

MACARTHUR ASTRONOMICAL SOCIETY

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President's Report.

Once Upon a Time.

The night was rather crisp but not unpleasant and the rain was holding off, for a while anyway. A tough battle with work and life had led me to the sanctuary of the forest and the chance to rekindle the spirit.

After some stargazing we gathered around the fire and aided by some social lubrications the 12.30 am of a Sunday morning quickly turned into 3am in a blink of an eye, and then we retired.

The rain became a reality and the sound it made upon hitting the tin roof was very soothing indeed. It was a great boost to have such fellowship that night. What was talked about around the fireplace was not of a major consequence, the mere fact of having it was the reward in itself. Thanks guys!

Unfortunately the planned Oaks field night back on June 21 was cancelled due to the weather, a most frustrating decision in hindsight as the night cleared rather early. We had better luck on Saturday the 5th of July even though it was ice cold.

Peter Druery had saved up a whole universe full of information for us and delivered it with his usual enthusiasm at last month's meeting. It was worth the wait, thanks Pete.

Last month we mentioned "The Festival of North Sydney" being held on Sunday night the 20th July. This was of course last night and no doubt we have some tales to tell at tonight's meeting. My apologies for the incorrect date in the preceding journals regarding the Oaks night 12 July... where did that come from?... it's right near a full moon in all its glory. Needless to say there was no night planned.

The Things That Are Planned

21/07/03	General Meeting, (tonight)
02/08/03	The Forest (Special Students Night)
18/08/03	General Meeting
30/08/03	The Forest
06/09/03	Observatory Night
18/09/03	General Meeting
27/09/03	The Forest
18/10/03	The Oaks

We had to change a planned Oaks night to accommodate the University of Sydney's request for a stargazing night at the forest. However we sometimes hold nights at The Oaks off the plan so to speak, so stay in touch via my mobile 0414 445 041.

Guest Speakers

I have made contact with Dr Russel Cannon who should be talking to us at next month's meeting. He has been away in Germany doing research and at time of writing is in India. According to Dr Cannon he is in India to assist in the retirement of one of the country's head astronomers.

A Big Thank You

John Rombi and John Koster recently attended St Marys Catholic School at Eaglevale, some 60 children were treated to some Solar observing and a talk on the planets courtesy of John Koster's planetary models. I believe some cloudy weather made the day a bit difficult so John Rombi went back later

in the week and showed the students the Sun in all its glory. John had just purchased a solar filter for his telescope. Just fantastic guys.

Well that's about it from me so good luck and stay warm.

Regards

Noel Sharpe

President

Black Holes are Holes Indeed

(Ursula Braatz, a regular contributor to Prime Focus, offers this fresh tit-bit about black holes.)

Of course holes have no surface, but for astronomers, the universe's black holes are a different story. They seem to have some kind of a border and behind that is gravity where not even light can escape.

Black holes were compared with neutron stars, but both are totally different. Neutron stars are made of very dense material and have a surface and a lot of gravity, like black holes, but black holes have no surface.

Scientists Christine Done and Marek Gurlinski from the British University of Durham have the results of six years research from NASA X-ray satellite "Rossi X-Ray Explorer" revealing that black holes have no surface.

Ursula Braatz

(Would anyone like to comment on this aspect of black holes?) Ed.

What IC This Month

July 17 – Aug 21, 2003

Bright Star Tour

North before midnight from the west will be Regulus, Spica, Arcturus, Antares, Aquila, Vega, Deneb and Fomalhaut. South from the west will be Canopus, Gamma Velorum, the Cross, the Pointers, the Stinger Stars, Grus, and coming up in the east Achernar.

Moon Diary

21/7 Last Quarter

29/7 New Moon

5/8 First Quarter

12/8 Full Moon

Barycentre (centre of gravity) of Solar System will move back inside the globe of the Sun this month due to the positions of the gas giant planets. As the outer giant planets orbit the Sun the barycentre will be dragged outside again in 2006.

Evening Planets

Mercury and **Jupiter** have some close passes between 20th July and Aug 1 as Jupiter moves into the sunset and Mercury moves away from it. During August Mercury will be visible any night between 7 and 8 pm.

Neptune remains in Capricornus and is at opposition on 5th August and visible all night. If you were standing on Neptune on that day and looking at the Sun you would see Earth transit across.

Uranus remains in Aquarius and will be at opposition 24th August and visible all night all month.

Mars is also at opposition and at its brightest and largest diameter for 200 years. Rising about 7 - 8.30 pm it will reverse direction against background stars in late August until late September. From July to September will be the best time to observe the red planet.

Dawn Planets

Saturn will rise in Gemini about 5.30 am to 4.00 am and meet with the last quarter moon late July as the month progresses.

Venus is behind the Sun till late September when it will return as the 'Evening Star'.

Comets

C/2002 O7 (Linear) is 8th magnitude and moving south in Leo then into Sextans and Hydra during August.

Meteors

27th July will bring the peak of the **Southern delat-Aquarids** at about 20 per hour.

The **alpha-Capricornids** will peak on the 30th July with only 4 per hour but usually bright and spectacular.

Portraits in the Sky

HERCULES – “The Strong Man”

Hercules is a sprawling constellation just to the west of Lyra. From Vega (alpha Lyrae) swing to the west-southwest 20° to arrive in the ‘Keystone’, which is the central part of the asterism. Hercules boasts one of the finest collection of binary stars, and two Messier objects as well.

The constellation is named *Hercules*, after the greatest Greek hero who was called *Heracles*. Heracles was named after the greatest of Greek goddesses, Hera. Her name means “Lady” and she was the daughter of Cronus, and twin sister of Zeus. Zeus later disguised himself as a cuckoo and seduced his sister (what a cuckoo), and the two were married.

Hera became the Queen of the Heavens: goddess of childbirth, marriage, and of women, she was the most widely beloved of goddesses in antiquity. The greatest of Greek heroes was named Heracles, meaning “the glory, or honour, of Hera”.

Although named after her, Hera tried to have the child killed because Heracles was the son of Zeus and a mortal woman (Alcmene). He was a continual reminder of Zeus’ unfaithfulness to her. She sent two monstrous snakes to his crib, but the infant strangled them both with his pudgy little hands.

Heracles became a favourite with the gods. Apollo made his bow and arrows;

Athene gave him a magnificent robe; Hermes provided him with a sword, and Castor (the greatest warrior) taught him how to use it. Hephaestus, the smithy of the gods, made a golden breastplate for Heracles. Thus armed and protected, Heracles paraded through Greek mythology, performing eight heroic deeds and the Twelve Labours.

In fact, the very word “hero” has its origins with the names Hera and Heracles. The Romans changed her name to Juno, Zeus to Jupiter, and Heracles became Hercules. “Hercules” came to Italy in his tenth labour. He would later be given credit for abolishing human sacrifice in the land.

The constellation was originally represented as a kneeling man, with a foot on the neighbouring dragon (Draco). Some star names reflect this connection.

Beta Herculis, is the brightest star in the constellation, and *Alpha Herculis* is 12° SE of this star.

Alpha Herculis is better known as *Ras Algethi*: ‘The kneeler’s head’. It is estimated to be from 430 to about 650 light years away and it may be as large as 400 solar diameters. This is a complex multiple star, a red (or orange) supergiant and a blue-green giant 5th magnitude companion. The secondary is also double and is blowing off a cloud of gas that has enveloped its companion and stretches away for a distance 14 times greater than the width of our entire Solar System.

Double stars in Hercules:

Hercules has several doubles, some with contrasting colours, as well as several close binaries, challenging for those with larger telescopes.

Alpha Herculis is a visual binary with a very long period, something like 3600 years. 3.2, 5.4; separation 4.6".

Zeta Herculis is a rapid binary with a yellow primary and a red companion with a period of 34.4 years: 2.9, 5.5. However the separation is very close at 0.7".

Kappa Herculis is an easily resolved binary: 5.3, 6.5; separation 28.4".

Rho Herculis: is two white stars which make a lovely double. 4.6, 5.6; separation 4.1".

95 Herculis is a very attractive double often described as gold and silver, 5.0, 5.1; separation 6.3".

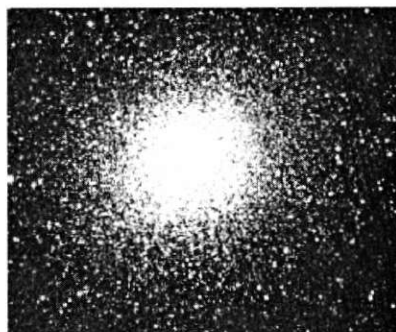
100 Herculis is another gorgeous binary of two equal white stars easily resolved. 5.9; 5.9; separation 14.2"

Struve 2319. A very beautiful binary of two rather faint stars: 7.2, 7.6; separation 5.4".

Deep Sky Objects in Hercules:

There are two Messier objects in Hercules: M13 acknowledged as the best globular in the northern hemisphere, and M92.

M13 (NGC 6205) is a spectacular globular cluster sometimes known as "The Hercules Cluster". This is a very compact cluster of over a million stars. It is very old with an estimated age of ten billion years. It's around 25,000-30,000 light years away and lies on a line between eta Herculis and zeta Herculis, in the 'Keystone' shape.



M13

M92 (NGC 6341) is also a globular cluster, located northeast of M13, and 6° directly north of pi Herculis. M92 is also very striking and worthy of consideration, even if considerably overshadowed by M13.

SAGITTA – The Arrow

Sagitta, while small and insignificant, is a constellation known from the ancient Greeks. Some believe that Sagittarius, the Archer, shot the arrow (apparently without a known target); others talk about Cupid or Apollo. Then again perhaps it is a poisoned arrow from the bow of Heracles. However there is no traditional story which explains Sagitta.

Alpha Sagittae is called 'Sham' meaning The Arrow. At 4.3 magnitude it is a G class giant with a temperature similar to the Sun but 340 times brighter. It only appears dim to us because it is 475 light years away.

The Bayer stars range from 3.5 to 6.5 but the *alpha* star is not the brightest. That position goes to *gamma Sagittae* which is a classic M class red giant with a dead carbon-oxygen core surrounded by shells of still burning hydrogen/helium. Soon it will decline to a variable star. The constellation has several multiple binary systems and a Messier object.

Double stars:

Zeta Sge (Struve 2585) is a close multiple system too tight to separate with a 22 year orbit. Forget the primary and secondary 5.5, 6.5; separation 0.2", but component C: 9.0, and separation 8.4" should be comfortable in a scope, and component D: 11th mag. and separation 75" should be easy in binoculars.

Theta Sge (Struve 2637) is also a multiple system: AB: 6.5, 8.5; separation 12". Component C: 7.0, separation 84".

1° SSW of *beta Sagittae* is *h84* an orange and blue double 6.4, 9.4, and nicely separated at 28".

Deep Sky Objects in Sagitta:

M71 (NGC 6838) is classified as a globular cluster, but looks more like a faint open cluster. It is found just between *delta* and *gamma Sagittae* and slightly south.

Har20 is another open cluster of 20 stars 0.5° SW of M71.

VULPECULA – The Fox

Vulpecula - The Little Fox, was introduced in a posthumously published star catalogue of Johannes Hevelius in 1690. The constellation was originally called *Vulpecula cum Anser*, The Little Fox and the Goose. It sounds rather cute and cuddly but Hevelius put the fox in this area because in his mind it was another aggressive, blood-thirsty, cunning animal similar to the Eagle and the Swan.

The brightest star, called *Anser* - "the Goose", is a class M giant 390 times brighter than the Sun, nearly 400 light years away. *Anser* is also called 6 Vulpeculae (Flamsteed) and is sometimes identified as a double with 8 Vulpeculae, 7' of arc away. However, it is only a line of sight binocular pairing. Vulpecula has a fine binary, a couple of variables, several faint galaxies and even a Messier object.

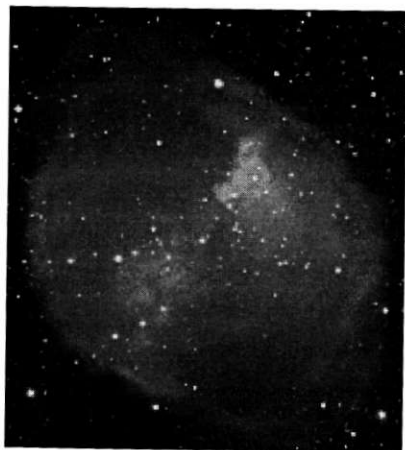
Double stars:

Alpha Vulpeculae is thought to have a true binary companion but some think it only optical, AB: 4.6, 6.0; separation 13.7".

Struve 2525 is a fine binary with orbit of 990 years; 8.5, 8.7; sep 2.1", located between *beta Cygni* and 3 Vulpeculae.

Deep Sky Objects in Vulpecula:

M27 (NGC 6853), "The Dumbbell Nebula" is a noted planetary nebula, large, bright, and oddly shaped (thus its name). It glows with a faint green colour. The nebula is found midway between 12 Vul and 17 Vul and about 0.5° to the south. 14 Vul is in the same field, just to the NNW.



M27

NGC 6940 is an open cluster of about a hundred stars, found just midway between 23 Vul and 32 Vul, 0.5° to the north.

Collinder 399 is a startlingly bright group of stars called "Brocchi's Cluster", or "The Coathanger".. They are actually unrelated and all moving in different directions at different speeds. But for the moment they make an enjoyable sight in binoculars 4° NW of the tail feathers in Sagitta.



Col 399 (The Coat Hanger)

At the east end of Col 399 you can see a bright haze which is **NGC 6802** an open cluster at 8^{th} magnitude.

So hang up your coat, watch for the arrows and chat with the strong man.

Good seeing

IC

MacDob

The Society's own 6" Dob telescope is available for a MAS member to use. This would be an ideal chance for a new (or old) member who does not have a scope to try out a good telescope (while 'only' 6" aperture, MacDob had great optics) to get both the thrill of viewing and also experience in telescope handling.

It costs nothing to borrow MacDob, (though a small donation towards its maintenance would be appreciated.)

If you'd like to borrow MacDob, discuss with me at the next meeting or call me on 4647 4335.

Bob Bee

Magnitudes of Stars

A piece of astronomy jargon often misunderstood is the term 'magnitude.'

Basically, this term is synonymous with a star's 'brightness.' That is, to say a star has a magnitude of 1 means it has a brightness of 1 (whatever that means.). What confuses most people is that a star with a magnitude of 2 is actually less bright than a star with a magnitude of 1.

Before we go into the actual magnitude numbering system, let's clear up one point. In general conversation, 'magnitude' means the apparent brightness of a star. i.e. as we see it from Earth. This is different from 'absolute magnitude' which tries to define a star's 'true' brightness if it was seen from a standard (but arbitrary) distance of 10 parsecs (32.6 light years.) So, if two stars of identical absolute magnitude were different distances away from us, they will have different apparent magnitudes (or just plain magnitudes.)

Now to the numbering system, and this is what confuses most. Historically, Hipparchus and Ptolemy divided the naked eye visible stars into six groups. The brightest were called 1st magnitude, the next brightest (but dimmer) were called 2nd magnitude, etc, and the least bright (and barely visible) were called 6th magnitude. Like Sherlock Holmes, you notice something unusual here? Yes, the less bright stars have a higher number. Or putting it in reverse, the higher the magnitude, the fainter the star. This system is historical and ingrained. We have to live with it.

This numbering system has been developed over the years to include negative numbers (e.g. -1, -4) and even, with the benefit of precise measuring instruments, decimal numbers. (e.g. Sirius is mag. -1.47).

Is there any method in this madness? Very much so. The magnitude scale is (for the maths buffs) a logarithmic scale, with each step of 1 magnitude representing a ratio in brightness of

2.512. This odd number is the 5th root of 100. Or, 2.512 multiplied by itself 5 times gives 100. So a difference in magnitude of 5 represents a difference in brightness of 100.

Difference in Magnitude	How Much Brighter?
-1	x 2.512
-2	x 6.3
-3	x 15.8
-4	x 39.8
-5	x 100

Of course, our naked eyes cannot determine magnitudes to that accuracy. The best we can do is no better than good old Hipparchus. But it is very important to understand what the numbering system means. e.g. if a book tells us that a certain deep space object (a galaxy say) is magnitude 11, that tells us it is 5 magnitudes fainter ($1/100^{\text{th}}$ the brightness) than the faintest star our naked eye can see (mag. 6.)

It also tells us that when Venus is blazing at mag. -4.47 it is 3 magnitudes ($2.512^3 = 15.8$) times brighter than Sirius, the brightest star.

Of course, stars not visible to the naked eye have magnitudes higher than 6. And the galaxies at the far reach of Hubble's light grasp are much much fainter still.

A mag. 29 galaxy, a test even for the Hubble or Keck telescopes, is 25 mag. fainter than our humble 4th mag. globular cluster ω Centauri. i.e. $100^5 = 10^{10}$ (ten thousand million) times fainter.

At the other end of the scale, although our Sun has an absolute magnitude of +4.8, being so close, its apparent magnitude is -26.7. In strict scientific terms, that is plummy bright!

Get the idea?

RB

