months (170) is only one short of the total for the previous SIX months - when roughly average conditions prevailed. The good weather has allowed several urgent, key programmes to be pushed ahead. And it also nurtured a most successful FLAIR run that saw Quentin's brief return to the telescope, together with his collaborator, French astronomer/organist Dominique Proust. To Delphine's satisfaction, no doubt, the corridors were again filled with lively exchanges - but now in French. Plus ça change...

LETTER FROM COONABARABRAN

Rhonda Martin

It is freezing, and windy, and Sydney has been attacked by a hail storm of such magnitude that it looks like a war zone, but O! what nights! and lovely seeing here in Coona. Such terrific nights that our Steve Lee, at a star party, found the comet which now bears his name. It's a pity that such weather does not attend upon poor old Paul Butler and his planet search - Paul seems to attract appalling weather in a way that no other drought breaker ever has, and that includes Gary Da Costa! So much rain came with Paul on his last observing run that the creeks ran riot and washed out the detour around a washaway that had happened on one of his earlier visits. It is a shame that Paul will be leaving us shortly without having experienced some of the excellent observing we get here.

We must congratulate Brendan and Amanda Jones on the birth of their second little girl, Shelley. Shelley was the cause of some concern along the way but everything has gone well and both she and Amanda are now resting comfortably.

On the road to the Observatory, near one of Paul's washaways in fact, there is a metal emu letterbox, tastefully constructed from ploughshares. Opinions generally range from 'O yuk!' to 'Fantastic!' but whatever one thinks of it, it has become comfortably familiar and a tourist attraction in its own right. Over the year or so since it came into existence, it has worn several costumes - its clothing generally appears overnight and the owner knows nothing about it. I have seen it wearing a Batman cloak and mask, a hula skirt (very short-lived), antlers and red nose at Christmas, but its Easter garb was the best yet and had tourists pulling up to take photographs by the hundred - Good Friday eve it had

sprouted a pair of Easter bunny ears which had the lamentable habit of slipping off the head and sliding down the neck, but by Easter Sunday obviously some Velcro had been found as the ears stood up proud and pink in the rain. That afternoon, a new development - it had laid an egg! and not only that, but had laid it wrapped in aluminium foil and with a big yellow bow! Now, that IS a feat. Who said life was dull in the country?

We must welcome Neville Hopkins to the AAT. Neville is the new mechanical technical officer and will be working with Allan Lankshear. So, in spite of some dreadful weather, from an astronomer's point of view, if the glorious nights (if cold) of the past few weeks are anything to go by, the AAT is in for some terrific observing over the winter.

PS from the editor: After reading this article in the Coonabarabran Times, we hope we're not about to lose a night assistant! The item refers to the new (and temporary) traffic lights at the clock tower placed during construction of a round-about (now I knew the town lacked something...)

"The Times has been led to believe that a certain naturalised Australian in town is copping a bit of a ribbing from his mates. Seems that some years ago he made the observation that he would stay in Coonabarabran until such time as the town had grown big enough for traffic lights. The time has come, Frankie, at least for a little while." (15/4/99)

NEWS FROM THE DUNGEON

Greg Smith

At last, the Epping mechanical workshop has placed an order for a CNC mill. The Deckel Maho DMC 63 V CNC machining centre will significantly increase the capacity and capabilities of the workshop. The controller makes machining complex 3D profiles possible and has a sophisticated programming interface.

Compared to the Maho mill which it will replace, it has faster spindle speeds, faster rapid traverses and much larger program memory in the controller. The machine is also fitted with an automatic toolchanger which will eliminate the need to stop machining and wait while the tools are manually changed.

Neal and Denis have smiles on their faces and are looking forward to the delivery in July. Joan was last seen getting on a plane for New York mumbling something about paying for it. When will AI ask for one at Coona?

LIBRARY NEWS

Sandra Ricketts

The library's web page has finally got its map of the floorplan of the (Epping) library!

Go to <http://www.aao.gov.au/AAO/library> and click on whichever area you are interested in. For example, if you want to search the catalogue, click "books"; to look at lists of preprints received recently, click "preprints" etc.

A much-improved PC has been installed in the telescope library. It is vastly faster than the old one, and with the windows interface to the catalogue, it is much easier to search for a book. Instructions are on a sheet next to the computer. If there are any problems, don't hesitate to contact the librarian at Epping, either by phone or email (lib@aaoepp.aao.gov.au).

EPPING EVENTS

Helen Woods

We now have some 50 staff working for the AAO in one form or another. Once again, in the last few months a number of new faces have joined us. Tim Young replaced Daniel Doyle in the Electronics section. He has recently completed his electronics apprenticeship at the CSIRO in North Ryde, and has, among other things worked on the project for the Parkes telescope upgrade.

Elizabeth Corbett has arrived at the AAO as the new AAO fellow. Her research interests lie in the field of active galactic nuclei and she has come to us from the ATNF where many of you may have already met her.

Rolf Muller has also joined the electronics area to work on the IRIS 2 and 6dF projects.

Antonio Cesar de Oliveira is currently visiting the AAO for six months. Cesar is a PhD mechanical engineer whose home base is the Observatory of the University of Sao Paulo, Brazil. He has spent the last 6 months working with Fred Ingerson (CTIO's fibres man) in Chile and he is now to spend a further 6 months with us in Epping. His main goal will be to pursue plans for fibre-based IFU spectroscopy for the SOAR consortium (who are building a new 4-metre telescope in Chile with joint US/Brazilian funds). With that in mind he will initially work with David Lee in putting together the new SPIRAL (phase B) micro-lens/fibre array and up-grade the SPIRAL spectrograph in readiness for commissioning during semester 99B.



The AAO is also proud to announce the arrival of four new babies over the last six months. Keith Shortridge became a father for the second time on 24 December and Tony Farrell became a father for the first time, but twice, in April with the arrival of twins Aidan and Adrian. We have just learned that Helen Johnston had her second baby on 6 May - a boy. As well, we have a couple of staff about to begin maternity leave, and, one or two more expectant fathers, so the southern winter will certainly be a lively one!

Unfortunately, we are also having a few departures. Jessica Chapman is leaving on Friday 28 May 1999 to join ATNF. Fortunately, she will be near enough for us easily to stay in touch with her. Tyler Bourke, on the other hand, has gone further afield - to Boston in fact, where he has accepted a post-doctoral fellowship at the Smithsonian Astrophysical Observatory.

BOARD MATTERS

Roger Bell

The 56th meeting of the AATB was held at Siding Spring and Epping on 21, 22 and 23 March. The meeting was very constructive and dealt with a wide range of issues. The Board was presented with progress reports on the major internal and external projects. They were particularly impressed with the successful implementation of project management at the Observatory.

Dr Gordon Robertson presented a proposal for ATLAS, a new spectrograph for the AAT. The Board was very positive about the innovative nature of ATLAS and the use of Volume Phase Holographic (VPH) gratings, and requested that a design study be undertaken.

Professor Roger Davies's term on the Board expires on the 30 June 1999. The Board extended its thanks to Professor Davies for his contribution as a Board Member since January 1996, and as Chair from July 1997. The Board elected Professor Jeremy Mould to take over as Board Chair and Professor John Peacock as Deputy Chair from 1 July 1999.

**CROSSWORD
COMPETITION**

Keith Shortridge

Send a copy of the completed crossword to the Librarian, (AAO), to arrive before 31 July 1999. The first correct entry drawn will receive a copy of a photo by David Malin. The winner will be announced in the August issue.

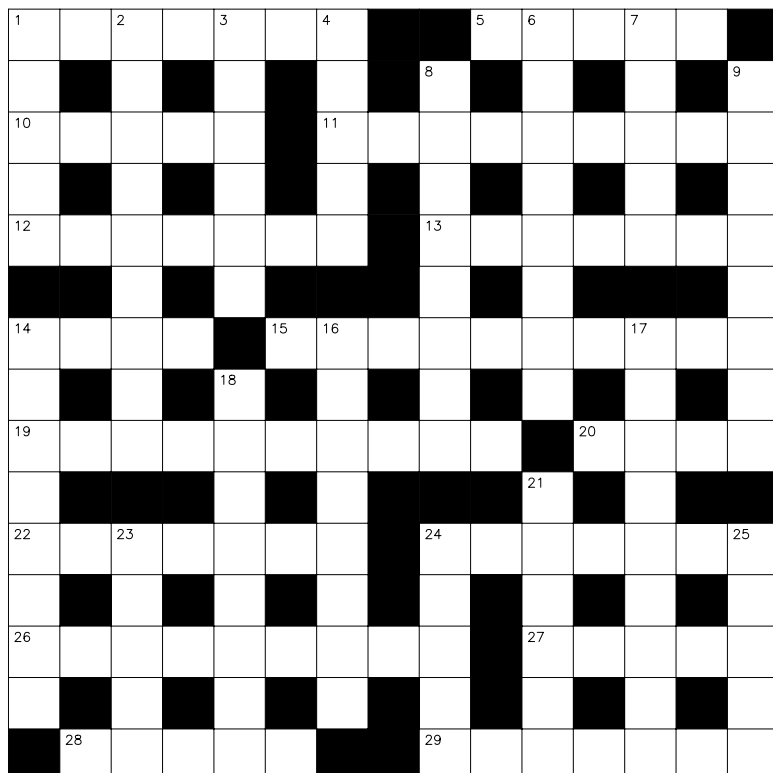
Across

- 1,5,10. We are all in the gutter, but some of us are... doing astronomy? (7,2,3,5)
- 5. See 1 across
- 11. Bowl too far above deep black. (9)
- 12. Give the impression of gravity with guests milling around. (7)
- 13. Claims the useful items are about right. (7)
- 14. More disorganised in Italy. (4)
- 15. 27's lady of the lake. (10)
- 19. Morton turns drab fellow into sporting legend. (3,7)
- 20. The archbishop of York's tangled robe. (4)
- 22. Audrey does high energy physics by the Scottish stream. (7)
- 24. See 8 down
- 26. Strong agreement in church to start making the sphere that holds the stars. (9)
- 27. Undomesticated author, we hear, quoted in 1 across

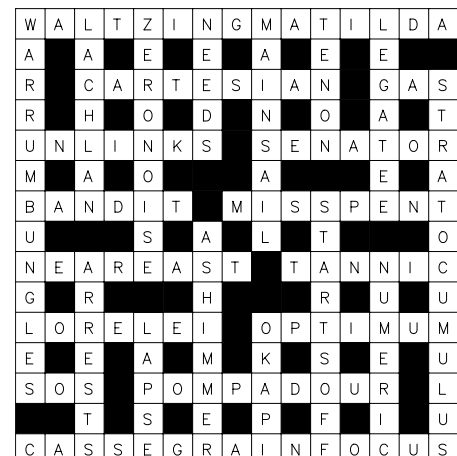
- from play about 15. (5)
- 28. Have a meal after church and practise deception. (5)
- 29. Fit out with sails, lazily and unbendingly. (7)

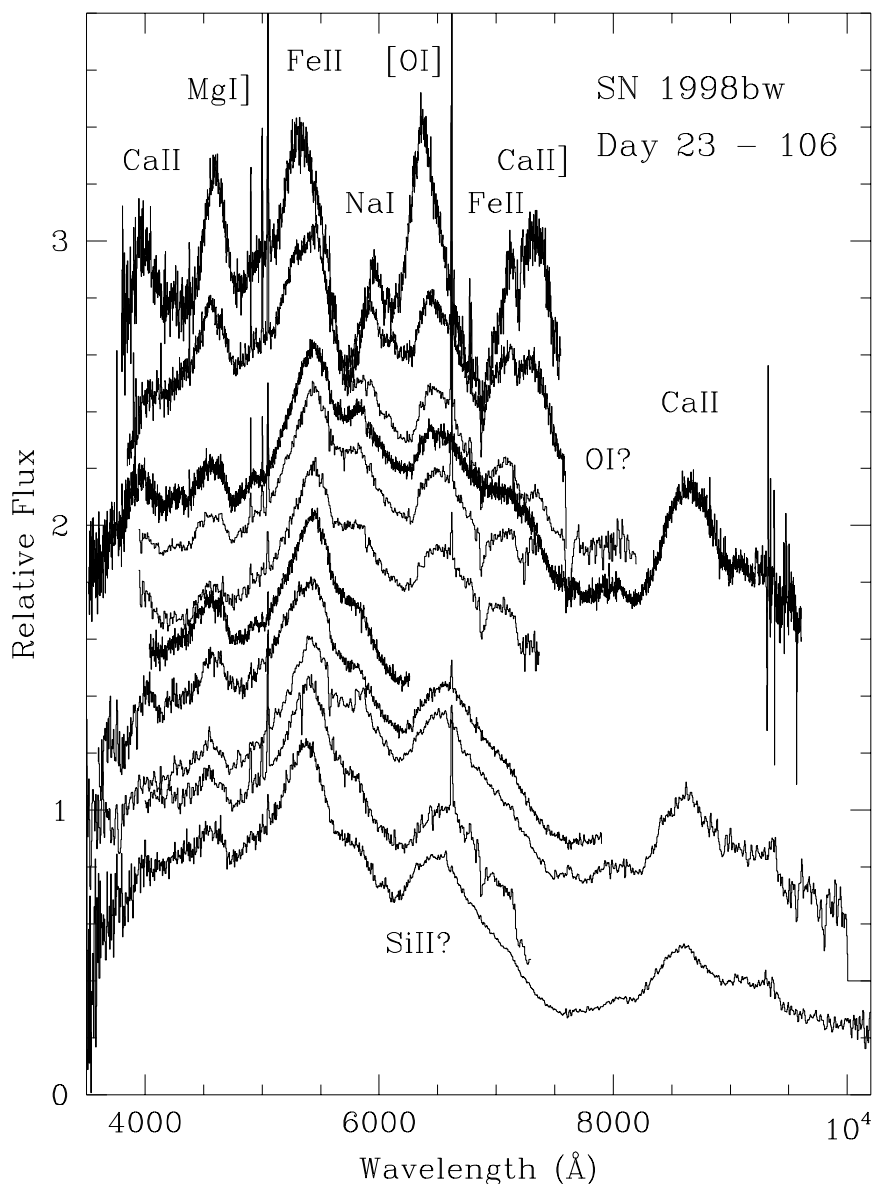
Down

- 1. Enumerates the scene of combat. (5)
- 2. O green man, when turned you support the other cause. (9)
- 3. Marching together between toe and ankle. (6)
- 4. Grand army's haunting spirit. (5)
- 6. Recordings attempt to make an ornamental textile. (8)
- 7. One who avidly dislikes being in the lurch at Eric's. (5)
- 8, 24 across. A used radar trap - a confused Latin motto for astronomers and other high fliers. (3,5,2,5)
- 9. After Switzerland, donkey takes French street back to get a hunter. (8)
- 14. 2dF survey is a communist move. (8)
- 16. Tin ended bent and notched. (8)
- 17. Dash! Faced deliveries around student, deep in conflict. (9)
- 18. Orb turned before a turn before a fence - what a to-do! (8)
- 21. Insect with listening equipment and false hair. (6)
- 23. Put a welder in a public house and deprive of drink. (5)
- 24. Michaelmas daisy is star turn around the East. (5)
- 25. A signalling pistol for Brundage the Olympian. (5).



November 1998 crossword solution.





Results from the spectral monitoring campaign for SN 1998bw (see article, page 4). Battling an unprecedented spell of bad weather last winter, this unusual object was observed on the AAT (including 2dF observations), on FLAIR at the UKST and on the 2.3m telescope. Observers were Heath Jones, Mike Bessell, Russell Cannon, Ray Stathakis, Ian Lewis, Dionne James, Ken Russell, Quentin Parker, Malcolm Hartley, Fred Watson, Brian Schmidt and Lisa Germany. Hopefully I didn't miss anybody! Many thanks to all for your efforts.

editor RAY STATHAKIS editorial assistant SANDRA RICKETTS

Submissions of articles on recent research with the AAT and UKST are always welcome: contact newsletter@aaoepp.aao.gov.au. Contributions are due the first week of the month of publication, in ascii or latex format with postscript figures.

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