Reflections

Journal of the Northern Sydney Astronomical Society Inc.

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In this issue of your magazine, in addition to the usual technical articles, you will find a very refreshing one by Lydia Bell. In "Starry, starry nights" Lydia tells us in her own words of her life-long connection with the stars and all the simple but profound joys their contemplation have brought to her life.

With this reflective article Lydia shows us that astronomy is not just a science but something anyone can enjoy as soon as they care to look up to the sky.
So, with or without a telescope, enjoy the Winter skies.
Cheerio,

Jean-Luc Gaubicher

In this issue

President's Message

Winter is upon us, with some improvement in the observing conditions that have plagued us amateur astronomers for the last year.
Successful Observing nights have been run in both May and June, and our first Observing Night/Sausage Sizzle (in May) was a success, with one of the largest turnouts for observing in many months. We plan to try and run a Sausage Sizzle every month in conjunction with observing, so look out for them on the NSAS website. If we end up with bad conditions on the scheduled observing nights, we will try and run observing on a non-scheduled night to make up.

Events of the last three months have included Macquarie Open Night in April, and several non-starting outreach activities due to bad weather. In July we plan to try again with St Ives North Public School for a star party and we will support a National Parks & Wildlife program at Berowa, so expect some calls for telescopes for both events.
St. Ignatius is still mulling over the date for a Star Party with NSAS, and hopefully that will be late Winter or early Spring.

The General Meetings continue to be well attended, and our run of speakers, mainly from CSIRO, have been uniformly excellent. We seem to have hit a source of young, interesting speakers, and will continue that through the year, with a few speakers from other sources already planned.

The Theory Group is now up to about lecture 14 (out of 95) of "Understanding the Universe" and all the attendees continue to be enthusiastic about the value of the course. Newcomers can join at any time, as the course does not require seeing the previous lectures. Come along on the second Tuesday and have an interesting evening.

The New Astronomers Group has hit a patch without many new participants, so we haven't really started a new group of astronomers on a course of understanding their telescopes and observing, but when there is enough interest, this will happen. If you're new to NSAS, or have just acquired a telescope, contact us to see if we can start a new stream in the NAG. In the meantime, the NAG continues on the fourth Tuesday night, running programs on what observing objects to look for in the next month, and somewhat more advanced subjects like astrophotography.

The change to the Constitution mentioned in the last Reflections was put to the membership in April and passed, so that the Committee now has a proper method of canceling memberships of persons who have not paid their membership fees within a reasonable time from the due date. The Department of Fair Trading has also indicated that a new Model Constitution (which NSAS operates under) will be published, so we will have to see whether it has any bearing on the operation of NSAS.

On the subject of membership, that has remained pretty much the same, around sixty, but the Committee is working on a membership drive, and will discuss the issue of increasing the membership significantly at the next GM, as we are suffering the lack of volunteers for various positions due to the limited membership.
Also discussed by the Committee is some serious work on making the NSAS website more interesting and dynamic, which will hopefully commence before the next issue of Reflections. The Committee would like your thoughts on this as soon as possible.

Articles from members for Reflections continues to be a problem and the Committee, through Bob Roeth, has been in discussions with Gwen Welch about reinvigorating the annual Geoff Welch prize for best article and.
As more money will be added to the trust, it is likely that multiple prizes will be awarded at the AGM this year.
You've got one more issue of Reflections before the judging, so just get down and start writing on your favorite astro subject! The Committee will publish the latest rules for the acceptance of articles for the Geoff Welch prize quite soon.

Let's look forward to more interesting speakers, clear skies, and fascinating educational opportunities from your Society over the next three months and, as always, don't hesitate to contact me or any Committee member about any matter to do with NSAS.

Best Regards,

Bob Fuller

Calendar

General Meetings:	July 20th	Guest Speaker: Bob Roeth, "Kepler: from Aristotle to Copernicus"
	August 17th	Guest Speaker: TBA
	September 21st	Guest Speaker: TBA
NAG Meetings:	July 27th	
	August 24th	
	September 28th	
Theory Group Meetings:	July 13th	
	August 10th	
	September 14th	
Observation Nights:	July 9th / July 16th	
	August 6th / August 13th	
	September 10th / September17th	

Deadline: Please send your contributions to the April issue of Reflections in time to reach the editor **before September 15th** to nsas.editor@ozemail.com.au

New Astronomers Group

Northern Sydney Astronomy Society hosts the New Astronomers Group which is a group that gets together to help people get the most out of their observing experiences.

NAG has something for everyone, those new to the field of astronomy as well as those who have several years of observing under their belt and are pretty confident in how to work their scopes.

If you are new to astronomy and want to find out how to get started, this where you will get help with choosing your first telescope or seting up your newly acquired scope. If you have a problem with your telescope, then NAG is one of the best ways to get it solved.

If you have owned a telescope for years now, we also talk about some of the more challenging objects to be found in the night sky. For instance, did you know there is a remnant of a supernova which is visible from the night sky over Sydney?

This is where the New Astronomers Group can give even the most seasoned observers some help in finding new targets that they may not yet have seen.

And, as we also have telescopes available on the night most of the time, this is a great way to put into practice what you have just learned.

We also discuss some of the events that have made the news such as the recent asteroid impacts on Jupiter and determine if some of these events will be viewable through our scopes.

NAG meets monthly on the 3rd tuesday of the month: do not hesitate to join us.

Roy Jordan

Had a thought experiment lately?

The ancients, often referred to as armchair philosophers, are probably guilty of too many thought experiments about motion. They made a start but they were hampered by being unaware of friction, wind resistance and inertia and by having unreliable timing devices.

For those reasons, we should not be too critical of their conclusions even though some of their dogmatic statements may seem, at first glance, to be almost hilarious to us.

Some of them may be seen as reasonable conclusions in view of the state of knowledge at the time:

- Heavy bodies fall faster than light ones
- No motion is possible without the action of a force and when the force is removed, the motion ceases
- Celestial bodies are made of matter different from the basic elements earth, water, air and fire and so are excused from the force requirement.

I think it was Galileo who had a fruitful thought experiment against the first of those assertions.

He imagined that a heavy body and a light body have been tied firmly together so that the two of them could be dropped as if they made a single body.

Will the bundle fall at the rate appropriate to the light body or to the heavy body or to a single body with the weight of the sum of the two bodies or to "none of the above"?

But do not imagine that Galileo only did thought experiments. He was able to show experimentally that a falling body covers a distance that is proportional to the square of the time spent falling.

Isaac Newton humbly made little of his own achievements with his claim that he had achieved so much because he stood on the shoulders of giants and in any case there remained much to be discovered and explained.

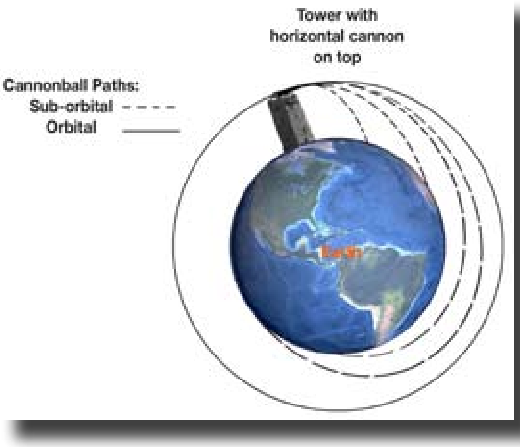
In his Principia, he acknowledged the works of giants like Christiaan Huygens, Galileo Galilei, Johannes Kepler and Jeremiah Horrocks.

In this, he ignored the fact that he had derived Huygens' results concerning circular motion before Huygens but lost the intellectual rights by not publishing his results.

Horrocks gets few plaudits in modern times but, by including him with the ones we have been taught to honour, Newton showed that he appreciated the importance of Horrocks' conclusions.

Newton, aware of Galileo's rule for falling bodies, used it in conjunction with a thought experiment of his own. He conceived a cannon and a number of cannon balls equal in weight that were to be projected horizontally from a very tall tower by successively larger explosive charges. He already knew that the distances to the

landing points would be progressively greater but he stretched his imagination into propulsive charges that were impossible to accommodate in any known cannon. The projectiles would go beyond the horizon, beyond the ocean, beyond …. ?
Newton recognised that the cannon balls would be falling throughout the flight but that the Earth's surface kept curving away from the flight path.
What if the speed of the cannon ball was great enough for it to travel all the way around the Earth, and perhaps to demolish the tower?



Newton's cannonball thought experiment
Diagram by the author

The falling of the ball would have to match the curving away of the Earth's surface throughout the flight. If the projectile returned at the height of its projection point, it could presumably repeat the whole operation ad infinitum. Just like the Moon travelling around the Earth - perhaps.
Well might he have screamed, "Eureka", but Newton was never the dramatic one. In fact, Newton wanted more confirmation and to obtain this, he did some calculations using Galileo's falling body rule in order to compare the calculations and his conclusion. His reaction to the positive result was an anticlimax: "It answered pretty well."
Perhaps this trivialises the work of explaining orbits but Newton had confirmed his thoughts about gravity.

Now, for another thought experiment:
Suppose that the Earth's forward motion in its orbit was suddenly and completely checked and no further restriction was applied to the Earth. What would happen?
Until the forward motion was cancelled, the distance the Earth fell towards the Sun was continuously being balanced by the distance by which the Earth fell away from the orbital path.
The two distances negated each other. Now, one of them is eliminated. Certainly, the Earth must now start to fall directly toward the centre of the Sun.
Galileo's falling-distance rule was devised for bodies moving in a small range of distances over which the attraction due to gravity is practically constant.
Hence, we cannot determine from that rule how long earthlings would have to make peace with each other, to say their goodbyes, to mourn their manicured lawns, andto laugh ironically about all the insurance payments made for nothing. Or if they should even decide to stop buying bananas with some green in their skins!

Of course, there has to be a way to get an estimate. It will be near enough as we would all be like beef jerky well before reaching the immediate neighbourhood of the Sun, or perhaps something more like activated charcoal.
Our thought experiment has to modify the situation just a little.
Suppose that there is a tiny residual forward motion of the Earth.
Now, instead of falling in a straight line toward the centre of the Sun, the Earth will move in part of a very narrow elliptical path with the Sun's centre as one focus. The major axis of the ellipse will be just a little more than 1 Astronomical Unit (AU) so the average distance to the focus will be very nearly a half of 1 AU.
Now, Kepler's third law, the Law of Periods, will tell us the complete period of that ellipse and we will have to divide this answer by 2 to know how long the Earth itself would take to fall into the Sun, assuming that the Earth does not completely evaporate before arrival.
The formula for the third law is very simple if all mean distances from the focus are measured in AU and all times are measured in Earth years:

$T^2 = R^3$
$T^2 = (0.5)^3$
or
$T = \sqrt{0.125} = 0.3535533$

The time required to get the Earth to its appointment on the barbeque menu will be given by halving this number of Earth years. Multiplying the halved number of years by 365.26 will change the answer into Earth days.

What do you think you might do first if you had 64 days and a bit before inevitable dehydration? In making your decision, if you need to know how much time you would have over and above 64 days, it is 13 2/3 hours roughly.
Don't forget that bananas ripen faster when they get warm!

Perhaps the situation described above could be brought to fruition by a head-on collision with an asteroid having its momentum exactly opposite to that of the Earth:
e.g. 1% of the Earth's mass travelling at 100 times Earth's velocity but in the opposite direction.
The momentum of a moving body is calculated by multiplying velocity and mass so other combinations are possible by choosing two numbers which are reciprocals of each other: e.g. 5 times the Earth's mass and one fifth of its velocity.

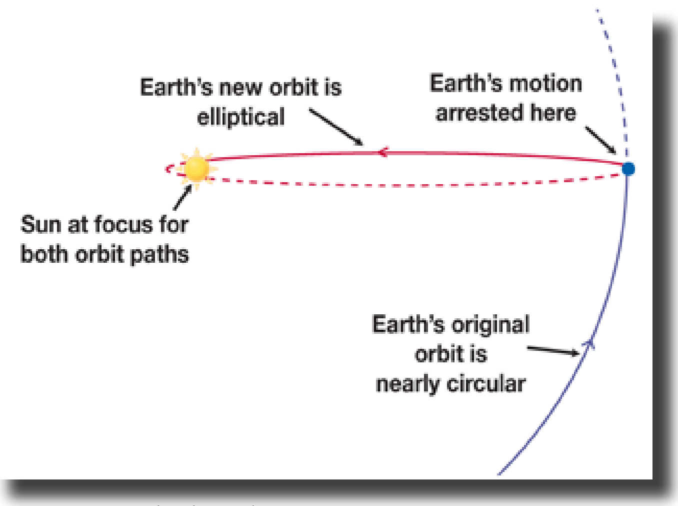


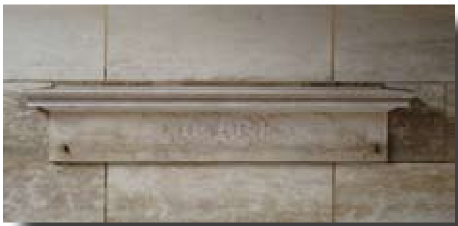
Diagram by the author

Bob Roeth

Back to Basics: Distance & length units

Locating objects, in space as well as in time, is what astrophysics is all about.

The scale from the size of a human being to the size of the Universe extending an order of 26 magnitudes, it is obvious that the metre is a cumbersome unit to estimate the majority of lengths and distances met in astrophysics.
More adapted units were needed to make it possible to express distances with numbers rather close to the unit than billion of billion metres.



Standard metre as seen in a Paris street
Picture credit: Wikipedia

This is the reason why, in astrophysics, lengths or distances often appear expressed in uncommon units.

They are usually reported in:

1. Astronomical unit (AU)
2. Light time
3. Parsec (pc)
4. Redshift (z)

Astronomical Unit
In the solar system, or for distances in a stellar environment, the radius of the orbit of the Earth is used as reference and is called the Astronomical Unit (AU).
It is approximately 150 million kilometres or more precisely: 149,597,870.7 km with an uncertainty of 450 metres!
However, the Sun is constantly losing mass, which causes the orbits of the planets including Earth's one, to expand. It is estimated that the Astronomical Unit is growing between 7 and 15 metres by century.

Light Time
The time it takes light to travel can be used to estimate distances, wether short, the Earth is at approximately 8 light-minutes from the Sun, or long, the most remote galaxies observed are roughly at 12 billion light-years away.
We call light-year the distance that light travels in a vacuum in one Julian year.
The speed of light in a vacuum being perfecty known (299,792,458 m/s) and the length of a Julian year being exactly defined as 31,557,600 seconds, a light-year is exactly equal to 9,460,730,472,580.8 km.

Parallax
The Earth moving around the Sun results in an apparent movement of the stars that are in the close vicinity of the solar system against the background of more remote stars.
Parallax is usually expressed in thousandth of arc-seconds.
A parsec is defined as the distance at which 1 Astronomical Unit underlies 1 arc-second. (The word parsec (pc) is the abbreviation of "parallax of one arc-second".)
A star with a parallax of P is at a distance 1/P in parsecs.
For example, the nearest star, Proxima Centauri, with a parallax of 0.772 arc-seconds is at 1.295 pc from Earth.
The Sun, with a parallax of …90°, is at 4.85 10^{-6} pc! (For the mathematical minded reader please note that in the case of the Sun the small-angle approximation is no longer applicable and the d = 1/P formula no longer valid.)

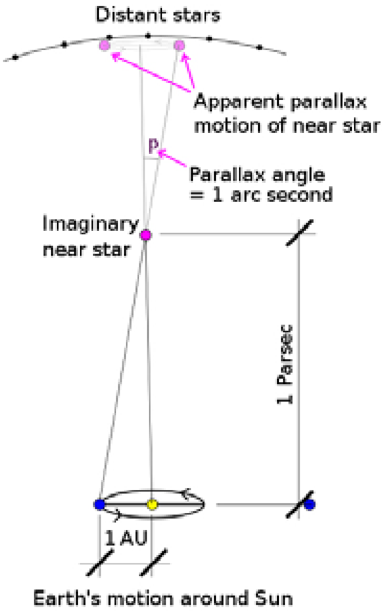


Diagram credit: Strain/Wikipedia

Redshift
Redshift is a bit more complicated to understand and... to explain!
The estimation of distances using the redshift of light is based on the Doppler-Fizeau effect and on the Hubble Law.
Basically, the light emitted by an object receding away from us is shifted towards the red, which is simple enough.
However redshift can have three causes:

- Doppler redshift is due to the movement of objects in the vicinity of the Earth, that is mainly within the Milky Way. In this case redshift can become blueshift if the object is approaching us.
- Gravitational redshift or Einstein redshift is the consequence of time dilation in the theory of general relativity.
- Cosmological redshift is due to the expansion of the Universe. This is the one we use to estimate distances of extragalactic objects.

Therefore, the total redshift z_t is

$$z_t = z_{doppler} + z_{cosmological} + z_{gravity}$$

but, for the sake of simplification, we'll only consider the cosmological redshift in the rest of this article.

As the Universe expands distant objects are seen receding away from us and the light they emit is shifted towards the red according to the following formula

$$\lambda_m = \lambda_e \frac{1+\beta}{\sqrt{1-\beta^2}}$$

where λ_m is the wavelength as measured when received on Earth, λ_e is the emitted wavelength and β the ratio of the velocity of the object to the speed of light (v/c).

The redshift z id defined by the formula:

$$1+z = \frac{\lambda_m - \lambda_e}{\lambda_e}$$

It is often expressed as $1+z = \frac{\lambda_m}{\lambda_e}$

When v is not relativistic (less than 10% of light speed) we can approximate the formula and we get

$$z \simeq \frac{v}{c}$$

If v is relativistic (z>0.1), life gets a bit more complicated and we have to use the following equations:

$$1+z = \sqrt{\frac{c+v}{c-v}}$$

and

$$\frac{v}{c} = \frac{(z+1)^2-1}{(z+1)^2+1}$$

In this case we note that z increases exponentially as v approaches light speed.
The Hubble law is expressed by the equation $v = H_0 d$ where H_0 is the Hubble constant (estimated to be 70.6 km/s/Mpc) and d the distance of the object.
Replacing v by its value from the definition of z we get: $d = c \frac{z}{H_0}$

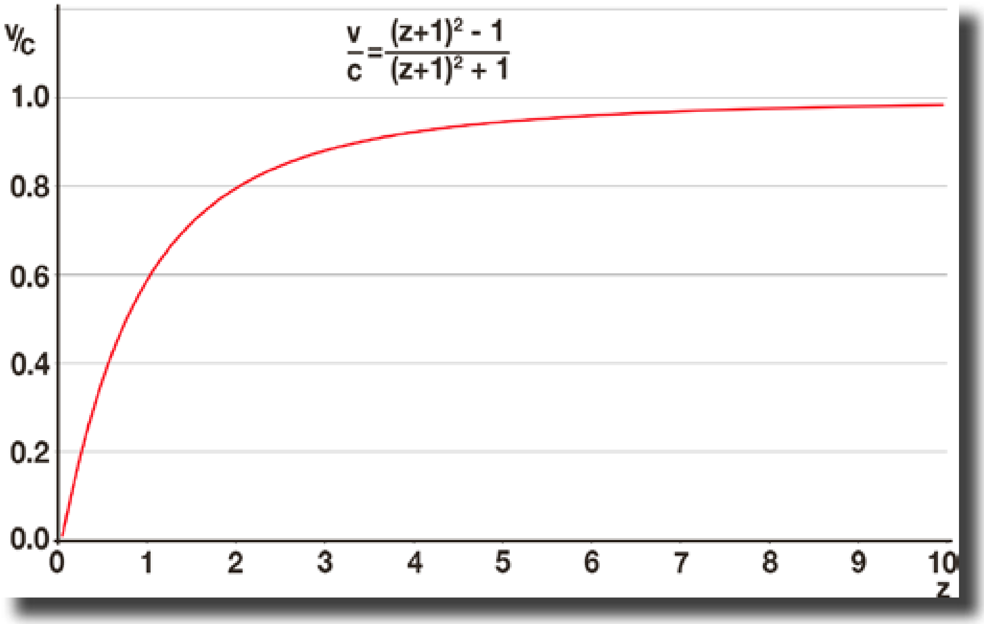
Let's take an example:
The hydrogen alpha line wavelength coming from a galaxy is measured at
λ_m = 662.45 nm.
From experiences in laboratory we know that the hydrogen alpha wavelength is
λ_e = 656.285 nm
Therefore we have
z = (662.450-656.285)/656.285
= 9.39x10^{-3}
v = 9.39x10^{-3}x300,00
= 2,793 km/s

and d = 12,796/70.6
= 39.6 Mpc
or 129 million light-years which happens to be approximately the distance of M104 aka the Sombrero Galaxy.

At the other end of the scale, IOK-1, one of the most distant galaxies, is at z = 6.964, which corresponds to a distance of approximately 12.88 billion light-years and a receding velocity of 290,700 km/s or 96.9% of the speed of light!

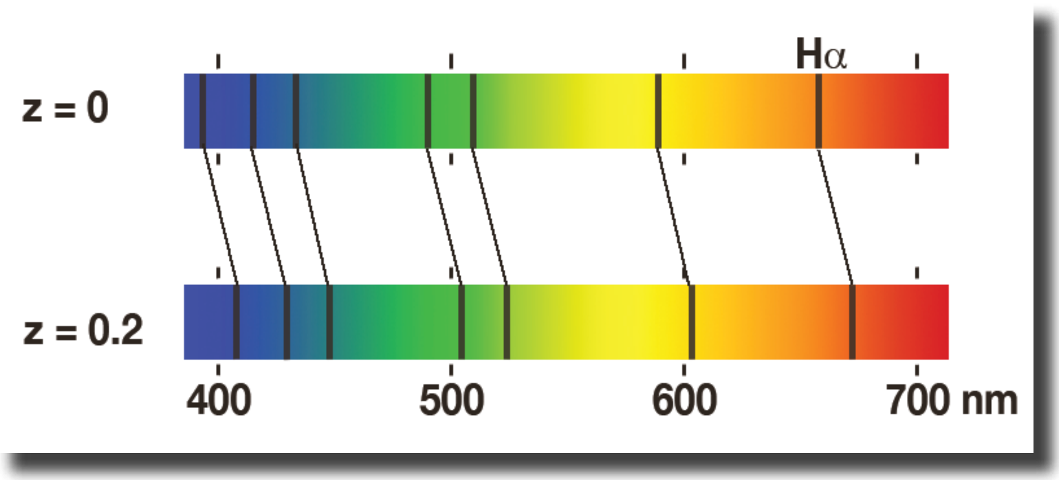
Why, going back over this article, I'm afraid it's gone a bit further than just basics but while doing my research I found this z stuff so fascinating that I wanted to share it with you.
So, sorry if I've lost you somewhere but it'snot even the tip of the iceberg.

Jean-Luc Gaubicher



Relativistic redshift increase

Diagrams by the author



Redshift of spectral lines

Conversion
The table below shows the approximate conversion of one unit into another one:

Symbol	Unit	m	AU	ly	pc
m	metre	$1\ 10^{0}$			
AU	Astronomical unit	$1.5\ 10^{11}$	1		
ly	Light-year	$9.5\ 10^{15}$	63,000	1	
pc	Parsec	$3.1\ 10^{16}$	206,000	3.26	1

Starry, starry nights

As a child living in the country with no street lighting, one night, lying next to the haystack I was shown Orion by my father.
Being of European origin, he didn't know the Southern Cross or the pointers.

My father had told me of Halley's comet's visit in 1910, or was it in 1914? when it filled the sky. But I found myself gasping when I saw it from Dee Why Headland and also out west somewhere and from near Canberra.

My telescope was 18 inches long. It fell into three bits, it had been telescoped so many times! But it was a bit hard to focus, holding 3 bits together. So, in time, I was given 3 pairs of binoculars. They had to suffice and I found out that if you keep them around your neck in the sleeping bag, they won't fog up.

Tops of dunes in WA deserts offer ideal viewing; there is no light pollution and trees are not going to block your views.
For me, many desert trips meant becoming familiar with more and more constellations and the opportunity of using more and more detailed maps.
Waking up during the night, the march of the stars, the circular motion around the celestial pole and the enthralling horizontal motion at the horizon in the North, become so entrancing.

How I miss Venus when I can't see her!
I took my kids, then my grandkids, but not my great-grandson yet, and showed them Venus, till they exclaimed "Tarr!" 'Tarr!' to my greatest satisfaction.
With my great-grandson, it looks like it will happen very soon!

Venus
Image credit: NASA

For now, a visit to the Observatory is planned for next month.

Camping by the beach I had great hopes of seeing stars right to the horizon, alas, the mist prevents that.
Northern skies were not very fruitful either. Despite camping out in the British Isles once, I was not able to see the Great Bear or the Polar Star.

Image credit: NASA

On the other hand, solar eclipses have been very thrilling for me.
Once on a visit to Melbourne I noticed it was getting darker in the early evening. I went outside to see if there were hail clouds. It grew much darker, completely dark, a wind shivered through the street tree I was standing under. Then a flock of blackbirds came to roost in the tree. I was experiencing an eclipse I knew nothing about.

The recent one, visible from a very narrow belt in South Australia, was planned for very elaborately.
It was a 4WD Club trip, but it had only 3 takers. We had set up our tent the previous day in a sheltered spot as the wind was blowing strongly and constantly. After we had found a good headland for viewing we had a long wait that we spent going for walks, drinking many a tea and coffee till early afternoon.
I was surprised to see a wombat sauntering by. Was I surprised? When he saw me he tore off as fast as his little fat legs could carry him!
At long last the sky began to darken. We used our welding masks and could see the shadow creeping across the face of the sun. At totality, a cheer sounded out all over the landscape; every headland was occupied.
After it was all over we regretfully packed up and headed for the luxury of Port Augusta Caravan Park.

While on a camping trip in the desert, last year, I slept in my tent with a full moon, too hard for stars. I got up early in the morning and glanced up: a gibbous moon! 'I am going crazy'. And, as I watched, it came out of eclipse. I told others of it and they didn't believe me…
When I got back to Sydney I looked it up it was visible only from a narrow part of Western Australia.

And, from our own backyard, partial eclipses were observed too with the help of pinhole cameras and welding masks.

1957; the world stopped for Sputnik.
I even erased an audiotape of the kids' childish voices to record more of the Sputnik's "beep, beep, beep" radio signal.
Then satellites, UFOs, space stations, space junk became routine and one night, while holidaying at Big Hill on the Great Ocean Road, we witnessed the re-entry of a satellite that blazed its way from about 30 degrees up to the horizon, lighting up the sky as it burnt up and fell into Bass Strait.

Stars always comfort me at times of stress. 'The stars are still up there and never changing.'
Never changing! Forever changing! Forever stunningly beautiful!

Lydia Bell

Astronomy anagram puzzle by Roy Jordan

An anagram is a word that is made by rearranging the letters of another word. For example, capes is an anagram of space.
For each word, find the astronomy anagram for it.

1. tars	2. comics	3. grins	4. remote	5. unable	6. arms
7. mono	8. shape	9. ulnar	10. orals	11. falser	12. racoon
13. sag	14. sating	15. platen	16. tracer	17. unstops	18. rumba

Answers on page 8

Observing the night skies from Sydney

There is plenty to see in the skies over Sydney and sometimes it is difficult to know exactly what to look for.
The most obvious targets are the Moon which is the brightest and of course the closest object to us... and then of course the planets which are always interesting to look at.
However you don't want to get your telescope out each time and look at the same objects time after time as this can get a little boring.

There is a whole lot more to the Universe other than moons and planets.
But how do you know what to look for? After all you do need to have a UBD directory of some sorts to know exactly what to look for.

For each of the next 3 months, I have come up with a short list of targets that can be seen from Sydney.

Considering that to see an object with the naked eye the object needs a magnitude up to 6.00, you can see these sample objects listed below should be able to see them easily seen with a small telescopes or binoculars.

Roy Jordan

July 2010

M4 - Cat's Eye Cluster (Magnitude 7.50)

Constellation name: Scorpius Constellation common name: The Scorpion

A globular cluster, 10 billion years old. Only 7200 light years away, M4 may be the closest globular cluster to our solar system. If you look 1.5 degrees west of the bright red supergiant Antares M4, you may see it though it is difficult to see with the naked eye. In a telescope, M4 is seen as a very bright and round globular cluster. The cluster's core is loosely concentrated with a string of 10th magnitude and fainter stars running across the center, partially obscured by clouds of interstellar matter. A remarkable object in any instrument.

M5- Globular Cluster (Magnitude 7.00)

Constellation name: Serpens CaputConstellation common name: The Snake's Head

Over 13 billion years old, M5 is one of the most ancient globular clusters. This is an easy naked eye object to see under dark skies. Visible as a small fuzzy patch in binoculars, this cluster takes on a majestic appearance in a telescope, with a bright granular core and a well-resolved halo. It is one of the most beautiful globular clusters for small telescopes. A prominent string of stars form an arc extending from the core. Look for the nearby pale yellow double star 5 Serpentis.

M83- Southern Pinwheel Galaxy (Magnitude 8.00)

Constellation name: Hydra Constellation common name: The Sea Serpent

M83 is a spiral galaxy in the constellation Hydra. It is not the easiest object to locate as it lies in a rather unremarkable region in the longest constellation in the sky. The reward for finding M83 soon becomes apparent, as it is one of the best galaxies to observe with small telescopes. Binoculars show M83 as a faint fuzzy patch but a telescope is required to glimpse spiral arms, dark lanes and bright knots. Medium to high magnification will aid in seeing these details.

M83
Image credit: NASA

August 2010

M7 : Ptolemy's Cluster (Magnitude 3.50)

Constellation name: Scorpius Constellation common name: The Scorpion

Larger and brighter than nearby M6, M7 is an open cluster of about 80 loosely concentrated stars only 800 light years away. It is easily visible to the naked eye. In binoculars M7 looks like a sparkling jewel embedded in the fainter star studded Milky Way background. M7 lies in perhaps the brightest region of the Milky Way. This amazing cluster is best seen at lower power.

Coathanger Cluster - Brocchi's Cluster (Magnitude 5.8)

Constellation name: Vulpecula Constellation common name: The Fox

A large and sparse open cluster composed of about three dozens stars. It is a fine sight in binoculars where 10 of its brightest members form the unmistakable shape of a coathanger. Only a few of the stars in the Coathanger Cluster are moving in the same direction through space, suggesting that the other stars may not be true members of the cluster.

M62 - Flickering Globular (Magnitude 6.4)

Constellation name: Ophiuchus Constellation common name: The Serpent Bearer

M62 is one of the brightest globular clusters in Ophiuchus and is seen in binoculars as a faint patch of light. A telescope will reveal a bright centre surrounded by a faint glow partially resolvable around the edges. M62 is unusually asymmetric, with its western half noticeably brighter than its eastern half. M62 is only 6 000 light years from the galactic centre, so it may be deformed due to gravitational interactions with the Milky Way's core. Three millisecond pulsars (neutron stars rotating several hundred times per second) have recently been discovered in this cluster.

Continued on page 8

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September 2010

NGC 7293
Image credit: NASA

NGC 7293 - Helix Nebula (Magnitude 6.50)

Constellation name: Aquarius Constellation common name: The Waterbearer

The Helix Nebula is believed to be the closest planetary nebula to us, a mere 300-500 light years distant. Because of its proximity it has an apparent diameter half that of the Moon. Although its combined magnitude is 7.3, the light is spread over a large area resulting in a low surface brightness. For the best view use binoculars and low magnification in telescopes so as to not wash out the pale glow of this nebula. In a small telescope, the Helix resembles a large pale smoke ring darkening towards the centre. The central star is visible using averted vision. A nebular filter will aid in revealing more detail. In photos, the nebula appears helical in shape, which is how it acquired its name.

M16 - Eagle Nebula (Magnitude 6.00)

Constellation name: Serpens Cauda Constellation common name: The Snake's Tail

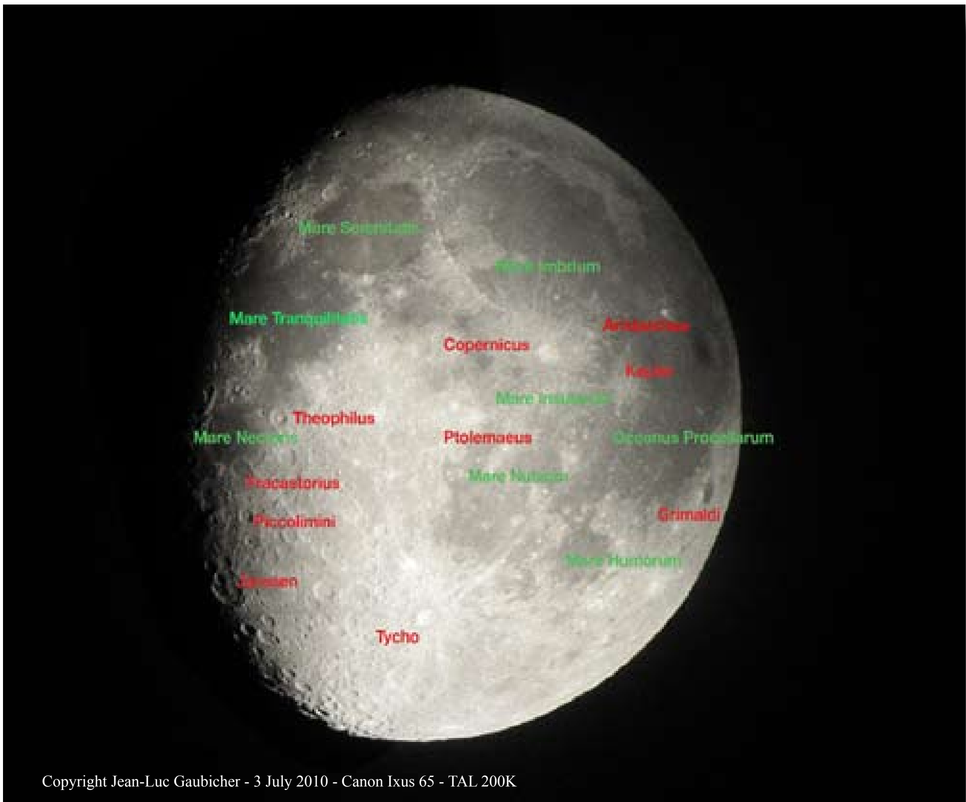
The Eagle Nebula is the subject of the most famous Hubble Space Telescope photo, the "Pillars of Creation" image that shows columns of cool hydrogen gas and dust protruding from a molecular cloud. New stars are being formed within these clouds. A young, hot cluster of stars lights up this emission nebula in the Sagittarius spiral arm of the Milky Way, which is a treasure trove for amateur astronomers. Many nights can be spent with the naked eye and binoculars scanning this area.

NGC 6960 - Veil Nebula (Magnitude 7.00)

Constellation name: Cygnus Constellation common name: The Swan

The Veil Nebula is the remnant of a supernova explosion that occurred thousands of years ago. At its peak, this supernova would have been magnitude -8, thirty times brighter than Venus ever shines. Left behind from the explosion are the wisps, streamers and filaments of delicate nebulosity that form dual arcs surrounding the star 52 Cygni. In a dark sky this nebulae can be seen in 10x50 binoculars. A dark sky, a larger telescope and the aid of a nebular filter will bring this celestial jewel to life.

Astronomy Picture of the Quarter



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Astronomy anagram solution:

1. Star	2. Comisc	3. Rings	4. Meteor	5. Nebula	6. Mars
7. Moon	8. Phase	9. Lunar	10. Solar	11. Flares	12. Corona
13. Gas	14. Giants	15. Planet	16. Crater	17. Sunspot	18. Umbra

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