MACARTHUR ASTRONOMICAL SOCIETY Inc.

Journal

PRIME FOCUS

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President's Report

It was just fantastic to see so many new faces at lasts months meeting. Our speaker on the night was Peter Druery and as usual he had a whole grab bag of latest news to convey. In particular I was fascinated with the discovery of "Hot Hydrogen" which links the vastness of space together. It would be worthwhile to research this a bit more as maybe there's a lot more to this universe than we currently think. Great work Peter.

I've been having discussions with several professional astronomers to see if they would like to come along and talk to us. Some scheduling considerations have to be taken into account and it now looks like it will be early next year when "Dr Fred Watson" and "Dr Russel Cannon" will be available. In fact Fred is semi-confirmed for February. Both these astronomers are very keen to come along so I will keep you posted.

Well, that one majestic photograph I've been striving to take finally happened recently when photographing down at the forest. Years of hard work with many failures combined with some reasonably passable shots have contributed to this one photo, something I can hang my hat on, success at last!

The world of Astrophotography can be very rewarding and feeling rather enthusiastic lately I've written an article about the subject. If anyone wants to contribute please do so. In fact we are looking for as many articles as possible for the end of year bumper issue of Prime Focus - see Bob Bee for details.

When I've been driving home from work the Venus road show has been quite spectacular. It's been real attention getter with many people asking the question, what star is that? It's certainly been a fortunate observing period lately as evidenced by that incredible sighting of the Southern Aurora last month. Also early views of Saturn have been amazing.

The Observatory Public night was due to be held on the Saturday the 12th of Oct, too soon to publish comments but we hope as always for clear skies and smooth sailing.
We are coming to the end of our marathon public education program. Last Tuesday saw us stargaze with the Leumeah First Cub Scout Group and Saturday just gone we were in action again with the "Jamboree of the Air", a regional event involving several Girl Guide groups stretching from Liverpool to the Southern Highlands, this being held at Kentlyn.

There's been some great television to watch recently. Did anyone catch the program that dealt with the formation of our universe. I say our universe as it's theorised that multiple universes co-exist, occasionally bumping together and creating very big bangs. They call this the "String Theory". Catalyst detailed the going ons around bacteria surviving quite happily in thermal pools of radio activity, combine this with nice surroundings of neon gas and it would make a great place to take the kids.

News Flash!

One of my favourite science fiction program returns for its last season on channel nine 10.30pm Tuesday's, I know many of you watch "Star Trek Voyager". Well I guess you either watch for the fantastic story lines and great special effects or to admire "Seven of Nine", whatever!, I have hired all the remaining episodes on video and can say without doubt, don't miss it !

Well another busy period coming up so I'll say my goodbyes until next time, "Live long and Prosper"

Regards
Noel Sharpe
President
Voyager Fan Club.

The Camera Club

It's a strange little corner of the world that's inhabited by us "Astrophotographers", hours of setting up for that one perfect shot, often at the expense of social interactions.

Please don't feel we're ignoring you, we are simply on a quest in search for the "Holy Grail", i.e. to capture a majestic piece of the night sky on film. It's akin to performing a Messier Marathon every time you venture onto an observing field. A set order of tasks awaits you and there is a strict timetable to adhere to.

Mixed in with that is a real commitment to accomplish what you set out to do and you just don't give up until it's done. Sometimes we are possessed, sometimes we place ourselves into very contorted positions, anything to grab that one special shot that will make all the effort worthwhile.

Am I an expert at this kind of photography?, No and very far from it. However I do hold a great deal of expertise at what not to do. The Camera Club is expanding its ranks and at our recent Forest nights we had several members employing their skills.

Also showing interest are several other members. In total I count seven active photographers with about three others on the fringes. That's quite a good number indeed. We use a lot of very strange words and have been called many things like, "Shutterbugs and Snaphappys". Maybe what we do is strange and seemingly complex, however I'm sure The Camera Club will set the record straight.

It's not my intention to write about the complete world of Astrophotography. I'm just writing about our own members experiences and skills. This is important as it's now time to really help everyone who wants to take photos. It's been a disappointment for many who have failed to produce a least some worthwhile shots, even if only for encouragement value.

If there is one piece of advice to give it would be to have patience, and you will need a ton of it. Yet to produce some really good photos can be very simple and easy indeed. Let's start at very basics, the camera itself. Obtain one that can keep the shutter in an open position for any amount of time you choose. By the way, all of us use older style cameras.

The modern type cameras that have all the fancy bells and whistles are useless. You don't need a light metering system as you are taking photos in starlight and battery operated cameras take a lot of power to keep the shutter open. The cold nights will be very draining on the battery. I might just clarify that all is

not lost if you have such a camera as Lunar and Planetary shots are possible, but think about picking up an old beauty as it will serve you well. Most can be found for limited cost.

So what is an older style camera? It's one that operates without a battery and if it has a lens,. That,s a bonus. Photographers have many strings to their bows and we can use our telescopes to replace the cameras lens if desired. The use of a camera is at the very starting point of astrophotography, so to describe such a camera would be as follows.

35mm Single Lens Reflex (SLR) with a lock up mirror, cable release, a B or bulb setting. So what does that mean? The 35 mm is the width of film the camera is designed to accommodate, it has nothing whatsoever to do with focal lengths or magnification. The reflex part is how the incoming light is projected onto the cameras viewing screen. It's done by mirrors and a prism and simply reflexs the light path.

The lock up is not a jail, but the term used to engage the shutter in an open position so the film plane is exposed to starlight, thus capturing an image. This is important as this introduces the time delay factor to the photography. To lock up you need a cable which inserts into camera body itself. You push the cable in to engage and when you finish the shot you press a round ring type device which looks like a washer. It's situated just below the top of the cable where you push it in.

Choose a camera that shows the clearest vision from its viewfinder. The central part of the screen is of no concern and you are better off without any markings. They call this a split screen. In astrophotography the trick is to focus starlight on the outer parts of the viewing screen.

It's easy as.

Now that you have the camera go and grab some film, very fast film like say Fuji 800 asa. The asa stands for Australian Standards Association. Set the lens to infinity, that is try to focus on a close object then focus again until fuzzy. Turn the lens ring all the way, this will now focus on the furthest distance possible like the stars, To infinity and beyond.

Now is to angle the camera skywards, be it on a table, tripod or even a brick on the ground and engage the shutter with the cable release. Of course the camera has to be on the B setting. Take the shot for 20 seconds then trip the shutter closed via the cable release. A good tip is to place a dull black piece of cardbord or similar in front of the lens before you open and close the shutter, this will stop unwanted vibrations when you are handling the camera from being captured on film, they call this the hat trick!

After 20 or so seconds you will get trailing of the stars, this is because the sky is in motion but the film in the camera is static time wise. But star trails can be useful as they show up the many colours of the individual stars. As far as the camera lens is concerned set the focal ratio for between 1.9 or 2.8. This determines the how fast the lens and camera system works. I will explain F ratios at a later date.

Well all I can say is good shooting, I can't wait to see some of your results!

Noel

Forest Dreaming.

After some last minute organising around keys to the cabin it was all systems go for our International House field night and stay over. Fortunately an offer to baby sit the "Young Ones" meant I was able to arrive earlier than usual, Bingo, it was still twilight! I hate setting up in the dark. Oh, by the way the young ones I refer to are not Vivienne, Neil and the gang, although sometimes it feels like it.

A good number of members were eagerly going about their duties and an impressive parade of scopes set the scene, Peter found his ideal set up spot and asked me to join him. I have previously located a most happy hunting ground for myself and I declined the offer. Later and with some amusement I watched Peter

pack up his scope and move his car to a new location. Someone had planted a massive tree right over his line of sight to the polar alignment stars - how rude! Peter as we know is a wise astronomer because he knew that waiting for the alignment stars to come out from behind the tree might take a while!

John and some other members were throwing every thing but the kitchen sink in trying to locate the Helix Nebula. I retired at about 11.30pm which is ridiculously early, but I was feeling quite ill and very tired. No fun at all. Our ever dutiful Vice President woke me up at 2.30am, under my instructions. Gee, thanks John.

The early part of the night was a disappointment in terms of the clarity of the night sky, high cloud and a ton of moisture laden air hung over us. The conditions were debated into the wee small hours. Upon awakening from my slumber the night sky presented itself as somewhat spectacular, a zillion stars overhead and now with everyone else sleeping it was more stars for me!...and Peter. Does this guy ever go to bed?

The stillness of the air was amazing and I enjoyed some fabulous views of Saturn, Taurus and the Orion Nebula. I was still feeling unwell, maybe it was the water from the cabin. Beware, as it's tank water and my farming friends say it must be boiled before drinking. Makes sense. What kept me going was the chance to take some photos, which may or may not turn out.

Maybe my unwellness was not due to the water, so I'll blame the weather conditions. It was close to 30 odd degrees during the day, evening thunderstorms to the north and would you believe after midnight frost, as evidenced by frozen tables, cars and scopes. Boy, was it cold! Where's that nice warm bed?

Braving the elements and under considerable duress I continued observing until the early morning twilight dampened the stars. I retired again for the night at about 4.30 am. My now deep and restful slumber was disturbed by the sizzle of "Bacon and Eggs" and a rather strange game of golf being played outside between Lloyd, Mark, Ned and his kids. Please watch out for the windows, I have enough stress in my life as it is.

I have never been a morning person and the thought of waking up from a nice warm bed to stargaze outside leaves me feeling a tad cold. Maybe it was the chance to see another Aurora or a Meteor Shower. Did "John the Dutiful" really wake me? The whole night was great, a lot of hard work but well worth it. Let's hope that the band of intrepid Astrophotographers, "Peter the Great", Dick the Clever, and "The First Noel" have some great photos to prove that.... it wasn't just a dream after all!

Signing Off
Forest Rump

What IC This Month
October 21 – November 17

Quick Sky Tour
Constellation parade from the west Libra, Scorpius, Sagittarius, Capricornus, Aquarius, Pisces, Aries, Taurus and Orion, rising just after midnight
Last chance to see Venus in the evening sky this month.
Return of our favourite Friar (Tuc) with the Small and Large Magellanic Clouds.

Moon Diary
Full Moon 21/10
Last Quarter 29/10
New (Dark) 05/11
First Quarter 12/11

Evening Sky Planets
Venus: Although only a sliver of disk it is still shining at a bright –4.5 as it disappears in Virgo sinking to inferior conjunction (between the Sun and Earth) on 31/10, before returning as the Morning Star mid November.

Urinus & Neptune are in Capricornus and directly overhead early evening. Neptune will have a cometary visit mid November.

Saturn rises at the tip of Orion's sword before midnight late October and will have a joust with the waning Moon on the 26th

Morning Sky
Jupiter rises in Cancer about 2-3 am and the last quarter Moon will pass by on the night of the 30/10. **Mercury & Mars** are both in the morning Virgo. Mercury is past its highest by the 25/10. Still bright at –1.2 before sliding down to opposition on 14/11. You have got to be quick to catch "the winged messenger". Mars is making his appearance now coming up just one hour before the Sun at first and then slowly moving to trail Sol for his big show next year.

Meteors
The **Taurid** shower happens at this time each year. The max is early November at a consistent 5 per hour from the north-east after midnight. Bright, slow with fireballs sounds exciting!

Comets
Brewington (P/1992 Q1) at 11th magnitude is in Sagittarius in October and moves to near Neptune in Capricornus by mid November. Neptune is near ν (nu) Cap.

Portraits in the Sky
Our constellations this month are gathered around that part of the sky known as "The First Point of Aries" which is the 'Vernal or Autumn Equinox' for the northern hemisphere.

In ancient times the position of the Sun and the beginning of the agricultural year coincided in Aries, thus "the First Point of Aries". However the vernal equinox is now in Pisces, but is still known as the First Point of Aries. In another six hundred years 'the first point of Aries' will have moved into Aquarius. For now the equinox is located about 6.5° south of Omega Psc

Aries – The Ram is an ancient constellation. The Ram may have been the one with the golden fleece sought by Jason but it is also likely that the Greeks took over a much older tradition of horned animals for a symbol of fertility and renewal.

The most obvious stars resemble a rhinoceros horn from our southern perspective. Aries passes the meridian on 23 October but is rather faint except for alpha and beta, which are second magnitude stars. Between δ **Ari** and **The Pleiades** you may find an old grouping of stars made up of *tau, 61, 63 and 65 Ari.* They are clustered around the rear end of the ram and known as 'the Flies of Aries'.

Double Stars:
Gamma Arietis is well-known as a binary pair, 4.8, 4.8, sep 7.8" but I could not split it. I must have been looking at the wrong star.

Epsilon Arietis is a closer binary of nearly equal stars: 5.2, 5.5; separation 1.4"
Lambda Arietis is a wide binary: 4.9, 7.7, separation 37.4".
30 Ari has wide components: 6.6, 7.4; separation 38.6" and
33 Ari has a faint component: 5.5, 8.4; separation 28.6".

Deep Sky Objects:
About one degree east of *Gamma Ari.*is 10.3 magnitude ***NGC 772***. This is a strangely shaped diffuse galaxy with a spiral arm.
Moving slightly north and west we find

Pisces - The Fishes
Pisces is an ancient constellation depicting certain events in the legend of Typhon, a massive Greek monster. This has nothing to do with typhoons or hurricanes.

Typhon was the deadliest and the largest monster ever conceived by Gaia (Mother Earth) and Tartarus. Its thighs were gigantic coiled serpents; its arms could spread across the heavens, and its donkey-shaped head touched the stars. In flight, its wings blotted out the sun, and burning boulders came out of its mouth.

When Typhon attacked the mountain home of the Olympian gods, each god took the disguise of an animal and ran away to Egypt, rather than stay to fight. Zeus transformed himself into a ram, Dionysus a goat, and Aphrodite and Eros both disguised themselves as fish and swam up the Nile to escape the monster.

After a long battle, which spread all round the Mediterranean, Typhon was eventually defeated when Zeus ended his rampage by hurling Mount Aetna at him, finally burying him deep in the earth. But under the earth, the monster still spews up fire and boulders every so often.

Origins of the legend are based on ancient Hittite culture, as well as popular explanations for the volcanic eruptions along the Aegean archipelago.

As for Pisces the fishes, they are Aphrodite and Eros, who were placed in the heavens to remember the time when Typhon nearly overran Olympus. Later cultures connect the two fish with the Biblical miracle of the loaves and fishes.

Pisces is two fish connected by their tails at the star **alpha Piscium** which passes the meridian on 22 October. Alpha's name, "Al Rischa", means "the cord". The sun passes through the southeast corner of Pisces; and the vernal equinox is also there. The constellation is rather faint; Pisces' stars are generally fourth magnitude. There are a few fine double stars, and one Messier face-on spiral, which is quite faint and a challenge for smaller telescopes.

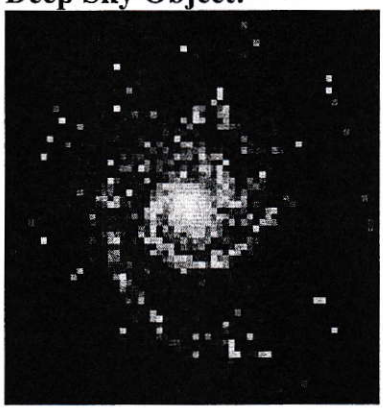
Double Stars:
The following doubles are all nice and bright and quite gettable with 100 mm or more.

Alpha Piscium 4.3, 5.2, has an orbit of 933 years but will require careful observation at 1.6" separation.

Zeta Piscium is a fine binary: 5.6, 6.5 and 23" separation.

Psi[1] Piscium 5.3, 5.5; 30" separation. ***Struve 61 (65 Piscium)*** is a splendid binary of equal stars: 6.3, 6.3; 4.4" separation. This binary is found just on the border with Andromeda. Start from zeta Andromedae, move north 3° and east ½° .

Deep Sky Object:



M74 (NGC 628) is a spiral galaxy seen face on, about 22 million light years away, and one of the faintest Messiers. Good finder stars help a great deal here. The galaxy is found ENE 1.5° from *Eta Piscium.* You will need dark skies and some tricks for this one. Why not join us at the Oaks one night soon!

Good seeing IC

Life Out There?

J Casey 12/9/2002

In the Beginning

The same elements that are found on Earth are found throughout the whole universe. The distribution of the elements in stars, planets and other bodies are not uniform, however. This reflects the fact that heat related processes near these suns segregate combinations of elements [chemical compounds] by boiling or stripping away the more volatile fractions orbiting nearer the sun(s), leaving the more refractory compounds to form inner planets. Further out, [where the Sun's radiation is weak enough to allow ices to condense] colder gas planets and comets are formed .

Liquid water appears to be a fundamental requirement of life, and this puts an inner and outer limit of distance from each star where life might be sustained, and where a suitable planet might be found to harbour it.

Nuclear Fireworks

Hydrogen and helium, the two lightest elements, were synthesised during the big bang, and all heavier elements were synthesised by thermonuclear reactions under the compression and high temperatures at the centre of stars afterwards, using as their fuel this hydrogen and helium.

Further fusion reactions take place as these stars age, progressively building up the concentrations of heavier elements as far as iron. The product elements from these fusion reactions have less mass than was present in the starting material. This missing mass is converted into energy according to Einstein's famous $E=MC^2$ equation and supplies the energy that the stars radiate. It also supplies the thermal agitation necessary to counter the crushing effects of gravity that keeps these stars stable. Fusion of hydrogen into helium gives much more energy than breaking apart unstable heavy elements such as uranium. Thus the difference in energy between an A-bomb and an H- bomb is provided by only a balloon full amount of hydrogen undergoing fusion in addition to detonation of the uranium trigger bomb.

The Building of the Building Blocks of Life

Elements up as far as iron are made in the nuclear fusion furnace in the central regions of normal stars. The elements heavier than iron cannot be formed by such simple nuclear fusion reactions because there is no excess energy available to drive the element formation higher than iron. These higher, heavier elements, which are (in small quantities) essential to all life, require extreme temperatures, pressures and neutron particle fluxes. Another source of energy is required for formation of these heavier elements- and this source is provided by gravitational collapse. This happens during supernova, -when stars of mass at least 5X that of the Sun undergo gravitational collapse near the end of their life after all the hydrogen in their centre has been converted to helium.

The resulting gravitational collapse raises densities and temperatures, and progressively ignites further fusion reactions [which in turn give diminishing amounts of energy] to form elements below iron. Further gravitational collapse supplies the high neutron density [as well as the energy from burning of outer shells] needed for synthesis of elements heavier than iron. Much of the freshly formed heavy elements are hurled into space in the resulting supernova explosion after the initial implosion, due to shock rebound effects.

Neutron Stars

Matter that did not escape the strong gravitational field during the supernova event then collapse back to form a neutron star remnant. The crushing gravity effects are so strong within this smaller size remnant that the repulsion of electrons in the outer shells of atoms within this mass are insufficient to resist the gravitational compression. The electrons degenerate by spiralling into the nucleus of each atom, where they are absorbed by the protons there, to form neutrons - thus forming a neutron star. Thus a neutron star has no atoms, no protons, no electrons- only tightly squeezed and packed neutrons.

Black Holes

When the mass of the neutron star remnant is still > 3x the mass of the Sun after the explosive phase of a supernova, even the neutron nucleus collapses under the even stronger gravitational compression. At some point in the collapse, the escape velocity rises to that of the speed of light. This is the event horizon of a black hole, where no matter can escape, nor can light itself.

Supernovas- Providers of Solid Matter for Planets

Supernova ejection of matter enriches the volume of space in its vicinity with heavier elements, as well as lighter elements such as oxygen, which then combine with the heavier elements to form stable oxides. Initially these are present as vapours, but then will form solid dust particles as they cool by expansion. Without such dust particles, it would be difficult for planets to form at all - the densities reached by only gas clouds of light elements such as hydrogen and helium [with their very low freezing points] would be insufficient to cause gravitational collapse to a rigid body such as a planet

without such dust to form an initial dense core to attract more matter by gravitation.

The Big Die Young

Stars that supernova have very short lives - they burn their fuel at a colossal rate, then explode and shower their debris into the neighbourhood. A star like the sun burns mainly hydrogen and remains on the main sequence [hydrogen burning] for about 10 billion years. A star of 5M [M = the mass of the Sun] would do so for only 68 million years, one of 15M for 10 million years, and one of 30M for only 5 million years.

Thus the big burn bright and die young, for they undergo the same initial fusion reactions as the smaller stars - but much faster. The formation of carbon and heavier elements up to iron occur within a small fraction of the overall life of each star, because, with less energy released with each further fusion, gravitational collapse pushes up the pressure and temperature more and more quickly, to burn these fuels into the next element, so the final death throws are short lived and cataclysmic.

Stellar Life?

In some ways the stars themselves are alive, and a bit like us - they are born by the first ignition of their nuclear furnaces. They grow larger by eating on interstellar dust and gases, with the greedy becoming fat by gorging on everything that comes their way. They grow old as they continually consume their more energetic fuel - hydrogen, and have to work harder to withstand the pressures on them as they age - so they expand their girth and get dimmer with age. And they die and give rise to progeny that are reborn anew from the hereditary bits of their parent[s] that mix with more dust and gases to form new stars in the compression shock waves that ripple outwards after their final fling.

They spread their influence throughout the universe, and in turn add their own bit to the tapestry of the cosmos. The frugal live long, and the big spenders consume more than their share, then blow it all in a short lifetime, and leave other to pick up the pieces after they are gone! The real heavyweights blow a lot of their matter and energy in a final farewell, visible across the universe, then hoard what they can and take it with them to oblivion and beyond. Few of us can do all that, but we too are remembered by the traits that we pass on to our children! Such is life in the cosmos!

End of Part 1 – by John Casey

[The rest of this article will be in the next November Issue]

What's Left of the Year – at a Glance

2/11 – Belanglo Forest
9/11 – The Oaks
18/11 – General Meeting

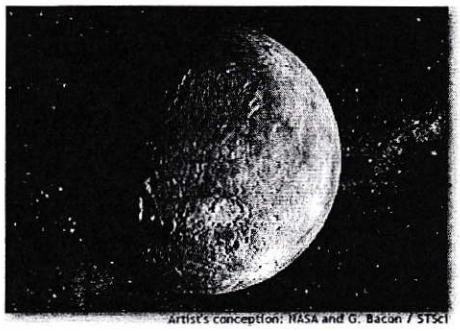
7/12 – Belanglo Forest
14/12 – Christmas Party

That's it folks!

It's Quaoar – Not No. 10

A billion km beyond Pluto, astronomers have discovered a 1300km-wide frozen celestial body – the biggest find in all our solar system since Pluto was first spotted in 1930 by Clyde Tombough.

Is it a planet? No – it's believed to be a very large Kuiper belt object, about half the size of Pluto which most professional astronomers, in their honest moments, also suggest is a Kuiper belt object and not a true planet. But that's another story.



This 'picture' is an artists impression of Quaoar (pronounced kwa-whar), the name of a native American god given to the object by its discoverers Brown and Trujillo. RB