

Vol 16: Issue 8, Sep '11

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From the Editor

Welcome to the September 2011 edition of Prime Focus.

Prime Focus is the Society's monthly electronic journal, containing information about Society affairs and on the subjects of astronomy and space exploration from both members and external contributors.

We are constantly seeking articles about your experiences as an amateur astronomer and member of MAS, on any astronomy-related topic about which you hold a particular interest. Please submit any articles to the Editor at **editor@macastro.org.au** at any time.

The larger "print" version of this September edition is now available at the "*Members/Prime Focus/2011*" menu link on our website at:

http://www.macastro.org.au for members to download.

Other astronomical societies, as well as industry-related vendors, may request a copy of this edition of Prime Focus in electronic form by sending an email to **secretary@macastro.org.au**.

If amateur astronomy-related vendors would like to advertise in Prime Focus from next month, then please send an email to the Secretary with your details, and we will endeavour to come back to you with a suitable plan.

Please enjoy this September edition - our fourth in the new-look Prime Focus series.

Clear Skies! Chris Malikoff



President's Report

Welcome to Prime Focus!

As I was unable to attend the August Macarthur Astronomy Forum, my first job this month is to thank Chris Malikoff for taking over my duties for the evening. Thank you Chris.

We have had two outreach events this past month. The first was a night for St Paul's Primary School in Camden. A big thanks to the members who turned up to support these kids. I really enjoy these nights. The questions from the children and their endless enthusiasm makes me feel a whole lot younger myself. Also a very big thank you to the staff of St Paul's for looking after us so well.

The second was our "m a g n i t u d e" public night at The Oaks. There were about 60 members of the public who attended. As usual, there were many questions asked and many questions answered. The moon was a little too prominent and didn't allow for many deep sky objects. We will choose a night that should allow both for our first "m a g n i t u d e" night next year. Keep an eye out for that.

This month's meeting will be a Members Telescope Workshop. We will be holding this at Blair Athol Community Centre, 59 The Kraal Drive, Blair Athol NSW. You can find a map here in Prime Focus on page 27 if you are unsure of the location.

Our October Macarthur Astronomy Forum is on Monday 17th with Guest Speaker, Gary Kopff from Wildcard Innovations. We will be back at UWS for this event. Trevor Rhodes

100 meters

Macarthur Astronomy Forum

Next Meeting:

Monday 19th September 2011 at 7.30 pm

Blair Athol Community Centre 59 The Kraal Drive Blair Athol, NSW

Guest Speaker: Chris Malikoff (Workshop Evening)

Topic:

"Telescopes for photography"

Looking forward to "doin' it" with you in the dark ...

Trevor Rhodes



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Member profile - Jack Goralewski

My interest in astronomy started when, at the age of eleven, I studied the solar system for a term in Grade Five. I nagged and nagged my Mum until I managed to get a telescope: the ubiquitous "525x" Tasco.

"525x! I'll be able to see little green men on Mars, and see the planets - just like on the box!" I thought. Sadly not. What I could see was a dim, soupy ball – Jupiter, nonetheless, and it obviously had a lasting impression on me.

My Mother, in her tireless encouragement of learning and education, signed me up to MAS sometime around 1998 and we attended a few meetings; even went out to Cobbity once. I saw the huge Meade GOTO telescopes, and realised that mine was crummy, and would never produce the pictures claimed on the box. So the telescope and box became one, stowed away in my back of my closet and sat there for some thirteen years.

Then, in early 2010, a friend of mine asked me to go to his place to help him setup his new telescope - a gift from his girlfriend. I explained that whatever experience I had in setting up a telescope was long lost, but figured I'd go along anyway. I was much surprised when I saw his new 'scope. It was very, very strange to me. The eyepiece was at the top end, and a mirror at the bottom. It didn't move up and down like a normal telescope, it went on strange angles.

Perplexed, I reached for the user's manual. It read: "Newtonian EQ3 telescope". "What the heck is EQ3?" I thought.

We set it up like the manual described, but I didn't have a clue why it worked the way it did. Regardless, we still used it in the Alt/Az fashion. We managed to find Saturn and my jaw dropped.

That same feeling I had when I was eleven came rushing back. When I got home that night, I hopped onto the internet and had a look for M.A.S. Lo and behold, it still existed and I immediately re-joined.

That pretty much takes us to today, where I now sport a 12" solid tube Dobsonian telescope, and few other bits and pieces. Oh, and I now know what an EQ mount is, and why that strange motion isn't so strange after all.

Tack

Secretary's Column Roger Powell Committee Matters...

Following a recent incident of a laser pointer being aimed at an aircraft from Mt Annan (we are confident that this incident was unrelated to any of our members) it is an opportune time to once more remind everyone to keep their laser pointers locked up when not in use.

Membership of the Society provides members with a free permit to use a laser pointer in pursuit of their astronomical hobby, but that will not protect members if they have no astronomical reason for carrying one, and it certainly won't help the amateur astronomy community if they or a family member uses one illegally.

Laser pointer registrations are handled by the Police Firearms Registry, which is a measure of how seriously the authorities view these devices. We do not want the right of astronomers to use them taken away, which is why the Committee maintains it's own register of members who own them. Please register your device with us - in order that we may provide assistance to you in the event that police ask you questions, and please keep your device locked up.

The Forest is our premier observing site, with dark skies and cabin facilities. The committee would like to encourage more members to use it on a regular basis. Our dark sky weekends are held there every month, at or close to the New Moon, which is the best time to view the most elusive objects.

Having said that, I am sorry to say that the Committee has been forced to put up The Forest admission fee to \$15.00 per person per night, because the owner has doubled the weekend fee from \$77 to \$150. Regardless of the forced increase, the Committee felt that \$15 still represents good value to members. We still expect to attract sufficient attendance to continue breaking even over the course of the year. The increase begins in November.

Despite our efforts to date, the Committee has been unable to secure financial support in the form of advertising or sponsorship, although we are waiting for some commercial organisations to respond.

For only the second time in our fifteen year history, the next General Meeting (the Macarthur Astronomy Forum for September) will be held outside the University of Western Sydney. The only other occasion was the initial meeting in January 1996, which was held in Phil Ainsworth's double garage in Ingleburn. Every other meeting since then has been held at UWS, free of charge. There is still a possibility that this may continue and a decision will be made next month on our venue for next year.

Whilst we are waiting to find out whether the University wishes to retain an association with MAS, we will be "road testing" the Blair Athol Community Centre to check it's suitability for our meetings. The Committee hopes that all members will attend, to help us decide whether this will suit our purposes. Like the UWS meeting room, it has it's pros and cons. In it's favour, it is clean & modern, with it's own car park and no access stairs. Against? Well, we want you to tell us what you think of its general comfort and acoustic qualities.

Blair Athol has no projection facilities, so we will be providing our own. It is folklore within the Society that the Committee purchased a digital projection unit about ten years ago to use at our UWS meetings. Immediately after taking delivery of it, UWS fitted out the meeting room with permanent audio-visual facilities and our shiny new projector was moth-balled. It's only use since then has been when one of our members has needed it when presenting an astronomy talk to a local community group. Take a bow, Bob Bee.

Bob is very much in demand locally and does several talks a year, all of them promoting astronomy and MAS. He does this for love and MAS is very happy to support Bob as part of our Public Outreach Programme.

The Management Committee decided recently that it would investigate the possibility of initiating a "Sister Society" relationship with an English-speaking astronomical society of our choice from the northern hemisphere. A number of benefits have been suggested in support of such an arrangement, not the least of them being the sharing of knowledge and experience between two similar groups on opposite sides of the planet. The feedback and suggestions of members about this will be welcomed by any Committee member.

I wrote in my June 'Secretary's Column' that the Committee had decided to write to Campbelltown City Council, protesting about their decision to install up-lights in Mawson Park. Thanks to Robert Leonard for drawing this to our attention. A letter went to the Mayor, Cr. Paul Lake and he later called me to discuss it as a sign of the high esteem in which MAS is held locally. I can now report that I was called two weeks ago by a senior staff member, to advise me that Council will not be proceeding with this installation.

That's one small step for MAS, one giant leap for Campbelltown Council!

Society Schedule September 2011 19/09/2011 Macarthur Astro Forum

23-24/09/2011 The Forest

October 2011 7-9/10/2011 "The Dish" Astro Tour 17/10/2011 Macarthur Astro Forum

Parkes Trip

MAS Field Trip

Depart 7th Oct, Return 9th Oct.

Final payments by 19th September.

If you wish to attend, please contact Treasurer Tony Law immediately to confirm your booking tony.law@iinet.au or see him at the Macarthur Astronomy Forum.

Cost is \$290 per person.

Confirmed Itinerary:

7th October:

8.00 am Pick up Narellan by Gang Gang Tours – Kevin is the driver (Queen Street)

10.00am Morning Tea provided by Gang Gang

12.00noon Break for Lunch in Mudgee (not included in cost)

3.00pm Arrive Golden West Motor Inn -

http://www.goldenwestmotorinn.com.au/

5.45pm Dinner at Golden West (included in cost)

7.15pm -11pm Dubbo Observatory -

http://www.dubboobservatory.com.au/

(included in cost)

8th October:

7.30am Breakfast at Motel (included in cost)

8.15am Depart for Peak Hill

9.15am Arrive Peak Hill Open Cut Goldmine -

http://www.parkes.nsw.gov.au/about/1011/5922.html

11.30am Depart for The Dish

12.15pm Arrive Parkes - lunch at The Dish (not included in cost)

Guided Tour of The Dish, movies and info – this event occurs every two years – see:

http://www.parkes.atnf.csiro.au/news_events/ opendays/2011/

4.00pm Depart to Moonraker Motor Inn -

http://moonraker.bestwestern.com.au/

6.30pm Dinner – at Moonraker (included in cost)

9th October:

8.00am Breakfast at Moonraker – (included in cost)

9.00am Depart for Narellan

11.30am Break for Lunch in Bathurst (not included in cost)

3.00pm ETA Narellan

Total Cost is \$290.00 per person based on 24 people twin share

Contact Tony Law to confirm your booking immediately – a \$100.00 deposit is required by August 15th 2011, the balance by September 19th.

Call Tony on **0419 215199** if you have any questions.



Tony Law



2013 Hawaiian Sojourn

Tony Law



We are arranging a trip to the 'Big Island" of Hawaii in 2013.

Tentative itinerary is for 4-5 nights viewing on Mauna Kea, Hawaii (Hilo) and four days on Oahu (Honolulu). Hilo is the the start point for visiting the major telescopes on the summit and observing from the Onikuza Visitors centre. A trip to the Kilauea Volcano is also envisaged.

On Oahu we will stay in Waikiki and visit Pearl Harbor, the Polynesian cultural centre, Pipeline (surf beach), etc

The anticipated total cost will be around \$1,250.00 for airfares, \$1,000 for accommodation and \$500.00 for food etc. Another couple of hundred for transport so about \$3,000.00 in total. Add a couple of hundred for incidental tours. We'll provide more details much closer to the time.

To help MAS Members save for this trip, we have set up a special bank account. You may pay in whatever and whenever you wish by direct debit or by cash over the counter. You must ensure that you include your name in the reference when you make the deposit so that it can be refunded if required. This is a non-interest-bearing account. We look forward to hearing from all interested.

Call Tony on **0419 215199** if you have any questions or would like to know the bank account details.



"To Infinity and Beyond..."

Davy Jones

One could not venture far into the development of scientific thought in the early 20th century without mentioning, possibly one of the best known names in science, Albert Einstein. In a career spanning over fifty years, he investigated many of the ambiguities of physics. Above all else, his name will be forever synonymous with: The Theory of Relativity and the formula: E=mc2. Many regard Einstein as a cerebral demigod; others, rate him high enough to be pasted onto a kitsch T-shirt.

Einstein was a theoretical physicist; an occupation stretching back to Pythagoras of Samos (570-495BC). As the name implies, those who work in this area indulge more in - what should in theory happen – rather than what happens in reality. Theorists create hypotheses with the use of mathematical models, formulae and thought experiments (German - gedankenexperiment: Ancient Greek - deiknymi). Such theories may not be proved conclusively for many years – if ever.

*For famous thought experiments see: Schrodinger's cat – or Maxwell's demon.

From our historical vantage point, it is only too easy to picture Mr A Einstein sitting in his patent office, pondering the finer points of relativity. Then – like Archimedes – he has a lightbulb moment when everything falls into place. "*Heureka!*", he shouts. (German, for that other word). He then dashes off to write his thesis before he forgets what he was thinking about.

I'm sure you'll appreciate; it didn't quite happen that way. As we have proved convincingly throughout this year – such significant ideas do not 'just occur' in isolation. To understand how the Theory of Relativity got going, it would be necessary to begin perhaps with Aristotle. If one didn't wish to delve that far back, then one would at least have to start around the time of Galileo (1564-1642) or Sir Isaac Newton (1642-1727). In more modern times, contemporaries of Einstein, Jules Henri Poincaré (1854-1912) and the Dutch physicist, Hendrik Lorentz (1853-1928), were both directly instrumental in the development of today's Theory of Relativity.

Whilst researching, I came across one document accusing Einstein of having stolen or plagiarized the idea of relativity from the above-mentioned gentlemen. The author of that document suggested Einstein would go down as the biggest fraud in history! Nikola Tesla, an amazing character I have written about previously, went as far as to suggest the concept of relativity originated with a countryman of his, one Ruđer Bošković (1711-1787). Incidentally, Tesla himself did not believe in General Relativity because it meant disposing of the idea of the 'cosmic ether'. It is recorded that although Albert Einstein never directly acknowledged the contributions of either Poincaré or Lorentz, a few years before his death, he commented on Poincaré as being one of the pioneers of relativity, saying: "Lorentz had already recognised that the transformation named after him (Lorentz) is essential for the analysis of Maxwell's equations, and Poincaré deepened this insight still further ... "

The 'logic' behind the Theory of Relativity does not immediately fall into place in our terrestrial bound psyche – nor, as one reveals its essence, does it directly make much sense. Trumpeted as one of the most significant advances of our time – Relativity is so named because time and length are shown not to be absolutes! The clock on the wall and the tape

> measure on the desk seem like absolutes! A minute and a centimetre for you, must be the same as they are for me – and the same elsewhere in the universe; but they are not! According to the theory of relativity, objects travelling (in space) near the speed of light will move slower and shorten in length, from the point of view of an observer on Earth. For an excellent explanation of this phenomenon I recommend

reading 'the twins paradox' – The Puzzle of the Twins pp. 59-65 – About Time – Davies (1995). Time dilation, as an observable reality, is clarified by Davies in his usual inimitable style throughout this paperback. The central point of time dilation, in this sense is: really high speed space travel is also time travel – the space traveller can travel into the future without physically aging at the same rate as an observer on Earth.

Einstein's third paper, 'On the Electrodynamics of Moving bodies' was published on the 3rd June1905. It is this paper that deals with space, time and the speed of light.Einstein's final paper of 1905 established perhaps the most well-known formula in

Two things are infinite: the universe and human stupidity; and 1'm not sure about the universe ·)

Albert Einstein (1879-1955

history: E=mc2.This theory states that mass and energy are essentially the same thing.

From special relativity, (1905) he explained that as a body neared the speed of light, its mass increased. As mass increases, the body becomes harder to push and accelerate; resulting in a universal speed limit – the speed of light itself.Light, then, becomes the fastest speed at which it is possible to travel.

It took Einstein several years to realise he had made a few oversights, hence the publication of an additional paper: The General Theory of Relativity. This paper was published in 1916, and dealt with gravity and acceleration – thus completing his earlier propositions.

As expected, initial reactions to Einstein's proposals were approached with great caution. Some of the implications were quite astounding; if Einstein was correct then space itself was curved. In addition, light could be bent by gravity (now known as gravitational lensing), black holes should exist, Cosmic Microwave Background Radiation (CMB) should be detectable and our cosmos would be expanding (as verified by Hubble in 1928).

Einstein's theories of special and general relativity have, in recent times, been established with a high degree of accuracy. Many of his calculations have been substantiated with the development of modern technology that allows measurements and experiments - undreamt of in Einstein's time - to be carried out. One of the earliest and most famous of these affirmations occurred during the total solar eclipse of 1919 - which proved beyond doubt that as starlight passed the Sun, on its way to Earth, it is deflected (bent) by the Sun's gravitational pull. Relativity also predicted the rate at which two neutron stars orbiting one another will move toward each other; when first documented, general relativity proved correct to better than a trillionth of a percent of accuracy. Einstein no doubt felt some degree of relief at the extent of such accuracy; or perhaps he just whispered: 'I told you so.'

Over the past one hundred years, many books have been written and many discussion papers have explored Einstein's theories.Successive experiments have continued to prove and support Einstein's mathematical hypotheses.Naturally – science being what it is – Einstein's work is always open to criticism or challenge. However, as time passes, proof piles upon proof, providing further support to the multitude of implications thrown up by his work. The Science News – Nov 10, 2005 – reported how the University of Manchester (UK) discovered a new method to check aspects of the theory of relativity: see - http:// w w w.sciencedity.com/releases/ 2005/11/051110090022.htm

Yet again, in May, 2011, NASA Science released results of, what it described as, an Epic Space-Time

Experiment: http://science.nasa.gov/science-news/ science-at-nasa/2011/04may_epic/

The details outlined in the NASA press release confirmed that - Space-time around Earth appears to be distorted, just as general relativity predicts! The extraordinary technology developed to gather the required data is mind-boggling. Four gyroscopes were launched into space to record and measure the twist created by the Earth's gravitational pull on the fabric of space itself. The four gyroscopes are the most perfect spheres ever made by humans. Each measures 3.81cm and never differs from a perfect sphere by more than 40 atomic layers. The process of Atomic Layer Deposition (ALD) moves into the area of semi-conductors, and is worth reading about, should one feel so moved. Einstein's work continues its relevance in revealing the mysteries of the universe. In so saying - we should never forget the contributions those not fully acknowledged - as we search to infinity and beyond.

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Startrails extraordinaire...

An Australian photographer lends an artisic eye to the capture of some beautiful ashes of colour.

Mr Harrison, 36, bought his first camera last year to take pictures of clothes he wanted to sell on eBay. After reading an article I came across in the UK's Daily Mail on August 30th, I thought that I'd bring to our readers the colourful splendor that is Australian photographer Lincoln Harrison's passion.

I'm sure you'll agree that they're all utterly wall-worthy. - Ed

"Night Shift"

Nikon D7000, Nikkor 10-24mm Foreground: 9 shot HDR, f4.5, ISO100 Stars: 720 x 60 seconds (12 hours), f4.5 ISO800

"Dead Tree"

Foreground 1 x 120sec, f4, ISO400, lit by moonlight. Startrails 300 x 60sec, f4, ISO400, after moonset. Total shooting time was 8 hours.

"Stars and Stripes"

"Starry Night"

Nikon D7000, Nikkor 10-24mm Stars: 190 x 2minute exposures, f4.8, ISO400. Foreground: HDR 9 shot bracket, f4.8, ISO100 at dusk.

"Light Curtain"

Nikon D3100, Nikkor 10.5 fisheye Foreground: 4 shot HDR, f3.5, ISO100. Stars 160x120sec, f3.5, iso400.

"Vicious Circle"

D7000, Nikkor 10-24mm startrails: 184x90seconds, f4.8, ISO400. foreground: 9 shot HDR, f4.8, ISO100.

"Dawn Startrails"

Lake Eppalock, VIC. Everything went right with this one. Perfect conditions. Nikon D3100, Nikkor 10-24 @10mm 130 x 59sec exposures f5.6 ISO400 for the stars 2.45am-4.55am 16 x 0.62sec exposures f5.6 ISO100 for the sky and foreground 5.30am (30 minutes before sunrise).

"Rockstars"

Nikon D7000, Nikkor 10-24mm Stars: 270 x 120sec, f4.8, ISO400 Foreground: 60sec, f4.8, ISO400 Total shooting time 9.5 hours Processing time 15 hours

Original story:

http://www.dailymail.co.uk/sciencetech/article-2031704/Australian-photographer-Lincoln-Harrison-endures-15-hour-photo-shoots-capture-stunning-night-images-star-trails.html





Starry Night



Light Curtain



Vicious Circle



Dawn Startrails



Rockstars

"Pour, Oh pour the Pirate Sherry" - Part 1

The moonlight shimmered on the ruined chapel, revealing snatches of gothic windows and tombstones. For a tantalising moment it seemed so real until, with a wave of the conductor's baton, it all returned to cardboard and paper-maché wizardry and the second act of "The Pirates of Penzance" had begun. A pensive General Stanley was surrounded by his bevy of not-so-beautiful daughters while the beautiful Mabel tried to tend her father's melancholy mood.

For a full dress rehearsal, the performance by the Campbelltown Gilbert & Sullivan Society was going exceptionally well. There had been no

fluffed lines, sets and props had performed beyond expectations and the orchestra of fifteen had outdone themselves. It almost sent alarm bells ringing about the unlikelihood of a repeat of this standard at the coming opening night.

Jack Hobden, the production's Director, surveyed the small theatre with pride. While intimate in size, with worn yet comfortable seats for only one hundred patrons, it exuded character and, in conjunction with the superb sets and props, captured the essence of the 19th century drama, if that's how one might describe a G&S musical, unfolding on the stage.

Jack sank into his center back row seat to enjoy his favourite song from the play. The oboe grunted out the rhythmic march and onto the stage, resplendent in blue uniforms, bobby's hats and black fibre-glass batons plodded the troupe of ten policemen, lead by their gallant and extravagantly mutton-chopped sergeant.

Marking time in straight formation, they broke into the chorus:

A short story by Robert Bee

"When the foeman bears his steel, Tarantara, tarantara!"

The harmony of tenors and basses was glorious and then Mabel and Edith joined in with the foreboding:

"Go, ye heroes. Go to glory..."

On it went, a most rousing and boisterous chorus of danger, bravery and glory. Jack leaned his head back and closed his eyes to enjoy the performance, picturing



every choreographed movement they would make. In such a small theatre, the acoustics were striking and Jack could feel himself being lifted from his seat with the emotion of it all. For a moment, his stomach seemed to twist inside-out and as the final tarantara faded, he felt a small emotional jolt as he seemed to settle back into his seat's cushion.

"Bloody well done..." he started to shout, then suddenly realized Steven Crowe, playing Frederic, hadn't come in on cue with his line "Now the pirate's lair..." The first missed cue for the evening. He opened his eyes and was puzzled by what he saw on stage. Everyone was still in position, some even in halfstride but all were looking offstage into the audience area with what could, at its kindest, be

described as maniacal stares. Very maniacal stares. A few were rubbing their stomachs as Jack had a strange urge to do. Leanne Scott, playing Edith, looked, if Jack didn't know better, as if she was about to scream. Jack was wrong. Edith did scream. Piercingly. Then she fainted into Frederic's arms.

"What the hell is going on here?" Jack shouted as he stood, then stopped abruptly, aware for the first time that he was not alone in the audience seats. All the seats were occupied, and all the occupants had turned their gaze upon him. Jack found himself the subject of 99 pairs of eyes – no, make that 297 eyes as Jack's nervous examination of the occupant of the seat directly in front of him revealed that that... person... like all the others, had three eyes.

It was hard to know which eye or eyes to meet, the two adjacent green egg shaped eyes, or the red semicircular eye above them, the one that kept blinking at him.

"Look," said Jack to the red eye beside him, "how did you get in here? This is a closed rehearsal." It was the only rational question he could think of at that insane moment.

The owner of the red eye stood and turned to fully face Jack. Jack wished that it hadn't. "To whom are you addressing that question?" it asked in a voice like the sound of the tumbling balls in the Lotto barrel.

"To whom? To whom?" Jack was so taken aback with the precise grammar, that he almost failed to notice the appearance of the questioner below the eye. Almost, but not quite. The two metre tall body, the long six fingered gorilla-like arms, the blue-gray plated skin bearing numerous green scars, a pulsating bellows-like orifice in the center of the chest and a necklace of mango sized skulls hanging from what Jack assumed was its neck. It was hard not to notice. Oh, and a wicked ray-gun type weapon attached to its modesty belt. Jack wondered why a creature so large and threatening in appearance worried about modesty and didn't carry two weapons, then realized it did. The second was in the creature's hand, aimed at the point between his eyes.

Clearly, the cast on stage and the orchestra noted the same features in the other ninety eight audience members as they snapped from their fugue and initiated a screaming exit stage left, right and through the backdrop in the middle, Frederic and the police sergeant chivalrously carrying the still fainted Edith between them. Jack's immediate impulse to follow them was tempered only by the 99 hulking bodies between him and the stage and the ray gun, or whatever it was, pointed at his head by a very steady six fingered hand.

His disappointment was short lived, however. Before Jack could frame his next question to his blue-gray neighbour, the entire cast came staggering back on stage, some looking slightly greener than when they had left. Peter McIntyre, the Pirate King, was looking very unregal, his tears competing with his sweat to run down his greasepaint makeup and drip from his chin. "There's nothing there, Jack," he croaked. "Nothing."

Not taking his eye off the muzzle of the weapon, Jack said "What do you mean nothing, Peter? Nothing where?"

"Outside, dammit" snapped Peter. "We opened the back stage door, and there was nothing. Just blackness."

"Actually," drawled Ken Burton, the police sergeant, "that's not quite correct. There were stars. Lots of stars."

"For God's sake, Ken, how can you be so calm about this?" snarled Peter.

"Easy. This is all just a dream, and I shall awake from it soon, so what's to get excited about?" Ken sat down on the stage, rolled over into the fetal position, placed his thumb in his mouth and started to suck, silently.

Jack forced his attention from the hysterics and human chaos on stage and turned to the weapon bearer. "Ah, I believe I was addressing that question to you." He forced himself to sit down, slowly. "And allow me to rephrase it. Who the hell are you, and where in blazes are we?"

"How nobly put," the Lotto balls burbled. The creature holstered its weapon and sat beside Jack, the theatre seat groaning under its weight. "Where the blazes you are is on, or more accurately under, our valiant ship Incandescent Conflagration."

"Incandescent Conflagration? What kind of name is that for a ship? Do you have a death wish? " Jack said.

"Probably lost something in the translation", said the creature. "And the hell we are the Zzurags, elite warriors from Zzenda. They call me Zzlugg."

"Zllugg?"

"No, Zzlugg. Two zeds, one el", corrected Zzlugg.

Jack glanced across at Ken Burton, blissfully sucking his thumb on stage. Maybe he's...

"No, you're not dreaming Mr. Hobden", Zzlugg said. "This is very real. As real as Tarantara."

"I beg your pardon?" said Jack. "Look here, what is it you want from us?"

"Oh, rapture unexampled! A simple question at last." Zzlugg turned all three eyes upon Jack, the red eye blazing more intensely than before. "You, and your troop..."

"That's troupe" interjected Jack.

"Spare me the singulars and plurals", said Zzlugg. "You are going to win us a war."

What war? With who... sorry, whom? And how will a troupe of G&S players win it?

Stay tuned for Part 2 of 'Pour oh Pour the Pirate Sherry.

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A Plethora of Double Star Catalogues

Bob Bee

This is the continuation of my earlier article where I covered the double star catalogues of Struve, O. Struve, J. Herschel, Dunlop, S.W Burnham and Aitken.

Double stars have long been a source of fascination and study over the history of observational astronomy. As a simple definition, a double star is a pair of stars that appear close to each other when seen through an optical instrument such as binoculars or telescopes. Their state of 'doubleness' however could be for two reasons. Firstly it could be simply a chance alignment of two stars which are not gravitationally associated and, in fact, of significantly different distances from the Earth. Strange as it may seem, such chance alignments are much less likely than the second reason, which is that the two stars are gravitationally bound, orbiting each other. Alpha Centauri is a classic example.

In the first case, the double star is described as an 'optical double'. In the second case they are described as being a 'binary star'.

Binary stars in particular are of special interest to astronomers. Precise measurement of their motion over long periods allow for the calculation of the stars' masses and other stellar properties. Hence the proliferation of Double Star catalogues as featured in this series of articles.

The precise percentage of stars in the galaxy that form a binary (or multiple – that is, more than two) system is an open question. At one time, it was the common wisdom that at least two thirds of all stars exist in such a relationship. However, recent surveys appear to challenge that high number. It would be fairly safe to say, for now, that 'at least' half of all stars are in a binary/multiple relationship.

Now we continue our look at the profiles of the various Double Star Catalogue compilers.

Alvan Clark = AC

Alvan (1832 – 1897), born at Fall River, Massachusetts, was the son of a famous instrument maker, Alvan Clark. Forgoing his early career choice as a portrait artist, he went to work with his father as a lens grinder. In this role, he participated in the manufacture and finishing of mirrors and lenses for some of the largest telescopes of the 19th century. His greatest lens making achievements were the great Yerkes 40 inch and Lick 36 inch telescopes, the largest and second largest refractors in the world.

It was a serendipitous moment in 1861, then, when testing a lens which he had made for Edward Barnard, he looked through it at the star Sirius and saw a faint spot close to the star. It turned out to be Sirius B (the Pup), the companion of Sirius predicted by Bessel 17 years earlier in 1844. This was to be the first white dwarf star ever visually located. It made A G Clark famous.

He continued his observations and is credited with discovering 16 double stars. Not a large catalogue but a prestigious one.



Alvan Graham Clark



Sirius and Sirius B

R.A.Rossiter = Rst

Professor Richard Alfred Rossiter (1896-1977)

R A Rossiter graduated from Wesleyan University in 1914 and received his Master of Astronomy (1920) and Ph.D (1923) from the University of Michigan. Meanwhile W J Hussey and his friend R P Lamont initiated the establishment of an observatory in the Southern Hemisphere to be devoted to cataloguing double stars. Hussey had been involved at the Lick observatory in discovering and observing double stars and he wished to extend that study to the southern skies. He chose young Rossiter to be his assistant in the new observatory that was to be built in South Africa. Sadly Dr Hussey died on-route to South Africa.

This threw the entire responsibility of site selection, construction, telescope installation and the commencement of the search for double stars onto the shoulders of Rossiter. The Lamont-Hussey Observatory was dedicated in 1928 with Rossiter as its first Director (or Astronomer-in-Charge).

Since 1933, except for a very brief period, he was the only observer for this long running program, resulting in the discovery of more than 5,500 pairs of double stars and approximately 30,000 measurements. He resigned his Directorship in 1952 after 26 years work.

His double star work was published in 1955 in the seminal "Catalogue of Southern Double Stars".



R A Rossiter



Lamont-Hussey Observatory, South Africa

F.Argelander = Arg

Friedrich Wilhelm August Argelander (1799 – 1875) was born in Memel, Prussia.

Argelander was enthused into a career in astronomy by Friedrich Wilhelm Bessel, the brilliant mathematician and astronomer who measured the parallax of 61 Cygni and discovered the 'existence' the companion of Sirius. He became a student of Bessel and then in 1820 his assistant at the Königsberg observatory. Under Bessel's mentoring, Argelander obtained a job as an observer in 1823 at the university observatory of Abo in Finland. Argelander became director of the observatory and in 1828 he also became professor for astronomy at the University of Turku. In 1839 he moved to the University of Berlin.

Argelander was responsible for establishing the study of variable stars as an independent branch of astronomy. In the process, he developed the nomenclature for variable stars, still used today. This nomenclature system is as follows:

In a given constellation, the first variable stars discovered are designated with letters R through Z, e.g. <u>R</u> <u>Andromedae</u>. Letters RR through RZ, SS through SZ, up to ZZ are used for the next discoveries, e.g. <u>RR Lyrae</u>. Later

discoveries used letters AA through AZ, BB through BZ, and up to QQ through QZ (with J omitted). Once those 334 combinations are exhausted, variables are numbered in order of discovery, starting with the prefixed V335 onwards.

Between 1859 and 1886, Argelander and his students in Bonn, Germany, published the huge star catalogue known as the Bonner Durchmusterung Des Nördlichen Himmels (Bonn Examination of the Northern Sky) or B.D. It gave the positions and estimated visual magnitudes of 457,848 stars, complete to magnitude 9. The B.D. covered declination zones +89° to -1°. Positions are given to the nearest 0.1 arc second in right ascension and 0.1 arc minute in declination. The B.D. was first published by Argelander in 1859-1863, then republished by others in 1903, 1951, and 1968.

This weighty catalogue included the details of many double stars which were identified with the prefix Arg.



F. Argelander

H.A.Howe = Hwe

Herbert Alonzo Howe (1858-1926) was Professor of Astronomy and Applied Mathematics, University of Denver, 1880-1925; Dean of the College of Arts and Sciences, 1892-1926; and Director of the Chamberlin Observatory, 1892-1926 until his untimely death. This prestigious career came about via a passionate interest in stars as a child, obtaining a Bachelor of Astronomy degree at age 17, then a Masters degree at age 19. This led to working at Cincinnati as an observatory assistant for three years, devoted to the measurement of double stars.

Herbert A. Howe was an internationally known astronomer and mathematician. He was instrumental in the building of the Chamberlin Observatory in Denver Colorado and was essential to the installation of the 20" telescope which he put to good use.

Howe published a book called 'A Study of the Stars' in 1896 which was both a popular astronomy book as well as a detailed description of telescope design.



H. A. Howe

Chamberlin Observatory

Chamberlin 20"

Cordoba Observatory = Cor

The Argentine National Observatory, today The Astronomical Observatory of Córdoba, was founded on 24 October 1871, by Argentine president Domingo F. Sarmiento and the North American astronomer Benjamin Apthorp Gould.

It is arguable that the establishment of Cordoba Observatory was the beginning of astronomical studies in Argentina. The chance meeting of Argentina's president Sarmiento with American astronomer Benjamin Gould while Sarmiento was visiting the United States revealed that Gould was very interested in travel to Argentina in order to study the stellar south hemisphere.

Sarmiento invited the Gould to travel to Argentina in 1869, and provided his full support to organize an observatory. On arriving in Buenos Aires for the inauguration of the Astronomical Observatory of Cordoba in 1971, the enthusiastic Gould began that night, first with the naked eye, then later with the aid of small binoculars, to begin a map of the southern sky, with more than 7000 ultimately stars recorded. This was published under the name of Uranometría Argentina.

Gould was director of the observatory until 1885, when he returned to the United States. Amongst his works on the observatory was its Catálogo de Zonas (1884), which registered more than 70,000 stars of the southern hemisphere, and the Argentinian General Catalog which contains about 35,000 stars. Many double stars were identified in these catalogues.

Cordoba Observatory proudly claims to have been in the forefront of astronomical photography. In one mammoth project it took hundreds of plates of open star clusters in the southern hemisphere, from which were subsequently determined the positions of each of their stars. This was the first systematic and large-scale astronomy book published using the photographic technique (they claim). It was published in 1897 under the name Fotografías Cordobesas.





Argentine stamp with Cordoba telescope

Cordoba Observatory



VIRAC - Latvia

Ventspils International Radio Astronomy Centre (VIRAC)

Allan & Liz Hobbs

Irbene, Latvia (a ghost town)

From our hotel in Ventspils, Latvia, we drove thirty kilometres north of town to the VIRAC (Ventspils International Radio Astronomy Centre) at Irbene. The now ghost town didn't appear on any paper maps, but we were fortunate the TomTom knew where to go. The road was very flat and straight for most of the way and we passed only about half a dozen cars in all.

As we turned off the main road, we passed blocks of derelict Russian accommodation buildings. The large unit blocks with peeling paint and broken windows looked pretty grim, much similar to their inhabited counterparts in various Eastern European cities, not to mention our hotel. In it's heyday, Irbene hosted over 2,000 Russians. Except for one car parked outside, the place seemed deserted. As we approached, a man got in the car and departed, leaving us to think we'd come all the way for nought.

There was paperwork stuck to the windows at the base of the telescope and as we were reading them, the door opened and a young mechanic, the only person in attendance, very keenly offered to show us around. He was expecting a school group for a tour in the next 20 minutes so we had to do a quick tour so he could be back for them.

He issued us with hard hats and as we climbed our way to the top, he made his explanations. The structure was built by a naval factory in the Ukraine and the interiors are reminiscent of a ship. Situated in a former Russian army town, the 1970s military installation is believed to have spied on communications between Europe and the USA for at least a decade.

When they left in 1994, after first committing sabotage on the installation, the Russians took the smallest dish, leaving the two heavier ones which are 16m (52ft.) RT-16 and 32m (105ft.) fully steerable, centimetre-wave range antenna, RT-32. The bigger one is the largest radio telescope in Northern Europe and the world's eighth largest. The sabotage, e.g. driving nails into cables, proved to be ineffectual as everything still works after some major repairs. The smaller RT-16 telescope is still in the process of restoration and only just had power switched on to it in the week we were

there for the first time since the Russians departed. The Russians didn't destroy the remaining two telescope as they were expecting to return some day, not expecting that Latvia would apply for independence.

Sadly, when we climbed onto the dish, the young man asked that no photos be taken as he wasn't supposed to take anyone up there. We had to walk on the rivets so as not to damage the aluminium sheets. It is built like an aircraft wing.

Back at the bottom, we had a look in the control room. All the equipment is original and still works. We'll there are two control panels, as everything on the telescope was duplicated, just in case. One of the control panels is fully operational and the other was not able to be repaired from the sabotage, consisting of cut cables. There are no mechanical or electrical drawings remaining as they were taken but the retreating Russian forces. A staff of thirty work there now, including seven scientists who mainly study the sun among other things. A combination of size and precision engineering makes the larger dish especially valuable to scientists. All of the "electronics" for receiving signals were removed by the Russians and new equipment has been installed to service the current requirements of the telescope.

It is definitely worth a visit if you are planning a trip to Latvia. It is also worth spending a little time exploring around the site as there are relics of the Russian times including old tanks. It's a pity we found out about that after leaving Latvia. We proceeded to the 38 metre high Ovisi Lighthouse- built in 1814, is the oldest lighthouse in Latvia. It has kept most of its original structural and architectural appearance and is still operational today. The light was first lit in 1814.

The building's interior features a second tower (a tower within a tower). Some structural modifications were carried out in 1866 and a separate building for the fog-horn was added in 1904. The lighthouse features a exhibition on the history of the lighthouse building. The lighthouse keeper is a woman and she gives you a personal and in-depth tour for a nominal fee. Great value. I (Allan) climbed the 300 odd steps to the top and was nearly blown off by the strong and freezing Baltic winds. (That's probably where I got the bronchitis I was to eventually end up with for the remainder of the holiday) the view from the top was great, you can even see the VIRAC telescope, some 5 kilometres away.



The antenna is mounted on the top of a 25 meter high tower. There are azimuth and elevation rotation axes on the tower. The vertical azimuth axis is made of massive 15 m tall pipe with 2.3 m diameter. On the top there is placed the elevation axis. The antenna system is of Cassegrain type. The supporting structure of the main mirror is made from steel pipes. This structure supports the mirrors' aluminium panels and surface have been adjusted with screws. At the centre of the main mirror there is a 4.4 m tall cone for receiving equipment. The main parameters of the antenna system are presented below.

PARAMETERS OF RT-32 CASSEGRAIN SYSTEM

- Diameter: 32.00 m
- Focal length: 11.45 m
- Effective focus length: 86.81 m
- F/D ratio: 0.36
- Subtended angle: 139.8°
- Diameter of the sub-reflector: 2.50 m
- Subtended angle of the sub-reflector: 21.06°
- Radiotelescope magnification: 7.58

There are radiometers and power density registration

equipment installed in apparatus rooms (from the Solar observatory in Baldone). The measurements on frequency of 11 GHz let us to make assumption - there are no intended mechanical adjustments to destroy the antenna mirrors' system. The location of the focal plane was determined with 1mm tolerance.

The driving systems for each axis (in fact doubled) are very similar. They each have 2 motors to drive in a wide dynamic range of velocities. There are differential gear-box systems to manage the total speed of each axis.

The resulting speed can be the difference of each motor's angular rotation speed. The maximum operational speed is 2 m/sec. The very complicated control system allows us to drive with 1, 2 or 3 motors together (including torsion brake motor). At the present only restoration of previous mechanical and electrical systems is completed allowing us to repair the system in cheep and simple way and let us start transit observations without the movement control. The parameters of operational speed are presented in table:



Axis		Speed [arc-deg/min]			Blocking
		continuously (Sept, 1995)	continuously (Oct, 1996)	starting (Oct, 1996)	
Elev	max	15	15	45	-1°12'
	min	0.23	0.13	0.40	+97°39'
Azim	max	10	10	30	-330°
	min	0.25	0.20	0.60	+330°

The control system for each axis consists of three parts:

- Analogue system with 3 selsins, 2 rotating transformers and a tachogenerator. Visual accuracy is about 20". Fully operational.
- Digital system of PC-50 [reversive counter] with a 14 bit optical encoder for 90° angle sector and measurement accuracy about 20" connected to a separate computer to determine the coordinates. Fully operational.
- Digital computerised system for azimuth and elevation axis is operational, but is installed for digital speed control only.

Performance parameters:

- motion range around the elevation axis: -1° to 97°
- motion around the azimuth axis: ±330°
- max angular velocity around the altitude and the azimuth axis (2 direct-current, 60kw motors): 1'/sec to 2°/sec
- min angular velocity around the altitude and the azimuth axis (2 direct-current, 5.5 kW motors): 2"/sec to 5'/sec
- survival wind speed: 40 m/sec
- max observing wind speed: 15 m/sec

Accuracy characteristics

- manufacture of the surface: 0.25 mm
- rigging of the panels: 0.5 mm
- rigging of azimuth axis: 5" to 10"
- azimuth-elevation axis orthogonality: 5" to 10"
- angular incidence of focal axis when pointing at horizon: 2'9''
- deflection of focal point axis when pointing at horizon: 3.7 mm
- combined RMS deviation of the reflecting surface of primary reflector (including action of dead weight and wind): 1.3 mm

Mass characteristics

- weight movable in altitude: 65t
- weight movable in azimuth: 600t

By G.Balodis and Z.Sika (VIRAC)

Web Sites

Ventspils International Radio Astronomy Centre (VIRAC) <u>http://www.virac.lv/en/info.html</u>

Celebrating the 10th Anniversary of the conversion of the RT32 telescope at VIRAC A collaboration between VIRAC, RIXC & radioqualia http://www.radioqualia.net/rt32/announce.html

All images in this article are credited to: Allan & Liz Hobbs





edit: NASA

In search of the GRAIL

NASA Launches Mission To Study Moon From Crust To Core

> The mission will endeavour to а n s w е longstanding questions about Earth's moon, including the size of a possible inner core, and it should provide scientists with a better understanding of how Earth and other rocky planets in the solar system formed.

CAPE CANAVERAL, Fla. --NASA's twin lunar Gravity Recovery and Interior Laboratory (GRAIL) spacecraft lifted off from Cape Canaveral Air Force Station in Florida at 9:08 a.m. EDT Saturday to study the moon in unprecedented detail.

AVITY RECOVERY AND INTERIOR LABORATO

GRAIL-A is scheduled to reach the moon on New Year's Eve 2011, while GRAIL-B will arrive New Year's Day 2012. The two solarpowered spacecraft will fly in tandem orbits around the moon to measure its gravity field. GRAIL will answer longstanding questions about the moon and give scientists a better understanding of how Earth and other rocky planets in the solar system formed.

"If there was ever any doubt that Florida's Space Coast would continue to be open for business, that thought was drowned out by the roar of today's GRAIL launch," said NASA Administrator Charles Bolden. "GRAIL and many other exciting upcoming missions make clear that NASA is taking its next big leap into deep space exploration, and the space industry continues to provide the jobs and workers needed to support this critical effort."

The spacecraft were launched aboard a United Launch Alliance Delta II rocket. GRAIL mission controllers acquired a signal from GRAIL-A at 10:29 a.m. GRAIL-B's signal was eight minutes later. The telemetry downlinked from both spacecraft indicates they have deployed their solar panels and are operating as expected.

"Our GRAIL twins have Earth in their rearview mirrors and the moon in their sights," said David Lehman, GRAIL project manager at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. "The mission team is ready to test, analyze and fine tune our spacecraft over the next three-and-a-half months on our journey to lunar orbit."

The straight-line distance from Earth to the moon is approximately 250,000 miles (402,336 kilometers). NASA's Apollo moon crews needed approximately three days to cover that distance. However, each spacecraft will take approximately 3.5 months and cover more than 2.5 million miles (4 million kilometers) to arrive. This low-energy trajectory results in the longer travel time. The size of the launch vehicle allows more time for spacecraft check-out and time to update plans for lunar operations. The science collection phase for GRAIL is expected to last 82 days.

"Since the earliest humans looked skyward, they have been fascinated by the moon," said GRAIL principal investigator Maria Zuber from the Massachusetts Institute of Technology in Cambridge. "GRAIL will take lunar exploration to a new level, providing an unprecedented characterization of the moon's interior that will advance understanding of how the moon formed and evolved."

JPL manages the GRAIL mission. It is part of the Discovery Program managed аt NASA's Marshall Space Flight Center in Huntsville, Ala. Lockheed Martin Space Systems in Denver built the spacecraft. Launch management for the mission is the responsibility of NASA's Launch Services Program

at the Kennedy Space Center in Florida

For more information about GRAIL, visit:

http://www.nasa.gov/grail

http://grail.nasa.gov





MAS Shop It's buyin' time!

Our Merchandise Officer, Stewart Grainger, currently has the following official MAS merchandise items on sale:

'Astronomy 2011 ' is a must have book available now. \$25.00 (members \$20.00).

MAS coffee mugs : now available for \$12.00 (members \$10.00).

m a g n i t u d e][: Our second DVD - \$14 (members \$10)

MAS polo shirts : available in navy, black or white (mens or ladies, various sizes): \$40.00 (Members \$35.00).

MAS baseball caps: \$25.00 (Members \$20.00).

MAS beanies: \$20.00 (Members \$15.00).

MAS sew-on badges : (105 mm x 60 mm) available in white on black and black on white: \$10.00.



'Ice In Space '2009 Compendium': a timeless compilation of astrophotographs by members of IIS in an 80page coffee table book - (retails \$50) \$25

Starwheels: ("Planispheres") large \$25.00 and small \$15.00.

'Heaven's Above - A Binocular Guide to the Southern Skies': a top-selling book by MAS member Bob Bee: available on public nights for \$18.00.



'Emu Dreaming': a book about the interpretation of the southern sky as seen by the Aboriginals: was \$15.00 now reduced to only \$10.00.

These items are on sale at general meetings, or by arrangement. Please contact Merchandise Officer Stewart Grainger - either by Private Message via the website forum or by email to:

merchandise@macastro.org.au

Let him know what you want to buy and make arrangements to pick it up from him. Please note, it is not possible for Stewart to bring every stock item to every meeting.

Members Observing Nights

Make sure you remember to bring your woolies... it's still cold!

On observing nights, at any venue, you must arrange your own transport and please try to arrive well before sunset, to enable you to familiarise yourself with the surroundings before darkness sets in. If arriving later, make sure that your approach to the final gate is only with parking lights and ask someone to guide you into the observing area from the gate. It is essential - for your own safety and that of others - that you bring a red torch with you to observing nights. If weather conditions look doubtful, please check the website "What's On" page before leaving home. If Stargard is cancelled, sometimes an unscheduled observing night will be held later that week.

During the course of the evening, please consider the needs of others around you, especially when using laser pointers, camera screens, computer monitors, car boot lights etc. Please read our Field Etiquette page on our website for reference.

Stargard nights are free to members and invited guests. Please contact the President before inviting anyone. Beginners are encouraged to observe at Stargard before progressing to the Forest.

To cover our costs, the charge for The Forest is \$8.00 per member per evening, whether attending just for the evening or staying all night. Experienced amateur astronomers who are non-members may be invited to attend the Forest subject to prior clearance from the President and will be charged \$12.00 per person per evening. **From November, this will rise to \$15 per night, per member, and \$20 per non member.** Please see Ned Pastor on your arrival to make your payment and please try to have the exact amount. Limited sleeping accommodation is available but not guaranteed. 240vAC field power is available as are kitchen and washroom facilities.





August's Forum Blair Athol Community Centre



As a trial run, our September *Macarthur Astronomy Forum* will be held at a new location. **Please do not go to the University, there will be no-one there!** The event will be a telescope 'workshop' held at the **Blair Athol Community Centre**, 59 The Kraal Drive, Blair Athol.

It is easy to get there and it has its own car park. From Blaxland Road, turn into Blair Athol at the 'Aldi' turnoff. Then turn left at the roundabout. Drive through two more roundabouts and the building is on the left.



NASA's Lunar Reconnaissance Orbiter (LRO) captured the sharpest images ever taken from space of the Apollo 12, 14 and 17 landing sites. Images show the twists and turns of the paths made when the astronauts explored the lunar surface. The latest orbital maneuver lowered LRO from its usual altitude of approximately 31 miles (50 kilometers) to an altitude that dipped as low as nearly 13 miles (21 kilometers) as it passed over the moon's surface, enabling far sharper imaging than previously possible.

Heavens Above!

It is a very common misconception by people on the fringe of amateur astronomy that you absolutely need a telescope to "see anything interesting".

This book comprises 158 pages and contains over 80 diagrams of the sky viewed from the Southern Hemisphere

In the book, the author takes you through all the constellations visible from the Southern Hemisphere which have objects visible through binoculars.

The planets and many globular clusters, open clusters, gaseous nebulae, galaxies, double stars and asterisms can be found with your humble field glasses.



This book contains:-

- charts showing 56 of the 88 constellations with the locations of binocular objects they contain and description and details of each object.
- maps of each month of the year showing the location of the constellations in the sky to the north and south

This is an excellent introduction to observational astronomy for beginners of all ages.

Advertisement

To purchase your copy of this excellent book please forward your cheque or postal order (made out to Robert Bee) for AU\$19.50 to the author at the address below.

This includes postage and handling (within Australia).

Please contact Robert Bee at rmbee99@hotmail.com for more details about the book or Direct Deposit information.

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MOUNT ANNAN, NSW, 2567

About the Author:

Robert Bee lives at Mount Annan on the south-west outskirts of Sydney, NSW.

Robert's passion for astronomy began in his teens and has deepened over the ensuing years. With degrees in Electrical Engineering and Science, he enjoys both observing the starry sky and understanding the physical laws behind what he sees.

Robert is a member of the Macarthur Astronomical Society (MAS) and has edited and contributed to the Society's monthly journal "Prime Focus" since it commenced in 1996 up to 2006. He has carried several positions within the Society during that time.

He shares his passion for astronomy with the people of the Macarthur Region through a fortnightly column called "Heavens Above!" in the Macarthur Chronicle newspaper. This column commenced in 1998 and is aimed at those with no background in science or astronomy, just a sense of curiosity and a willingness to step outside the back door and have a look at the sky.

Robert also enjoys writing fiction, with a preference for science fiction and fantasy, and has had a number of short stories published in periodical magazines and successes in short story literary competitions. He currently has a children's science fiction novel, with an astronomy theme of course, in progress.

Robert enjoys talking to the public about astronomy and guiding them around the sky, both at public nights run by MAS and also at clubs, societies and schools.



This image of Earth (on the left) and the moon (on the right) was taken by NASA's Juno spacecraft on August 26th, 2011, when the spacecraft was about 9.66 million kilometers away. It was taken by the spacecraft's onboard camera, "JunoCam". The solar-powered Juno spacecraft lifted off from Cape Canaveral Air Force Station in Florida on August 5th to begin a five-year journey to Jupiter.

