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UNIVERSE

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UPCOMING MEETINGS

In This Issue:

2. SOLAR CYCLE 23 UPDATE:
H-ALPHA DOPPLER SHIFTS
Harry Roberts

5. GREAT TELESCOPES
OF THE WORLD - PART 1
Scott Mellish

7. 2003 MESSIER MARATHON,
LAKE SOMONA, CALIFORNIA
Jane Houston Jones

8. EXPLORING THE MOON
WITH A SKETCH BOOK—
THEOPHILUS REGION
Harry Roberts

FOR SALE

10. PIER DESIGN
Stephen Macmillan

11. SKY SKETCHER'S POST
MORTEM
Scott Mellish

14. ASTROCARD NEWS
Greg Bryant

KEY DATES FOR 2003
Lesa Moore

15. MAP PROJECTIONS -
PART 2
Ted Lumley

11 APRIL 2003 - ORDINARY MEETING

"Gemini, Antarctica And Lofar - Three Astronomical Opportunities For Australia"
MICHAEL BURTON, UNIVERSITY OF NEW SOUTH WALES

Abstract: (Omitted from sample version)

9 MAY 2003 - TECHNICAL MEETING

"Globular Clusters"

ANDREW MURRELL, ASNSW DEEP SKY OBSERVER

Abstract: (Omitted from sample version)

16 MAY 2003 - ORDINARY MEETING

"The AAO/UKST H-alpha Survey And A Rich New Vein Of Planetary Nebulae"
DR. QUENTIN PARKER, MACQUARIE UNIVERSITY

Abstract: "The AAO UK Schmidt Telescope (UKST) has undertaken an H-alpha survey of the Southern Galactic Plane and Magellanic Clouds using a single-element, narrow-band interference filter of exceptional quality. This is probably the last great photographic Schmidt survey and the first where the sole method of community access will be via an on-line digital atlas. An H-alpha survey with an unprecedented level of coverage, resolution and sensitivity is being produced, superior to any other survey of optical line emission in our Galaxy in terms of these combined properties."

Many exciting discoveries have already been made including new supernovae remnants, Herbig-Haro objects and Wolf-Rayet stars. Here we provide brief results and details of a rich new vein of Galactic Planetary Nebulae.

The AAO/UKST H-alpha Survey is unique in revealing a substantial new population of optically identified PNe over the entire southern Galactic Plane and over 1000 new PNe have been found."

13 JUNE 2003 - ORDINARY MEETING

"Mega Spectroscopic Surveys: The Chaos Principle"

DR. BRIAN BOYLE, DIRECTOR - AAO

Abstract: (Omitted from sample version)

11 JULY 2003 - TECHNICAL MEETING

"Choosing Accessories For Telescopes"

DON WHITEMAN, ASNSW

Abstract: "We will look at the most common accessories that could be needed for amateur telescopes and how to choose them."

Observatories:

Wiruna: 33° 01' S 149° 46' E
Crago: 33° 33' S 150° 37' E

There will be plenty of accessories on display and the discussion will be largely informal."

SOLAR CYCLE 23: H-ALPHA DOPPLER SHIFTS?

By Harry Roberts

The writer continues to be astounded by the huge range of exotic solar phenomena which can be recorded with an H-alpha filter (Lumicon 1.5 Angstrom.) Over the last six months or so it has become increasingly apparent that the filter can detect a range of Doppler-shift events!

Christian Doppler (C19th) discovered the change of wavelength of a wave (of light or sound) caused by motion of the source relative to the observer, and the phenomenon is now called a Doppler shift. It is well known that a light source receding from the observer will have its spectrum shifted towards the red (longer) wavelengths. Conversely an approaching source will show spectral features shifted blue-wards. The effect can really only be observed if the light has been spread into a spectrum which contains some sharp (measurable) absorption or emission lines, which can be compared with a stationary comparison source.

Fraunhofer absorption lines in the solar spectrum are clearly and sharply defined and permit professional astronomers to measure quite small velocity variations in the Solar atmosphere.

The Lumicon filter (and presumably other brands) is designed to isolate the H-alpha line located at 6563 angstroms. Because of thermal and other variables, the filter has a small "tuning" screw which allows the user to slightly vary the filter frequency by tilting the filter unit. The observer can with experience detect the slight drop-off in chromospheric detail as the filter wanders "off band", and small re-tunings are needed every 10 minutes or so. A good way to tune to line centre is to tune off band alternately in each direction, which gives the observer a good feel for where the H α central line is.

On fourth July 2002, while observing a small flare and stable filament near the centre of the solar disc, such a tuning adjustment became necessary. When the tuning screw was rotated $\frac{1}{2}$ turn clockwise a large black filament sprang into view, while all other surface detail faded. The new filament was clearly an extension of the stable filament, and could be seen to be in motion. The fading of disc detail meant I had

tuned too far, and restoring the "normal" tuning made the newly seen (moving) filament vanish!

I was puzzled. It had not occurred to me that there was chromospheric detail to be seen with the filter off-band. I repeated the off-band tuning and recovered the dark filament, now even further from its original position, though all other stable disc features again vanished.

From the presence of flaring and the rapid motion of the filament it was clear I was observing a filament ejection event, such as I had previously observed many times at the Sun's limb. In this case however the event was occurring near the solar centre, and I realized the ejecting filament was travelling almost directly towards Earth at (presumably) the usual million km/h. Was it possible that the rapid velocity of APPROACH had Doppler shifted the 6563 angstrom light emitted by the filament, making it BLUE-SHIFTED enough to be invisible at "normal" tuning?

On 20 07 02 a similar event was recorded in AR 30, where a C3 class flare event was occurring. Tuning the filter off-band ($\frac{1}{2}$ turn clockwise) eliminated all solar surface detail, but revealed a medium sized black filament on the north edge of the sunspot group. The filament remained visible from 03:00 to 03:10 when it began fading. A nearly identical observation occurred in AR50 on 31 07 02 05:01 during a flare. By now it seemed that the filter could be tuned to detect filaments ejecting off the Sun. Did it follow that the reverse tuning (counterclockwise) could detect matter falling back onto the solar "surface"? i.e. RED-SHIFTED.

On 01 10 02 I observed a short dark filament in AR 134 which, while faintly visible at "normal" tuning, became dramatically dark with the filter tuned $\frac{1}{2}$ turn counterclockwise. I concluded this filament was collapsing back onto the solar surface after an ejection event, and was accordingly RED-SHIFTED by recession. The fact that the filament could be faintly detected at "normal" tuning suggested that some of the filament's material was "at rest" relative to the observer. Perhaps it was partly static in suspension above the chromosphere.

In spite of many attempts I could detect no "Doppler Shifting" in fila-

ments in ejection at the solar limb. This was to be expected, as they would have very little motion in approach or recession relative to a terrestrial observer. Several observations show the ejection velocity of filaments to be over 800,000km/h.

The accompanying observations (figs 1 and 2) record the eruption of a large dark filament associated with Active Regions 223, 225 and 229 on 21 Dec. 2002. The filament had been stable for days, and at 01:11 UT on the 21st I found its ejection underway. I did not observe the initial moments.

The ejection event carried the main mass of the filament eastwards at a modest rate. Although clearly visible at N (normal 6563Å) tuning I observed the filament to become dramatically darker with the filter tuned "bluewards", i.e. the filament had a B+ tuning. Its shape evolved rapidly between 01:11 and 01:40. At 01:56 the filament seemed to be trapped in magnetic loops and the tuning now showed BOTH strong "blue" (approach) and "red" (recession). At this point it seemed that the filament was beginning to slow and, in part, fall back onto the Sun.

At 02:15 the filament was fading and forming into loops. At this time the tuning showed both strong N (normal 6563Å) and strong "red" (recession) features. Seemingly the filament was static above the Sun and in part collapsing back to the surface.

At 02:29 there was little left of the filament: one red-shifted loop remained together with an irregular N (normal) component, now all quite faint.

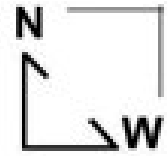
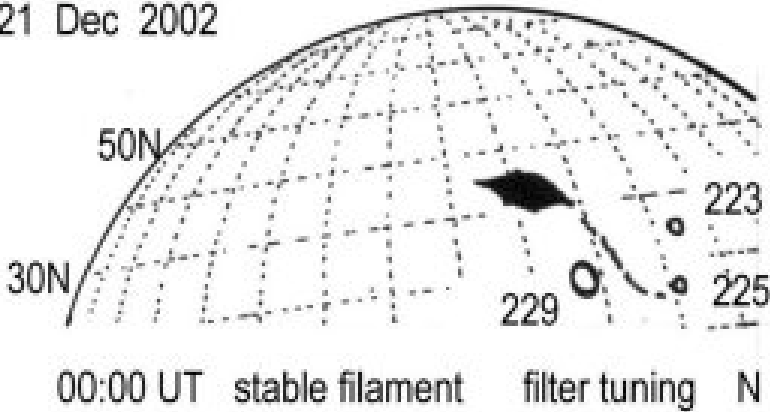
Free use of the tuning screw of an H-alpha filter appears to reveal the bulk motions in ejected filaments. I've found little in the amateur literature about the monitoring of ejection events, or the detection of H-alpha Doppler shifts. Golub and Pasachoff in "Nearest Star", p64 refer to Doppler observations of chromospheric motions. Beck, Hilbrecht et al, "Solar Astronomy Handbook" (Willmann-Bell, p355) refer directly to the "measure (of) velocity components in the direction of vision to obtain a spatial picture of the movement." They argue at some length that calculated velocities "in some cases can lead to incorrect results!" This is supported by a long (complex) quote from the profes-

Filament Ejection

21 Dec 2002

Fig 1

ARs 223,
225 & 229

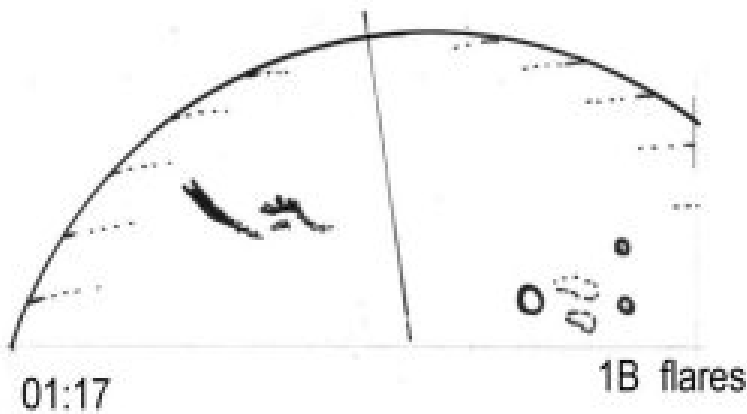
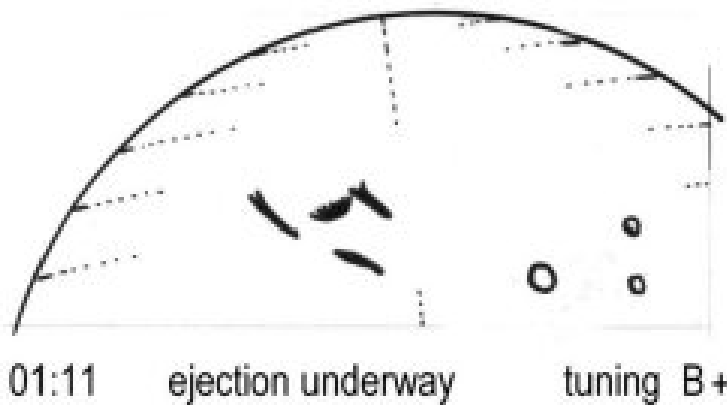


C8 80 X

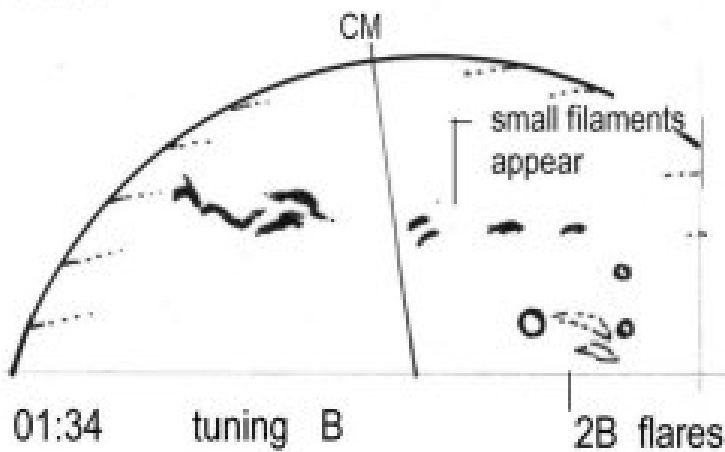
Lumicon
H-alpha

Chatswood
Harry Roberts

note: sunspot
groups shown
as small circles

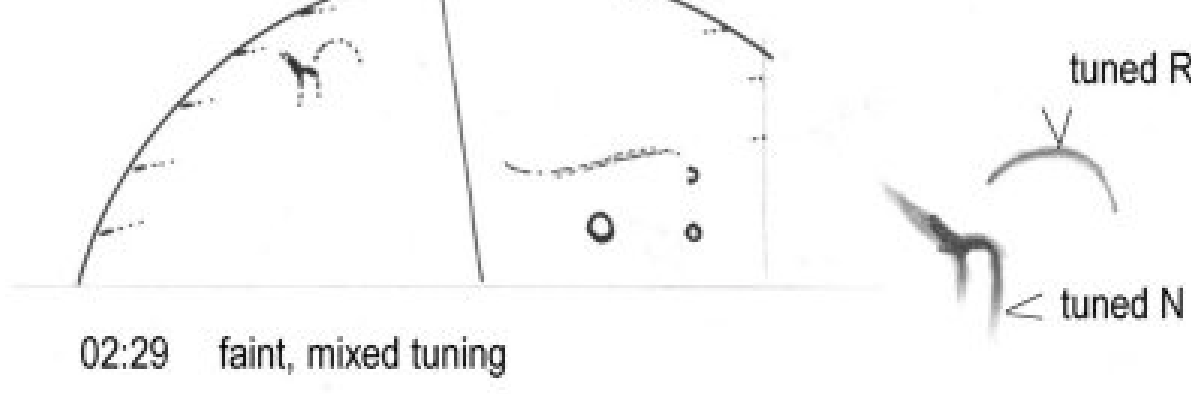
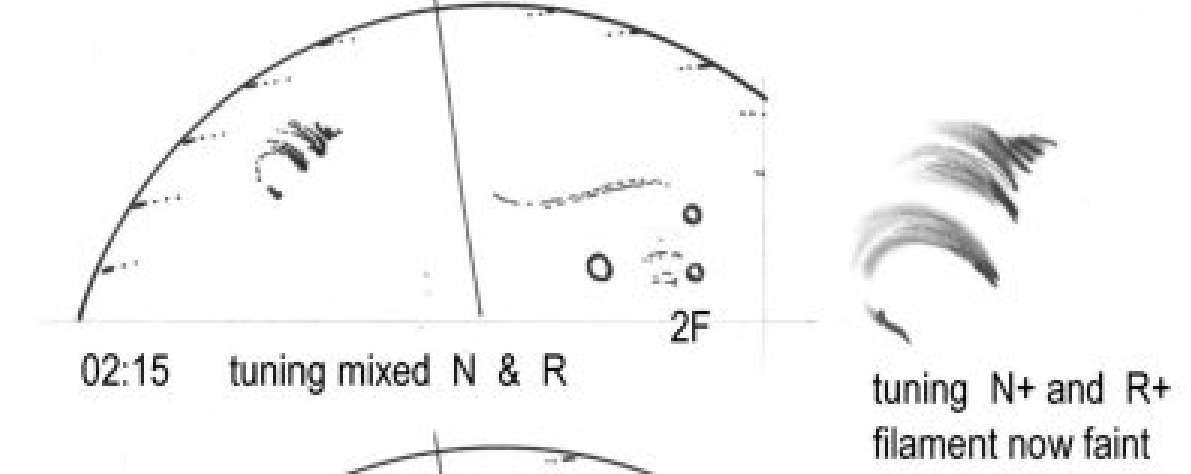
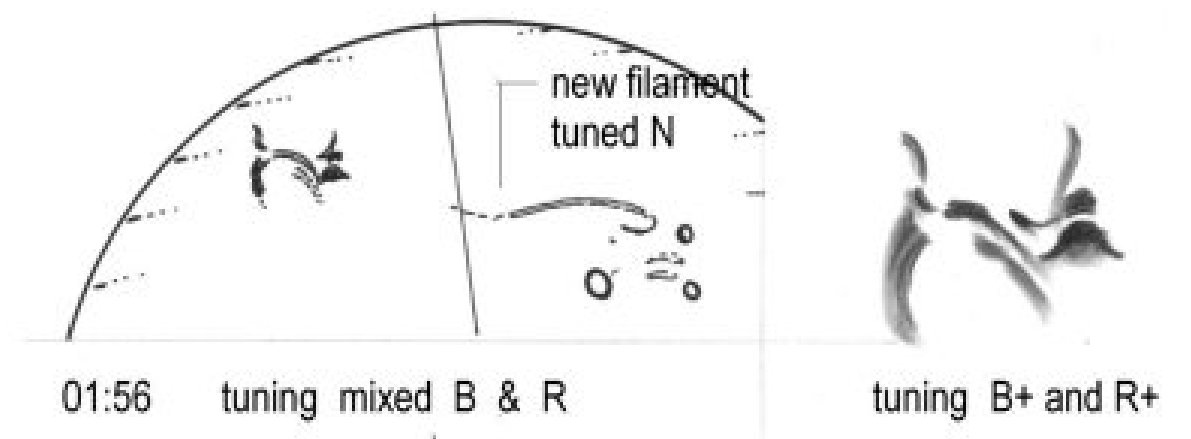
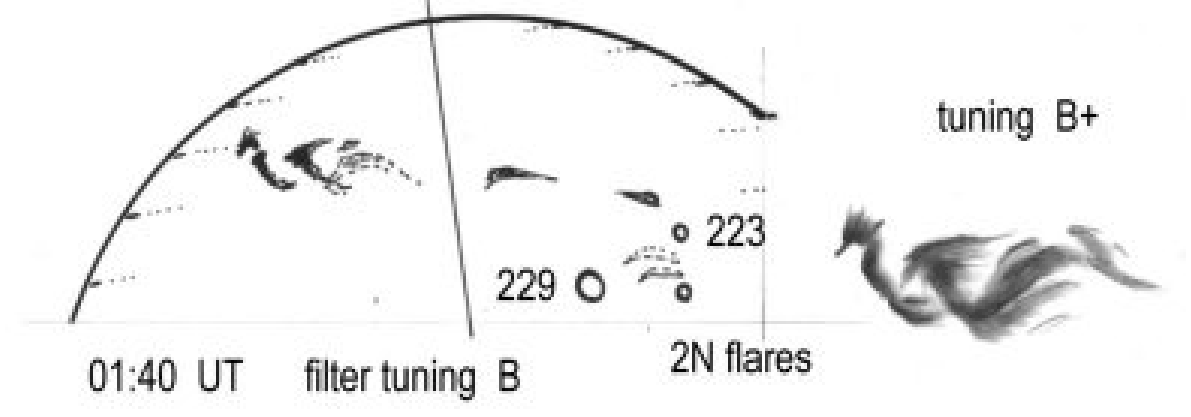


detail 2.3x



tuning B+

CM Fig 2



sional literature. They finish by concluding on p358: "For the amateur this means that the Doppler shift measured by shifting the central wavelength of a(n) H-alpha filter can be used to measure the bulk motion of filaments above the chromosphere but can lead to completely incorrect results for the line-of-sight velocity of chromospheric structures." This seems to support the detection of bulk movement in ejections, but warns of error in detecting motion in the chromosphere itself.

Harold Zirin in "Astrophysics of the Sun" makes many references to detecting motion of ejecting filaments with the detector set to $H\alpha - 1\text{\AA}$ (i. e. 1A blue-wards of 6563Å) and concludes high approach velocities, e.g. page 278. Zirin uses $H\alpha$ movie equipment to monitor bulk movements of various chromospheric structures; (revealing a cornucopia of $H\alpha$ phenomena which await amateur study!)

It therefore appears that the above observations correctly show the ejection of a filament above the surface of the Sun at 01:11 until, at about 02:00, the material began to fall back to the surface. At about 02:30 the material was being absorbed back into the solar atmosphere. This was therefore an incomplete ejection event, the material not being fully ejected into space.. Though I found no reference on the Web to a CME from this site, there may have been one. X-ray flaring throughout the ejection was modest reaching 2B at 01:34.

I would like to hear from anyone who is learned in the field regarding detection of bulk Doppler shifts of solar eruptions. It seems hard to believe these effects can be detectable with amateur equipment. (Refer to Acknowledgments below.) Perhaps it's explainable in other ways. Suggestions anyone? 'Til then I'll keep on "tunin' ".

Clear skies
Harry Roberts.

Acknowledgements:

I wish to acknowledge Bob Evans, Director Aurora and Solar Section, Royal Astronomical Society of NZ for his assistance in preparation of this article, and arranging for it to be refereed by a figure most "learned in the field."

I wish to gratefully acknowledge the referee Jay M. Pasachoff, Field Memorial Professor of Astronomy Williams College, for his most encouraging comments. I reproduce in part his remarks which answer the question I posed in my final paragraph:

"It is good to see him (the writer) rediscovering filament motions. He seem surprised in his ultimate paragraph to be an amateur detecting such motions, but a 1.5-Å bandpass filter didn't used to be amateur equipment. If he can detect a shift of 1-Å, that is one part in about 6500 of the wavelength, so he should be able to detect a speed of approach or recession of 1/6500 of the speed of light, or of 300,000 km/s so a 1-Å shift corresponds to about 50 km/s."

GREAT TELESCOPES OF THE WORLD - PART I

By Scott Mellish

The last time I embarked on a series of articles was a few years back when I did a dossier on Great Astronomers. It ended up going as far as part 110 or whatever.

Anyway I thought it was time to start a new series on Great Telescopes.

So you will be either interested, or bored to tears on my latest escapade. However it will be good fodder for the journal which always seems to be starved of articles at the best of times.

To start the ball rolling the first telescope we will deal with is the legendary 40 inch Yerkes Refractor.

Charles Tyson Yerkes was a very rich financier, and he was ruthless in his dealings. His various scams and brown paper bag funding landed him in strife during 1871 and he ended up in jail after the collapse of his bank.

It probably couldn't have happened to a nicer bloke. But whilst in the slammer Yerkes was reported to have said "I have made up my mind to keep my mental strength unimpaired, and think my chances for regaining my former position, financially, are as good as they ever were."

He was pardoned after doing seven months of an original 33-month sentence.

From then on he would strive to better his name, especially in high society circles.

After staying out of strife for about a decade, Yerkes came back into notice after he and a group of his mates purchased control of a Chicago streetcar company.

He could have done without the attention, as the local papers tore into him almost on a daily basis.

As with most wealthy men of the day, he resorted to bribes and skullduggery to gain favors from councils and politicians.

Soon he became the most vilified man in town. And his prior stint in jail did not serve him well.

Yerkes realized that he needed to clean up his scumbag image.

In 1892 he was approached by a young astronomer by the name of George Ellery Hale. Hale had been dreaming about an observatory that could adequately study the Sun - Hale's main interest in astronomy.

Hale learnt of two 40-inch diameter glass disks that were wasting away in an optical workshop. The glass was to be used by the University of Southern California, but the faculty could not find the funds to complete the project. Hale saw a chance to profit from the USC's misfortune, but he needed the cash to do it, some \$16,000.00 in total and that was just for the chunks of glass.

On the 4th of October 1892, Hale visited Yerkes in his office. He was shrewd enough to pander to Yerkes' stupendous ego. The project he had in mind would not be just any old telescope, but the largest on Earth..

For someone like Yerkes, who liked the biggest and best of everything, it naturally made him very keen on the idea.

The cost of the great telescope came up, but Hale was cunning enough not to mention the observatory building, which would no doubt have emptied Yerkes' pockets that much more quickly.

I think Hale must have realised that the entire cost would have sent Yerkes into a fit, and doomed the grand project.

Anyway Yerkes showed an interest in funding the project, and Hale left feeling as though he had a blank cheque to build the observatory and telescope.

Hale then leaked to the press an



CHARLES TYSON YERKES
1837-1905

overblown account of Yerkes' extraordinary generosity.

This was a blatant attempt to con Yerkes into funding the project, and it worked. On October the 12th news stories heralded the "princely donation."

Hale had trapped Yerkes, who would have no doubt nearly pooped in his pants thinking about what it could cost him.

Yerkes stated on December the 5th that he would "add to my gift, an observatory necessary to contain the instrument."

Yerkes had not planned to fund the entire project. Deep down I suspect he would not have not been a very happy little vegemite.

Despite Yerkes' immense generosity he still attracted criticism. The *Chicago Times* gave him a serve, saying that "The astronomical beneficence of Mr Yerkes does not excuse his street railways shortcomings any more than the educational liberality of Mr Rockefeller justifies the methods of the standard oil company."

Most of the editorials however were positive. This, though, did not calm Yerkes' suspicions that he was being scammed. What aggravated the matter was Hale going out and ordering three custom-made spectroscopes without letting Yerkes in on the cost of the instruments.

When the building plans were complete in 1894, and the scope's mount was ready, Yerkes then refused to spend any more money on the project. His relationship with Hale frosted over. During 1897 as the building began to take shape, the President of the Chicago University where Hale worked, William Rainey Harper, approached Yerkes for some

more funds.

Yerkes at the time was locking horns with some of Harper's mates on the reformist civic federation as he was trying to get 50-year terms on his streetcar franchises. Yerkes told Harper he should "fix up his mates on the council." Harper was very diplomatic with his response to Yerkes.

In a later letter to Harper, Yerkes stated that he was worried about his many enemies striking at the grand telescope project.

Only a few days after he said this the floor of the main dome collapsed. This major shambles was apparently the fault of the floor's designers. None the less this would have made Yerkes deeply suspicious.

After all the trials and tribulations the observatory was finally opened on October 21, 1897.

Yerkes rose to speak of the observatory named in his honor.

"There is nothing of moneyed value to be gained by the devotee of astronomy, there is nothing he can sell... consequently the devotee of astronomy has as his only reward the satisfaction which comes to him in the glory of the work which he does and the results which he accomplishes."

These were wonderful words from a man who was not liked by many people.

Still you do not get to be super wealthy without doing some head kicking.



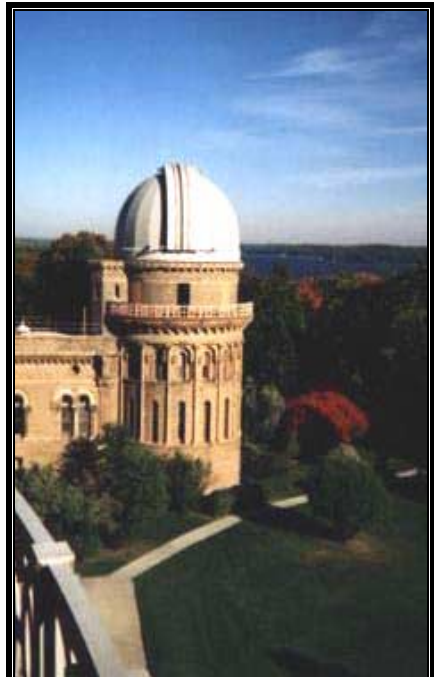
THE 40" YERKES REFRACTOR

After Yerkes completed his speech he received rapturous applause. Here he had found an audience who actually appreciated what he had done.

President Harper replied by saying that: "If it were possible for you to derive a tithe of the satisfaction from your gift which the giving of it will bestow upon each one of us you will have been rewarded."

Despite Yerkes immense generosity he remained a social outcast until he died.

As for the telescope, however, it was to become famous.



YERKES OBSERVATORY

Unlike many observatories it is readily accessible. In fact it actually has a golf course as a neighbor.

The 101.6cm refractor is still the largest in the world and it is in perfect shape. It is used on almost every clear night.

The observatory also houses a 104cm reflector and a 61cm reflector. The Great Yerkes refractor is indeed a telescope from a more elegant age.

CLEAR SKIES

References: Yerkes observatory. Uni of Chicago. Astronomy encyclopedia.

2003 MESSIER MARATHON, LAKE SONOMA, CALIFORNIA

By Jane Houston Jones

With Don Machholz for inspiration and his Observer's Guide as a road-map, I hoped the skies would permit me to complete a Messier Marathon Friday night, March 28th, 2003. As Venus peeked through the branches of a California coastal oak tree at dawn, I looked back on the previous 11 hours in a happy haze. I had just observed 105 Messier objects out of the total 109, plus NGC5866 which most marathoners count for the Messier 102 boo boo, for an official grand total of 106 Messiers. I missed four of them. M77 was behind a tree in the evening sunset haze. M30 was not due to rise until after sunrise. And M72 and M73 were caught in horizon-hugging clouds, and try as I might, I couldn't coax them out for confirmation.

I unloaded my 17.5-inch f/4.5 LITE-BOX reflector, Hagrid, at the highest point with the best horizons at Lone Rock Flat, Lake Sonoma, CA, 90 miles north of San Francisco. I wasn't even sure until I began if I was going to go for the marathon or not. But finding the first object, M74, happily sealed my fate for the night.

A couple of other observers were on hand for most of the night. One observer was intent on re-observing and describing a couple of dozen Messier objects for his Astronomical League Messier Certificate. Another - a newbie - was just happy to be there and interested in seeing and finding as many Messiers as he could for the first time through our astronomy club 8-inch f/5.7 loaner telescope.

A third was an astronomer from our California Central Valley, in the area for a family memorial service. He was after some solace and stars and received both. He happily sketched a couple of the Messiers through my 17.5-inch Hagrid for a book of sketches he was drawing for his young daughter. A couple of additional astronomers were on hand working on their own non-Messier projects.

The amazing display of the universe and our place in it unfolded as the hours passed pleasantly by. The glow of sunset was replaced by the bold and bright planets Jupiter and Saturn and our brightest star, Sirius. The triangular glow of the zodiacal

light obscured many of the first visible stars in the west.

As soon as alpha and beta Arietis were visible, I lowered the big telescope nearly to the horizon, knelt on a gardeners kneepad until I finally coaxed M74 (and gamma Arietis) out of the murky horizon above eta Piscium. Unfortunately, M77 slept with the fishes for this year's marathon. This part of Cetus was obscured by a particularly beautiful clump of oak trees. I already knew M30 was impossible for me to see on this night, and therefore the magic number of 110 was unreachable. My galaxy quest pushed on toward Triangulum and Andromeda and I logged local group members M33, M31, M32 and M110. It was now 8:00 p.m. PST.

My next stop was on the outer rims of our own Milky Way galaxy, which is the second largest of the Local Group of galaxies, second only to M31. Cassiopeia and Perseus Arm are located in the outer Perseus Arm of the Milky Way. M52, M103, M76, M34 are to be found there. Then on to Taurus, Orion, Lepus and Gemini, located in the Orion arm of the Milky Way. The Orion arm may just be a spur of the outer Perseus aArm. This is where our sun is located as are M45, M42, M79, M43, M78, M1, M35. Then on to Auriga I hopped. I swiftly viewed M36, M37 and M38. Then I swung over to Monoceros and Canis Major, Puppis and Cancer and enjoyed M41, M93, M47, M46, M50, M48, M44, M67. When we look at the winter Milky Way, stretching east of Orion, we are looking through the galactic plane toward the outer limits of our galaxy. This is the home of the galactic star clusters, and we had seen about half of the night's clusters already.

Galaxy time! It was time to leave the Milky Way views for only first time since the beginning of the night. M96, M95, M105 in Leo are favourite star party showpieces in Leo. They are part of the Leo I group of galaxies, 38 million light years distant. M65 and M66 are probably related to the M96 group. The galaxies of Ursa Major, M81, M82 are among those nearest to our local group. M108, M109 and M106 came next, plus planetary nebula M97. Then M40 for dramatic punctuation. Many of the Messier galaxies are part of galaxy groups near our local group. M94 and M64 are one group. M51 and M63 comprise another group. M101 is part of another and even M102

(NGC5866) is part of a galaxy group.

Globulars M3 and M53, far from the galactic centre were next. Then supercluster time! I powered through Virgo's M98, M99, M100, M85, M87, M89, M90, M88, M91, M58, M59, M60, M49 and M61 in record time, but stopped and switched eyepieces to the 31 Nagler for a long look at M84 and M86 and the surrounding view I call the 9 gals(axies). M104, M68 and M83 were next and then back to the Milky Way!

The glorious globular clusters of the galactic centre - the Milky Way central region and the familiar summer Milky Way now came into prominent view. I looked at M5, M13 and M92. Then the next inner arm - the Sagittarius arm of our Milky Way and the obscuring dust clouds of the great rift appeared. This is where the great diffuse nebulae and open clusters in Scutum and Cygnus are found. M57, M56, M29, M39, M27, M71, M107, M12, M10, M14, M9, M4, M80, M19, M62, M6, M7, M11, M26, M16, M17, M18, M24, M25, M23, M21, M20, M8, M28, M22, M69, M70, M54, M55 and M75. Whew!

The final push was M15 (4:23 a.m.) and M2 (4:32 a.m.). These turned out to be the last Messiers I could see. M72, M72 and M30 were not visible.

The Zodiacal light after sunset delineated the ecliptic plane brilliantly, with a little help from Jupiter and Saturn. The winter Milky Way's galactic plane crossed this angle. As the Earth rotated over the hours of Messier Marathon night, our view of the sky changed. First outward, then towards our galaxy again. Then outward looking toward intergalactic space and finally ending with a look at the galactic centre. From the Andromeda galaxy, to the open clusters of Cassiopeia, to Virgo galaxies and then to Sagittarius. From sunset to sunrise. The sky darkened at dusk and then brightened again at dawn. On the drive home Venus and the "C" shaped crescent third-quarter moon rose from its position far south of the ecliptic, showing the geometry of the sky once again on a new day.

Date March 28/29, 2003 Location Lone Rock Flat, Lake Sonoma, California 38 42' 90" N, 123 02' 43.7" Altitude 900 ft. Instruments: 17.5-inch f/4.5 Litebox reflector, Orion 80mm reflector, 25mm 16x also Oculars: 9mm (222x) and 16mm (125x) 31mm (64x) Seeing steady but not excel-

lent. Relative humidity hovered near 45 degrees all night. Temperatures in the 50's, Transparency LM 6.3 at 9:00 p.m. using LM Area 4 Alpha-Epsilon-Beta Gem, 14 stars, and also 6.3 LM using Area 16 Alpha Cvn - Epsilon - Eta UMa, 13 stars at midnight.

EXPLORING THE MOON WITH A SKETCHBOOK: THEOPHILUS REGION

By Harry Roberts

Theophilus as everybody knows was St. Theophilus, Bishop of Alexandria, the Egyptian city of the Nile Delta. He ruled from 383 AD, and was succeeded as Bishop by one Cyrillus. And when we examine the lunar eastern hemisphere we find the two of them still closely associated on the western side of Mare Nectaris.

The preliminary drawing for the illustration was the product of another early evening of good seeing. Both major craters are right on the terminator and their interiors are filled with shadow. The western rim of Theophilus, however, is catching the lunar "morning" Sun, and we can see several terraces within. A small impactor has neatly punctured the northern group of terraces with a crater, Theophilus B. The central peaks of Theophilus are at elevation 1400m above the Nectaris plain. 120km to the west a range of higher mountains is also seeing morning light; they must be higher than 1400m.

Theophilus, which is about 100km in diameter, has partly covered Cyrillus and is obviously the younger crater. Cyrillus being older is partly disintegrated. It is 98km in diameter. To its SE is the shadow-filled Cyrillus F, which on Lunar Orbiter images looks more like a depressed area in the mountain range than a crater. Due E of Theophilus is the younger looking Madler. Johann Madler was a nineteenth century selenographer who published "Der Mond", an Atlas (I assume) which contained a lunar map he had compiled. I think he also co-authored "Mappa Selenographica" with W. Beer in 1837. I'm sure he'd like his crater. While only 28km diameter, it has a bright ray to the east and internal terraces.

Low levels of lighting near the terminator throw enormous shadows and make features as low as 50 metres visible! I could therefore see two

nice wrinkle ridges in the smooth mare floor of Nectaris SE of Theophilus. And when I looked closer I found the area peppered with tiny craters. There were too many to plot them all, but the drawing locates some of them. I guess they are each around 2-3km diameter. Further S out of the field of view the ruined crater Beaumont seemed to have been almost obliterated by these tiny buck-shot craters. Then I noticed in their midst two craters surrounded with dark ejecta! One of these (I discovered) is Beaumont L. I thought I could detect a dome here. I recall that the dark ejecta is thought to be mare material vented as a result of low level volcanism.

The NE side of Theophilus lies outside Nectaris and consists of much rougher ground, striated with radial ridges presumably caused by the impactor that created the crater. Here a chain of isolated peaks leads roughly northwards towards Mare Tranquillitatis.

Before beginning this observing session I had noticed (naked eye) the new Moon's terminator had an obvious notch in it. Through the 8x50 finder it was clear that the notch was the dark shadow area immediately W of Theophilus, and in the finder the illuminated mountain mass west of the crater hung as an isolated island of light on the night-side of the Moon. I do not recall noticing this effect in the past.

FOR SALE

Two receiver units from the long-defunct Culgoora solar radio telescope. All reasonable offers considered.



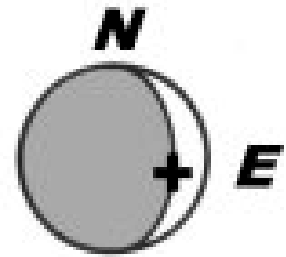
Each unit consists of a well-constructed metal box containing the power supply socket and two or three inputs with BNC connectors marked 80, 160 and 240. There is another BNC connector which seems to be the IF output. Presumably the units contain the RF preamplifier, mixer and local oscillator. Unfortunately I have no other information about them. They have never been used or opened and are offered "as is" but may be of interest to someone intending to build a radio telescope, or a collector. Having moved to a home unit, I have had to abandon any plans in that direction!

For more information contact:

John Faulkner

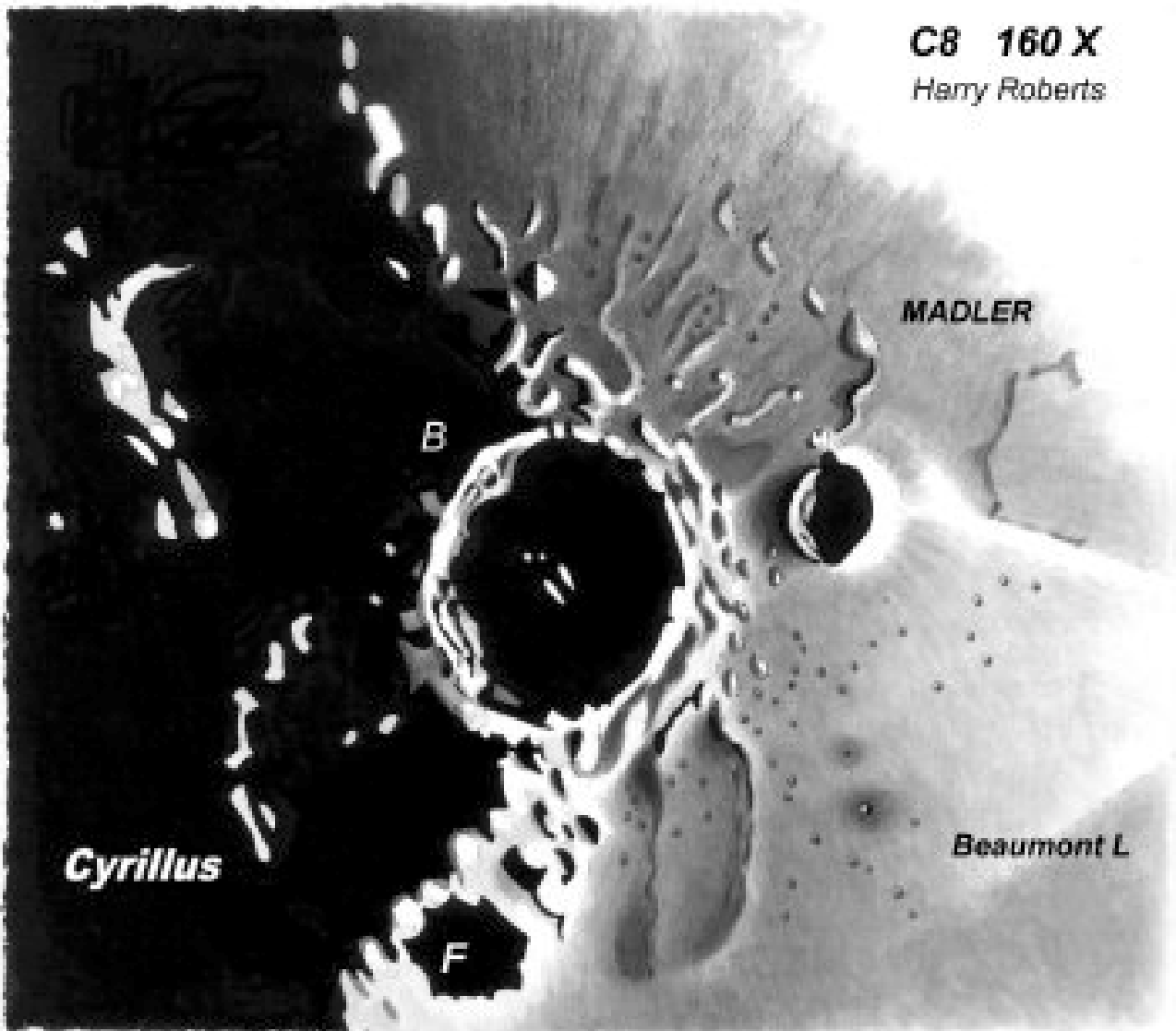
j.faulkner@... omitted

Theophilus region



C8 160 X

Harry Roberts



centre of view ~ 11 S, 26 E
september 12 2002 08:57 - 09:48
seeing 7 - 8/10

PIER DESIGN Part 1

By Stephen Macmillan

Email: smacmillan@qvalent.com

Web: <http://users.hunterlink.net.au/~ddsmm>



Figure 1: Completed Pier

Introduction

After spending six months levelling a tripod then performing a 20 – 40 minute drift alignment every time I wanted to image, I decided I needed a more permanent set-up. Where I live is heavily tree-studded. The only clear view is in the pool area. This spot provides me with reasonable north and south views. After some discussion with my 'non-astronomy inclined' wife, an observatory in the pool area was not an option. A pier became a reasonable compromise. I then spent a considerable amount of time scanning the Internet for pier designs.

After some research, I decided on a 12" diameter concrete pier using a two-plate system to mount my wedge on. The pier is designed to suit my Nexstar 11 GPS and Celestron heavy duty wedge, and with some modification of the top plate holes, will suit any SCT wedge or equatorial head. As the Nexstar 11 GPS has an internal compass I steered away from any designs involving mild steel due to the effect it could have on the compass pointing.

Equipment

I am not a handy person. Cutting a piece of timber straight is a challenge, but with a bit of assistance from friends and the local hardware

store, building a pier is a fairly straightforward exercise.

Parts List

Description	Qty
Aluminium Plate 12" x 12" x 3/4"	2
Sonotube 12" x 48" long	1
2x4's 8 feet long	3
Stainless all-thread rod, 3ft x 3/4"	1
Stainless nuts 3/4"	9
Stainless washers 3/4"	9
Stainless all-thread rod, 3ft x 1/2"	1
Stainless nuts 1/2"	16
Stainless Washers 1/2"	16
Rebar 3/8" x 4ft	4
Stainless bolt, washer & nut 3" x 5/16"	1
Rebar 3/8" x 2ft	4
Wood plate 12" x 12" x 3/4"	1
Wood Screws 3 1/2"	10
Cement 40Kg bag	4
Mild steel hex nuts	6
Mild steel plate 2"x2"	3
Sand & Gravel 3/4 cubic metre	1

All of the above parts were sourced from a local metal dealer, hardware store or concreting supply store. While stainless steel was used for all the threaded rods, washers and nuts, the plates were made of aluminium rather than stainless steel. Aluminium is considerably cheaper than stainless, and Aluminium is a lot easier to file if any of your drilled holes don't quite line up.

Digging The Hole

Once you decide where to place the pier it's time to start digging. It's always wise to check that there are no pipes or power cables underground. As you can see from these photos, my pier is close to the pool, so I was careful when digging to ensure I didn't hit any piping. Luckily, none was present.



Figure 2: Digging the hole

I was planning a 3' x 3' x 3' hole as this seemed like a good size to support the 12" diameter pier. When I got down to 2 1/2' I hit sandstone, nothing like having a solid base, so I stopped there. The next step was to create a rebar cage. This gives the concrete strength. The cage con-

sisted of 3/8" rebar formed into a 2' cube and four x 4' pieces of rebar in the centre to provide strength for the column itself. I used wire to form up the rebar cube. Its good if you can prevent the rebar from touching the dirt and seal it in concrete. This will prevent it from rusting. Refer to Figure 12, Hole Size (see part 2).

Forming Up

After the rebar is in place it's time to form up the pier column. I ended up purchasing a plastic tube used to make cement columns from a scaffolding and formwork supplier. The tube is constructed in such a way that it can be peeled away once the concrete is set. As a general rule, the diameter of the pier should be at least the same as the diameter of the scope. In my case the scope diameter is 11 inches so I went for a 12" pier diameter. I wanted to be able to view sitting down, so I made the tube rise 27" above ground level. This, combined with the 6" of the dual plates and the 15" of the wedge, gives an overall height of 48". Adjust the pier height to suit your needs. You need to suspend the tube in the centre of the hole with at least 6" clearance between the bottom of the tube and the base of the hole. This is to allow enough concrete to form a solid base under the tube.

Use the 2x4's as formwork to suspend the tube. This can be done by forming a triangle of formwork at ground level and two pieces as side braces. Now use the 3 1/2" wood screws to screw the timber into the sonotube. It's important to get the tube plumb. Its handy if the ground around the pier hole is level as this helps get the tube plumb. Now use wooden pegs to secure the formwork in place and to stop the sonotube from moving when you pour the concrete.



Figure 3: Formwork

Pouring the Concrete

It's very important that you don't make the concrete too wet. Keep the amount of water you add to a minimum. If the concrete is sloppy you

will have a lot water in the hole. This will cause the concrete to drop or move as it dries. I used a sand and gravel mix. The gravel size was approx $\frac{1}{2}$ - $\frac{3}{4}$ ". This was purchased from a local landscaping supplier. With this mix I used a six parts sand/gravel to one part of white cement ratio. If you buy the sand and gravel separately, try a four-part sand, two-part gravel to one part cement. Add the water slowly until the mixture is just wet. Shovel the mixture into the hole instead of pouring it straight out of the barrow. Pouring it in from a barrow could knock the sonotube out of alignment. Start by filling up between the outside of the sonotube and pier walls. If you want to replace the grass, fill up to about 3" from the top of the hole. This leaves enough room for grass and topsoil. Now shovel the concrete into the sonotube. As you are shovelling in the concrete tap the sides with a rubber mallet. This will help pack the concrete down and remove any air bubbles. Fill with concrete to the top of the tube.

The mounting system

To support the wedge I used a two-plate system. This consists of two 12" x 12" x $\frac{3}{4}$ " aluminium plates held together by four pieces of $\frac{1}{2}$ " stainless steel threaded rod and stainless steel nuts and washers. Refer to Figure 9 Top Plate and Figure 10, Bottom Plate for the CAD drawings of these plates (see part 2), . To mount this to the pier I used three 12" x $\frac{3}{4}$ " stainless steel threaded rods embedded in the concrete. All of these materials are available from a local steel supplier. Trying to cut stainless steel is not fun. Ask the steel supplier to cut it for you. A number of pier designs I read about on the 'net bent the bottom of the threaded rod before embedding it in to the cement. Trying to bend $\frac{3}{4}$ " stainless steel is also not on my top ten fun ways to spend a Saturday. When I spoke to the steel supplier and explained I wanted to embed the three 12" sections of $\frac{3}{4}$ " threaded rod into the concrete, he suggested I use a bolt and plate technique. This involves screwing a $\frac{3}{4}$ " mild steel nut, a 2" square mild steel plate with a $\frac{3}{4}$ " hole in the centre of it then another $\frac{3}{4}$ " nut underneath. Now lock these together with spanners. This is a standard way used in the building industry. The 2" square plates with $\frac{3}{4}$ " holes can be purchased at a steel or formwork supplier. The threaded rod / nut / plate / nut is the same technique used to separate the two aluminium plates that hold the

wedge. I searched the Internet for the hole and location dimensions for the Celestron heavy-duty wedge without any luck. So I measured them myself and drew up the attached cad drawings (see part 2, next issue). I then gave the drawing, the two aluminium plates and the wedge to a friend of mine who is a workshop foreman. He then drilled and tapped the holes in the plates as per my plans, but also rechecked the dimensions against the actual wedge to confirm that my drawings were accurate. The plans attached should be sufficient for any metal shop to drill and tap the plates for you.



Figure 4: Mounting plate system

Creating the Template

To make up the template that will be used to embed the three x 12" x $\frac{3}{4}$ " threaded rods into the concrete, cut a piece of wood the same size as the bottom aluminium bottom plate and about the same thickness. Place the aluminium plate over the top of the wooden plate and clamp together. Now use a $\frac{3}{4}$ " spade bit to drill the three holes in the wood using the aluminium plate as a guide template.

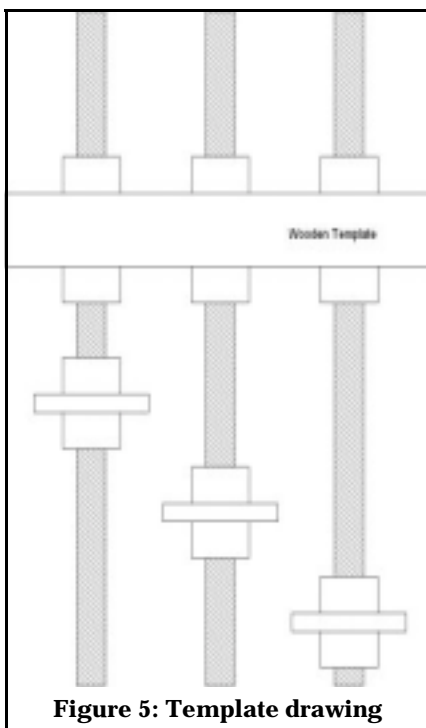


Figure 5: Template drawing

I elected to have 4" of thread rod exposed from the top of the pier and 8" embedded in the pier. Use stainless steel nuts and washers to lock the threaded rod at the correct height the wooden template. The top nut will be removed, but the bottom nut will be embedded in the concrete. The top of this nut will be exposed to the atmosphere, so use stainless. Vary the nut and plate anchoring system at different heights on the bottom 8" of threaded rod. As these will be covered in concrete mild steel can be used. They will also be far enough away from the scope not to affect its internal compass. Now draw a line going between the north and south corners of the template. This line will be used to assist in pointing the template at the pole.

SKY SKETCHER'S POST MORTEM

By Scott Mellish

The new Moon in March saw a very mixed bag of weather at Wiruna. I had arrived on the Friday afternoon to find Mike Kerr and Joe Cauchi on site. Joe had arrived not long before me, but Mike had been there since the uesday.

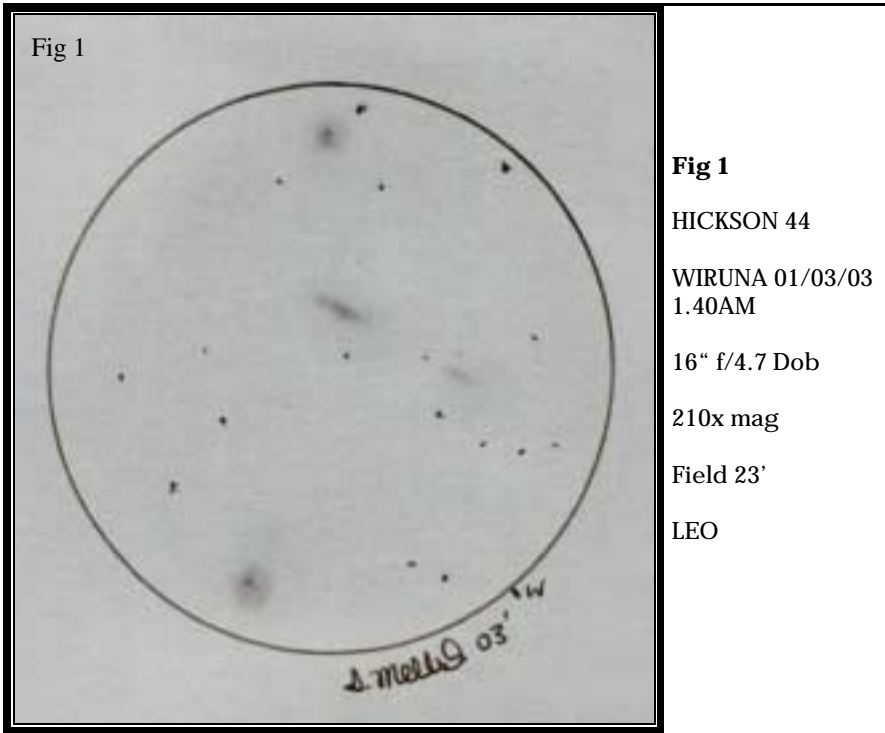
The previous new Moon weekend was a bit of a loss, so I was anticipating some clear skies, as I was staying until the Wednesday.

The Friday night clouded over fairly early and stayed that way most of the night.

Saturday was a bit more considerate and it offered up a pretty clear night. The wind was blowing fairly strongly so many of the scopes were unusable, except for the Coffin, which is built like a battleship and can withstand the fairly strong winds at Wiruna.

There were a few visitors around that I had not seen before, and due to the lack of scopes in operation I ended up giving a few impromptu sky tours. To give a summary of some of the more notable objects I sketched I will begin with the rather nice galaxy group Hickson 44.

I have had a bit of a thing for Hickson Compact groups lately, and this one was no exception. In the eyepiece of the 16' f/4.7 Dob at 210x mag, HCG 44 was a very rewarding view. As you can see in the sketch below (Fig 1) within the 23' field are four quite prominent galaxies of around 11.0 - 13.0 mag.



Starting at the top of the sketch we have NGC 3193 (Hickson 44B). This galaxy is also known as Arp 316. At around mag 12.0 and 2.0' x 2.0' in size it merely appears as a soft oval smudge with a fairly prominent core region, with no hint of any abnormalities associated with Arp objects. There is also a 9th magnitude star to the top right at about 2.0' which makes a nice contrast. NGC 3193 is classed as an E2 galaxy.

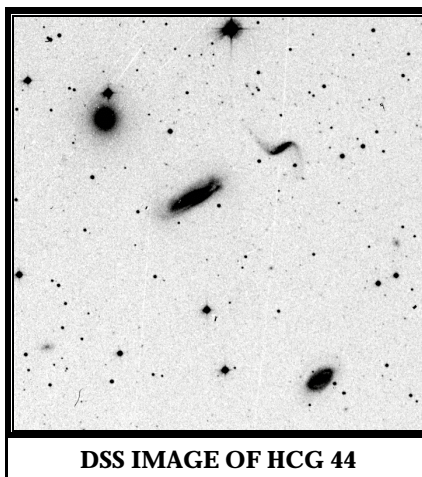
The next object as we come down is NGC 3190 (Hickson 44A) at about mag 12.0. This was my favourite object of the group, as it is a quite prominent edge-on galaxy and appears in the eyepiece as the dominant member. The galaxy has a very soft outer halo that is mostly overshadowed by the prominent, classical cigar-shaped central region. At about 4.4' x 1.7' NGC 3190 is the most elegant group member. NGC 3190 is classed as an SA(s)a pec sp galaxy.

At some 6.0' to the right of NGC 3190 and slightly down we come to the most obscure of the group members. NGC 3187 (Hickson 44D) is the poor cousin to NGC 3190. At around mag 13.6 this object was very diffuse and had an only marginally brighter central streak as a hint of its existence. With a low surface brightness NGC 3187 contrasted well with the brighter members and made me earn my keep with averted vision in an attempt to glean as much detail as possible from this faint little edge-on galaxy. NGC 3187 was about 3.4' x 1.5' in size and is not at first evident

when you observe this group. But the longer you observe it, the easier it becomes to see. It is classed as an SB (s)c pec galaxy.

The last object of the group is at the bottom of the sketch, and it just managed to squeeze into the 23' field. NGC 3185 (Hickson 44C) is not too dissimilar to 3193 (Arp 316). It has a reasonably bright core region with a soft outer halo. In the eyepiece at 210x the object appears to be a face-on spiral galaxy rather than an elliptical object. At some 2.4' x 1.6' in size and at about mag 12.5 NGC 3185 was quite easy to see even though it was on the edge of the field. It is also the widest separated of the group being about 16.0' distant from its nearest companion galaxy. NGC 3185 is classed as an (R) SB (r) a galaxy.

Overall HCG 44 rates as an easy group, but I would advise a dark sky site to enhance the view. HCG 44 is at R.A.10 18 5.1 DEC +21 49 50.



The next object of interest that I came across was a nice group of NGC galaxies in Corvus.

I actually had a quick look at the Sombrero galaxy just to say hello, then had a look on the millennium star charts to see what else was about and found that I had looked at most of the galaxies in this region of sky but noticed that I had not ticked off this little group from my list.

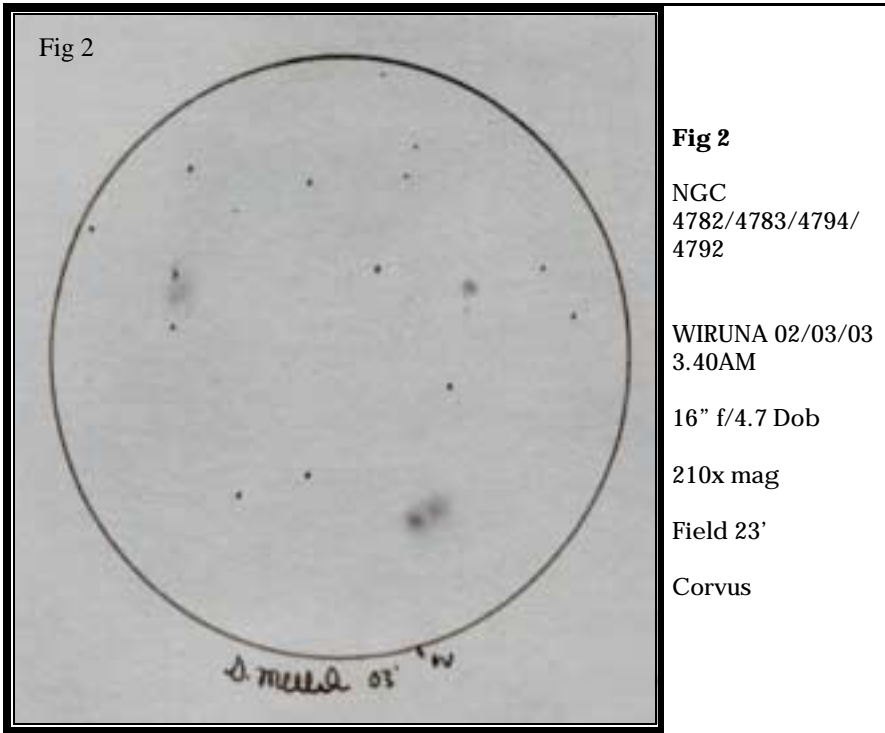
In the eyepiece of the 16" at 210x we see a gathering of four galaxies in the 23' field. As seen in the sketch (Fig 2) there are two very close objects that may be interacting with each other. The close objects are NGC 4783/4782. These galaxies oddly enough do not show up on the DSS image (Fig 3) as two separate objects, but they appear as one over-exposed blob without any hint of their duplicity.

The Megastar chart however did show them as a pair. If you notice in the sketch, the brighter galaxy with the more distinguished core is NGC 4782, while its mildly fainter companion is NGC 4783. Both these objects are listed as EO Pec galaxies, but in the eyepiece they seem to hint at being face on spirals. They are both roughly 1.7' x 1.7' in size and would each be at about mag 12.0.

The next object to the top left of the 23' field is the rather diffuse NGC 4794. Situated almost between two mag 13.0 stars this rather quaint looking object appeared slightly elongated and without any hint of a core region. At about mag 14.0 and 1.8' x 1.0' in size NGC 4794 is classed as an SB (rs)a galaxy and was an unremarkable object other than having three other companions to contrast with it.

The last object we come to is the tiny and inconspicuous little galaxy about 10' above and slightly to the right of NGC 4782/4783. The rather minute little thing is NGC 4792 and is listed in Megastar as being at mag 16.0. This it definitely is not, as it would have been rather more difficult to see than it is. In the 16" at 210x mag it would at my guess be about mag 14.0. Though it is small, it was relatively easy to see in the 16" and I would not put it down as a hard object. It is classed as an SO sp, but appears as a featureless little fuzzy dot some 0.8 x 0.8 in size. Not a particularly inspiring object, but it did look rather quaint with the other objects in the field.

NGC 4783/4782/4792/4794 are at R. A.12 54 36.8 DEC -12 34 05.

**Fig 2**

NGC
4782/4783/4794/
4792

WIRUNA 02/03/03
3.40AM

16" f/4.7 Dob

210x mag

Field 23'

Corvus

The final object from this observing run is rather different to the previous ones.

I had only just purchased the latest Ephemeris about a week beforehand, and after having a look at what comets there were about the sky I decided that Comet 116P/Wild 4 would be placed reasonably high in the sky by the time I wished to observe it. I am not one to go chasing after comets, but if there are any around I may give them a go on the odd occasion. I plotted its coordinates on the millennium star chart using a pencil and steered the telescope over into Libra and star hopped over to the plotted position.

With just a minor bit of scouring about I came across a rather faint bit of fuzz of about some 12.0 mag. With a bit of averted vision I could just glean the hint of a fan shaped tail and a reasonably bright nucleus. It was rather a bland object, but it at least gave the hint that it was a comet. Being a galaxy hunter I double-checked the chart to see that there were no galaxies plotted within the field just in case I had mistaken it for something else. There was nothing else plotted even close to its position, so I was satisfied that it was Comet 116P/Wild 4. So I did a sketch and that was that, you can see the result in Fig 4.

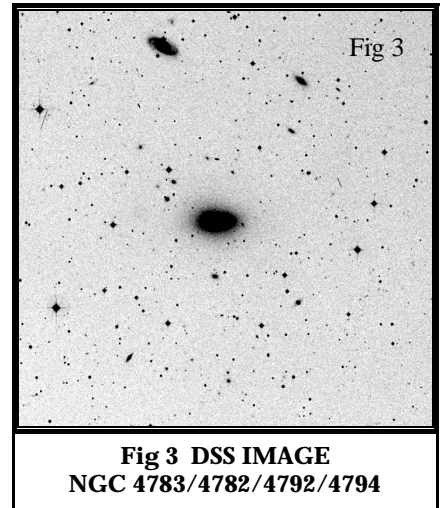
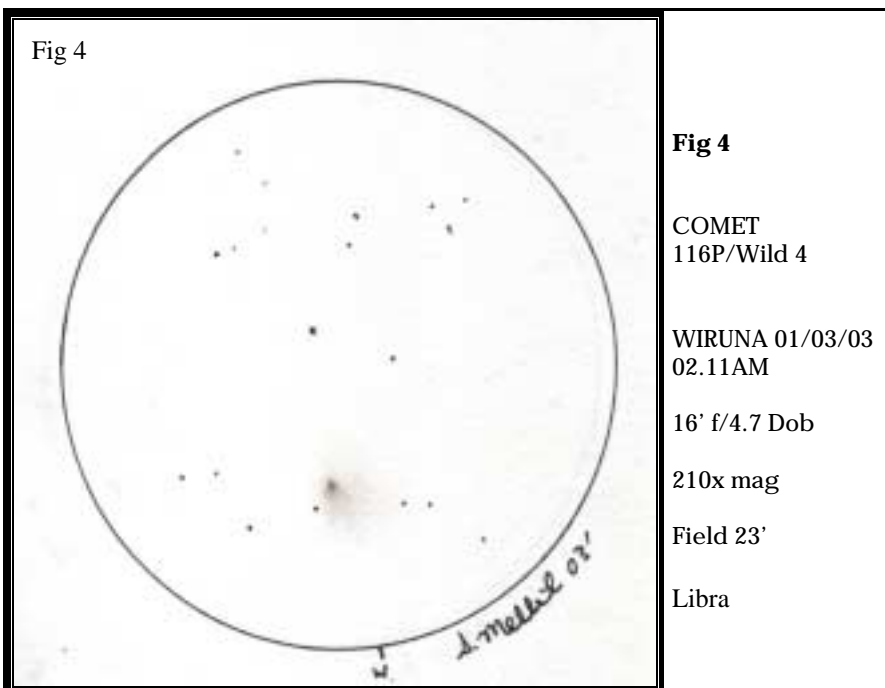


Fig 3 DSS IMAGE
NGC 4783/4782/4792/4794

So despite staying at Wiruna for five days I only managed to get about one and a half night's observing, which was pretty poor, though I at least got enough done to fill a Post Mortem.

CLEAR SKIES.

**Fig 4**

COMET
116P/Wild 4

WIRUNA 01/03/03
02.11AM

16' f/4.7 Dob

210x mag

Field 23'

Libra

ASTROCARD NEWS

By Greg Bryant

Twenty years ago, in May 1983, the club launched the Astrocard service. A stroke of luck saw the service in place just in time for the announcement on 4th May of the discovery of Comet IRAS-Araki-Alcock, which peaked at 2nd magnitude just one week later, passing just 0.03 astronomical units (AU) from Earth - the 3rd closest approach of any comet reliably known.

Observers must have been wondering if they had stumbled into a shooting gallery, as five days after the announcement of IRAS-Araki-Alcock came the discovery of another comet, Sugano-Saigusa-Fujikawa. It passed just 0.06 AU from Earth at 5th magnitude a month later (that approach ranks at number ten on the all-time list). No comet since then has passed as close to Earth as either of the above comets (the Great Comet Hyakutake in 1996 was ranked 19th at 0.10 AU), though some known periodic comets will challenge those rankings in the next two decades.

Jump forward twenty years to today, and some 170 Astrocards have been issued. Recent months haven't seen anything quite as immediate as the Astrocard service's beginnings. However, some highlights have included:

- Three novae in Sagittarius, the brightest of which reached 5th magnitude under a moonlit sky.
- Two comets that were easy binocular sights earlier this year. One of them, Comet C/2002 V1 (NEAT), was visible to the naked-eye for a short time from good skies.
- The discovery, last October, of Comet C/2002 T7 (LINEAR) which is still on track to rise to naked-eye visibility in Autumn of next year, at the same time as the previously discovered C/2001 Q4 (NEAT).

In the meantime, May's morning sky plays host to a binocular comet. Discovered last December, Comet Juels-Holvorcem has brightened at a rapid rate for observers in the Northern Hemisphere, more so than was expected. We'll catch it from the end of April, after perihelion. At that time - based on its performance up until late March - it could be 6th magnitude and fading as it moves through Pisces and Cetus.

If you'd like to subscribe to the club's Astrocard service, payments of \$10 made payable to the ASNSW should be sent to

The ASNSW
GPO Box 1123
Sydney, NSW 2001

Key Astronomy Dates 2003

Submitted by Lesa Moore

24th - 25th May

School of Astronomy at Macquarie University
<http://www.physics.mq.edu.au/~alanv/ffaevent.htm>

13th - 26th July

International Astronomical Union General Assembly at Darling Harbour
<http://www.astronomy2003.com/>

Sunday 20th July

Festival of Astronomy North Sydney "FANS" at North Sydney Oval

Friday 29th August

"Opposition of Mars Party" at Macquarie University Observatory
email: starrylady@hotmail.com

Saturday 6th September

Astronomy Open Night at Macquarie University
<http://www.physics.mq.edu.au/~alanv/ffaevent.htm>

The Macquarie University School of Astronomy is coming up. I can highly recommend this weekend activity.

Eight talks are given over two days by professional astronomers, usually from the Anglo-Australian Observatory and the Australia Telescope National Facility. Occasionally talks are also given by lecturers and professors from Macquarie and other universities. Lunch, morning and afternoon tea are provided. At the time of printing, the program has not been finalized, but check the web page for details of speakers and cost.

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MAP CONSTRUCTIONS

PART 2 OF 2

There are other non-projection methods of making maps, particularly those covering the whole sphere. These are obtained by making a frame of grid lines and plotting shape upon it.



Fig 10
Mercator Projection

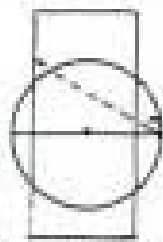


Fig 11
Gault's
Stereographic Projection.

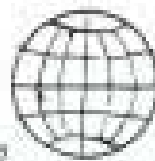


Fig 12
Lambert's Zenithal
Equal Area Projection

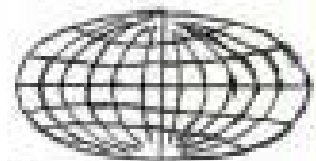


Fig 13
Hammer Aitoff Projection

Mercator's Projection has the sphere placed within a cylinder and expanded in such a manner that where the globe is expanded to reach the cylinder in longitude it is expanded in latitude by the same ratio. This keeps the direction of one place from another correct, for use in navigation. But the high latitudes are exaggerated and the Polar Regions blown away.

Gault's Stereographic has a cylinder intersecting the sphere at 45° latitude and all points of the shape are projected onto the cylinder from the opposite ends of all diameters. It is not so exaggerated in high latitudes.

Lambert's Equal Area Projection preserves all areas correctly.

Hammer-Aitoff Projection is derived from the Zenithal Equal Area by compressing it to 50% high vertically only while doubling the numbers of the longitudes. It is also equal area.



Fig 14
Globular Projection

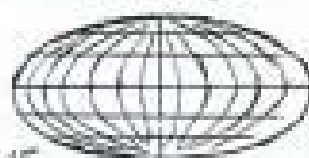


Fig 15
Mollweide Projection



Fig 16
Parabolic Projection

Globular Projection used in many atlases to show the world in two hemispheres, east and west. The Equator, the Polar Axis and each half of the perimeter is divided into the same number of parts with circles drawn through them.

Mollweide, or Elliptical Projection is an Equal Area one. The meridians are all ellipses equally spaced and the parallels are all straight lines unevenly spaced. Frequently used to show distributions.

Parabolic Projection is an equal area projection intermediate between between Sinusoidal and Mollweide. The meridians are all parabolas, and the parallels are straight lines.

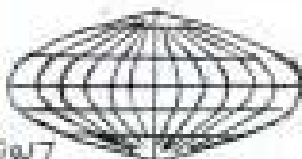


Fig 17
Sinusoidal Projection

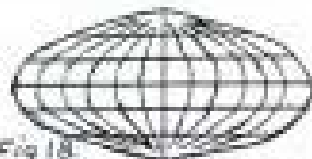


Fig 18
Eumorphic Projection

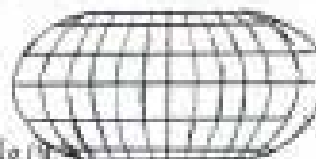


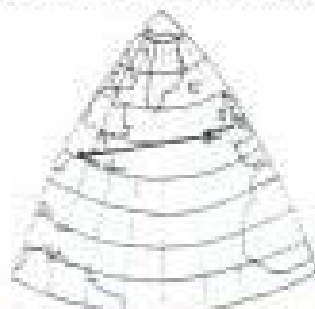
Fig 19
Eckert's Fourth

Sinusoidal Projection The Equator and Polar Axis are straight lines evenly divided, the parallels are straight lines evenly divided and the meridians are sine curves. It is equal area.

The Eumorphic Projection is an arithmetical mean between Sinusoidal and Mollweide, also equal area.



van der Grinten



Two Point Projection

van der Grinten's shows whole world in one circle. Popular in some newspapers.

Two Point Projection This is suitable for ships plying regular between two ports. All points on the map are drawn at the correct distances from both of these ports.