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#### MAS Committee

President John Rombi

Vice President Daniel Ross

Secretary Roger Powell

Treasurer Dick Everett

**Committee Members** Lloyd Wright Stuart Grainger Ivan Fox

#### **MAS Postal Address**

P.O. Box 17 MINTO NSW 2566

Web: www.macastro.org.au

Prime Focus Editor Kate Johnston cyberpiggy@optusnet.com.au Macarthur Astronomical Society Inc.

Journal

# PRIME FOCUS

### **Presidents Report**

John Rombi

Good Evening and welcome to our May Meeting.

We are very privileged to have as our guest speaker Professor Bryan Gaensler (Syd Uni)

After being bestowed with the Young Australian of the Year Award in 1998, Bryan received a Hubble Fellowship at the Centre for Space Research of the Massachusetts Institute of Technology. In 2001 he moved to the Smithsonian Astrophysical Observatory as a Clay Fellow. In 2002, he took up an appointment as an assistant professor in the Department of Astronomy at Harvard University where he was also the Director of Undergraduate Studies for the Astronomy & Astrophysics concentration. In 2006, he moved back to Sydney as an Australian Research Council Federation Fellow in the School of Physics at the University of Sydney

In 1997, he showed that many supernova remnants are aligned with the magnetic field of the Milky Way like "cosmic compasses". In 2000, he and Dale Frail calculated that some pulsars are much older than previously believed. In 2004, he used the Chandra X-ray Observatory to make the first detailed study of the behaviour of high-energy particles around a fast moving pulsar.

In 2005, he was reported to have solved the mystery of why some supernova explosions form magnetars while others form ordinary pulsars.

Later that year, he and his colleagues observed the brightest explosion ever observed in the history of astronomy, resulting from a sudden pulse of gamma rays from the magnetar SGR 1806-20. In 2005, he also reported puzzling new observations of the Large Magellanic Cloud, showing that powerful but unknown forces were at work in maintaining this galaxy's magnetic field. Bryan Gaensler is the international project scientist for the Square Kilometre Array, a next-generation radio telescope.

Welcome Bryan.

#### Last Month

Kate & Daniel Ross took us on a tour of Greenwich Observatory.

It was a great personal tour, to see all the old telescopes and timepieces and Daniel straddling the  $0^*$  latitude. Thankyou.

#### Monthly Observing

Finally a clear steady night at The Forest.

The observing was marred initially with dew, but when it finally turned to ICE, BOY!! Did the viewing improve. The galaxies just jumped out at you, the nebulas, like Eta Carinae showed brilliant detail.

I wished the night would never end!!.

We now have 7 active astro-imagers, and I must say the quality of the images I've seen are breathtaking.

#### New Secretary

I'm happy to announce that M.A.S. has filled the position of secretary.

One of our founding members Roger Powell approached me after last months meeting and volunteered his services. At the recent committee meeting, he was unanimously accepted as secretary.

Thank you, Roger.

#### T- Shirts and Caps

We currently have orders for 13 T- Shirts and 2 Caps.

I will be speaking to the company involved, concerning pricing

this week. Due to the lower than expected volume it may mean a price increase. So if you haven't placed an order yet, DO IT NOW!!

#### **Rotary Observing Night**

There will be an Open Night for the public on Saturday June 14th; I need as many scopes on the ground as possible, if you can help (please see me)

<u>Next Month</u> Our speaker will be Dr Laszlo Kiss from Sydney University. Well that's all for now. Clear Skies, John Rombi

#### **Observing Dates**

May 31/05/08 Stargard

June 7/06/08 The Forest 14/06/08 Public Night 16/06/08 General Meeting 28/06/08 Stargard

July 5/07/08 The Forest 21/07/08 General Meeting 26/07/08 Stargard

August

2/08/08 The Forest 18/08/08 General Meeting 23/08/08 Stargard 30/08/08 The Forest

September 15/09/08 General Meeting 20/09/08 Stargard 27/09/08 The Forest

October 20/10/08 General Meeting 25/10/08 Stargard

#### <u>November</u>

1/11/08 The Forest 17/11/08 General Meeting 29/11/08 Stargard

December 20/12/08 Stargard 27/12/08 The Forest TBA - Xmas Party

#### Laser Pointer Legislation

Roger Powell

Members were told at the AGM by the outgoing Secretary, Bob Bee that he had written on behalf of MAS to three NSW State politicians, on 9<sup>th</sup> April, expressing the concerns of members about the proposed bans on pointers. These letters were to the State MPs Graham West (Campbelltown) & Geoff Corrigan (Camden); and to the Police Minister David Campbell.

Similar letters were also sent to the Federal MP for Macarthur, Pat Farmer and the Federal Minister for Home Affairs, Bob Debus.

At the time of writing this article (9<sup>th</sup> May), over five weeks later, the Society has received no considered responses from any of them and just two formal acknowledgements (from Mr. Corrigan and Mr. Campbell). You may draw your own conclusions about whether they are showing any interest in our concerns.

On 7<sup>th</sup> May the Society was contacted by the office of the NSW Shadow Police Minister (Mr. Gallacher MLC), providing a copy of the legislation introduced in Parliament by the Government that day. If this Bill is enacted by Parliament without amendment, the following will apply:

1. Laser pointers will be classed as "dangerous implements".

2. A person must not, without reasonable excuse, use or have custody of a laser pointer in a public place.

3. The maximum penalty will be \$5,500 and/or imprisonment for 2 years.

3. Laser pointers will be defined as a "hand-held battery-operated device, designed or adapted to emit a laser beam that may be used for the purposes of aiming, targeting or pointing".

There is no distinction in the Bill regarding colour/frequency nor is there any minimum output power. So whether they are red, green, infra-red or whatever, they will all be given the same treatment and 5mw will be classified just as dangerous as 50 mw or more.

The proposed legislation gives astronomers no specific exemptions but provides for a rather shaky "reasonable excuse", with the onus on the person in possession to prove it. It will be a "reasonable excuse" for a person to use or have custody of a laser pointer for the lawful pursuit of the person's occupation, education, training or hobby. However, after the media hysteria - and with such a hefty penalty - I would be very careful about the possibility of being caught in possession of one.

Many of you will have seen John Rombi's recent coverage in the local press on this issue. His declaration on behalf of MAS is well worth repeating here in Prime Focus:

The current issue of the aiming of high power laser pointers at aeroplanes is causing serious concerns in our community, raising the prospect of future draconian legislation to limit or even ban the possession of laser pointers. There is absolutely no excuse or defense for the act of deliberately aiming a laser pointer, of any power, at any aircraft and the Macarthur Astronomical Society condemns such actions without reservation.

However, the ownership of laser pointers is a complex issue, as there are in our wider community many legitimate uses for such devices particularly those of low power (e.g. 5 to 20 milliwatts). In particular they are invaluable tools for the amateur astronomer, both when conducting private observations and giving public star talks for both general interest and education.

However, rather than debate the issue here, the Macarthur Astronomical Society wishes to make the following public declaration and commitment to the NSW Government and the people of the Macarthur Region:

We the members of Macarthur Astronomical Society earnestly commit ourselves, as a Society and as individuals, to the practice that while conducting private astronomical observations and public displays we will never, ever, under any circumstances, aim our laser pointers at or anywhere near the vicinity of any passing aircraft.



Congratulations to all members of the new 2008 MAS Committee. L-R : Dick Everett, Lloyd Wright, Ivan Fox, Daniel Ross, Stuart Grainger and John Rombi. (Not in photo - Roger Powell – recently voted as Secretary)

# Star Hopping to Messiers #4 Canes Venatici (M3,51,63,94 &106

Bob Bee

Now we are moving up into the big league – the galaxy super-clusters, with a globular thrown in for good measure. Canes Venatici (CVn) is on the border of Coma Berenices which itself borders Virgo. As we will see in later issues, both Coma Berenices and Virgo contain their own galaxy super-clusters. Canes Venatici's galaxies are not part of either.

As Canes Venatici is not one of your better known constellations, the first task in finding CVn's Messiers is to find CVn itself – not easy as it has only two significant stars. Alpha ( $\alpha$ ) is mag 2.9 while beta ( $\beta$ ) is mag 4.2. The diagram below should help. It represents 19<sup>th</sup> May at 8pm, facing due north. At its highest, CVn is only 20° above the horizon. As you can see it sits immediately below Coma Berenices, immediately to the east of Leo.



OK, you've located Canes Venatici. Now there are five Messiers to be found. **M3** (an impressive globular cluster) and the spiral galaxies **M51**, **M63**, **M94** and **M106**. M3 is a nice binocular object while the galaxies are, not surprisingly, for telescope only. M51 is theoretically visible in binoculars in a dark clear sky but only just. A word of caution – as Canes Venatici and its galaxies are very close to the horizon, you'll need a viewing location with a good uncluttered northern horizon and, most importantly, no light pollution.

The chart below shows the general locations of the Messiers in the constellation so you have a rough idea of where you will be searching. North is down.



Let's find **M3** first – it's the easiest. While not shown on any of the charts above, the 4<sup>th</sup> brightest star in the entire sky, **Arcturus** at -0.05 mag, is in Bootes immediately east of Coma Berenices. Find that first. Then locate  $\alpha$  **CVn**. M3 is conveniently located almost exactly midway in line between the two. (M3 is 14° from a CVn, 12° from Arcturus.) So if you put your finder-scope (f/s) on Arcturus and move it towards  $\alpha$  CVn (or vise versa), you will come across M3 halfway there. It's that simple.

**M51 & M63**: From the chart above, you will notice that M51 is almost exactly twice as far from  $\alpha$  CVn as the distance between  $\alpha$  and  $\beta$  CVn (5.25°) and almost at right angles to the line joining  $\alpha$  and  $\beta$ . That's the area of sky to search in. In moving to M51, we will also find M63.



# From this point on, it will be very useful if you know the Field of View in degrees of your finder scope.

Start from  $\alpha$  CVn. Using Chart A, move down and east about 2.7°. You will see a small triangle of stars (the top right star will be a 'double') which is about 20' wide. From the centre of that triangle, move down about 2.2° and see an asterism of four mag. 5 stars about 1° wide. Select the lower (fainter) of the four stars and move down again about 1.1°. Get your f/s on that spot and look into your main eye piece. You should be right on M63, a 9<sup>th</sup> mag. spiral galaxy. Another way is to swing the straight line of the 3 stars in the asterism 120° clockwise about the left hand star. That should land on M63.

Having found M63, let's move on and find M51. This is via a series of small hops to 'paired' stars. See Chart A. **Starting from M63**, move downwards 1.4° to a pair of stars (15' apart), then 1° to another pair (also 15' apart), then 2.3° to a slightly wider pair (30' apart), then down (and slightly eastward) 1.5° to **M51**'s location. (Now that's real star-hopping.) In your eye piece you should see M51, an 8<sup>th</sup> mag. face-on spiral galaxy.

Now let's find **M94**, a compact spiral galaxy nearly face-on. Though its position looks fairly simple in the overall chart above – a bit off-line from the centre of the  $\alpha$  –  $\beta$  line, there are no obvious asterisms to guide you to the precise spot (like the 'pairs' for M51). Again, knowledge of your f/s FoV will help immensely. See Chart B.



A handy tip is to find the **asterism** of five stars of mags 7 and 8 in the shape of a sting-ray (or a kite with a short tail) located 3° east of  $\beta$  CVn. It's 24' long from nose to tail. As the asterism is 3° from  $\beta$  CVn, it should be in your f/s FoV if you place  $\beta$  CVn near one side. Now the distance of this asterism from  $\alpha$  CVn is 4° and M94 lies exactly on that line 1° from the asterism's centre. (Neat, eh?) Another way is find the asterism, then find the lone 7<sup>th</sup> mag. star south of it (that is, above), half way to  $\alpha$  CVn. Move your f/s to their mid-way point and that should land right on **M94**.

Finally, let's hop to **M106**. Bear in mind this is as close to the horizon as M51 so you might want to do it first, along with M51 before it slips out of view. Either that or travel far north, say to Lightning Ridge. See Chart C below.



The basic strategy here is to start from the star  $\gamma$  CVn, move to an asterism of five stars, move from it to a three star asterism and M106 is in its middle (or near enough). That's the plan.

 $\gamma$ CVn is named La Superba. It's a deep red M7 class variable supergiant star that changes magnitude from 5.0 to 6.5 over 160 days. You'll find it 4.5° from  $\beta$  CVn as shown on Chart C. Now if your f/s has a FoV of 5°, then by placing the edge of the f/s view on  $\gamma$  at the opposite edge you should see a nice asterism of five 7<sup>th</sup> mag. stars, also in a sort of sting-ray shape. It is 1.2° long (nose to tail) and there is a 5<sup>th</sup> mag. star about 30' to its west. Place the centre of your f/s FoV on the 5<sup>th</sup> mag. star. About 1.5° directly above (south of) that star you will see a triangle of stars of mags. 6, 7 and 8 which is 1° long. Place the centre of your f/s in the middle of that triangle, maybe a 'tad' closer to the narrow base and that should be right on **M106**. Check your main eye-piece. Got it? Well done!

*Remember – as always, the above charts show true sky perspective. In your finder-scope, it will probably be mirror image and inverted. Make the necessary allowances.* 



# **Royal Stars – The Watcher of the West**

Ian Cook

**ANTARES** (Alpha Scorpii) marking the Ancient Autumnal Equinox is the second in our series on the Four Guardians of Heaven. What's more, it is rising into our evening sky right now!

A brilliant jewel set within the Milky Way, guides us to the great constellations of Scorpius – "The Celestial Scorpion", one of the few constellations that actually looks like its' name.



Ptolemy named the star **Ant-ares** meaning – similar or equivalent to, or "the rival of" Mars", because of its colour, and without exception all European cultures have followed his lead. Found within the Zodiac, the apparent path of the Sun and planets, it is commonly mistaken for the red planet itself.

The House of Mars or 'Ares' as the Greeks called the god of war was located in Scorpius and therefore the god was its guardian.

The Scorpion's Heart - Antares, is also the heart of the Chinese Blue Dragon, and for the Babylonians it was the "Lord of the Seed". The Mesopotamians called it "Creator of Prosperity".

The star has always stood for action and eminence in human affairs. Many temples were oriented to catch its rising or setting throughout the eastern Mediterranean.

Antares is a class M (M1.5) red supergiant gleaming redly at the scorpion's heart and radiating a large part of its light as invisible infrared within a red-yellow reflection nebula.



DSS image

**Red Supergiants** are the largest stars in the universe in size, but not the most massive. They are not much more than 'hot vacuums' having no distinct surface (photosphere) but simply tailing off into space. They all have stellar winds emanating from the core that are slow and dense and if the core nuclear reaction should slow down for any reason the red supergiant will heat up and change into a **Blue Supergiant**.

The red supergiant stage of evolution is short, lasting only a few hundred thousand to a million years. Current thinking says the most massive RSG (Red Supergiant) evolve further into Wolf-Rayet stars while the lower mass ones continue to develop an iron core and suffer collapse in a type II supernova.

Until the explosion of supernova 1987A in the Large Magellanic Cloud, it was assumed that all type II supernova came from red supergiants. However, the progenitor star in that case was a blue supergiant, and it now appears that some massive stars swing back and forth between red and blue spectral types in the late stages of their evolution before collapse.

**Antares** has fused its entire hydrogen core and has established steady helium core burning. It has a cool surface temperature of only about 3600 degrees Kelvin, because the outer layer gas has expanded away from the source of heat due to lower inward gravity compression.

A low temperature coupled with high luminosity tells us that the star must be huge; a calculated radius of about four times the Earth – Sun distance (4AU). It is so big that astronomers can easily detect and measure the size of its apparent disk.

This magnificent first magnitude (0.96) star, ranked 15th brightest in the sky, is over 10,000 times brighter than the Sun. When its distance is considered, the star must be some 60,000 times brighter than the Sun.



Diameters of giant and supergiant stars

Calculations give it a diameter approximately 700 times that of the Sun, or three-quarters the size of Jupiter's orbit. Uncertainty surrounds its distance and temperature measurements because of difficulty in locating its actual surface. The star is slowly evaporating mass under a fierce wind that has created a gas cloud, or nebula, that shines with light scattered from the very large bright star within.

Perhaps this contributes to the semi-regular variability of Antares that can change by several tenths of a magnitude over a period <u>of years.</u>



Nebula surrounding Antares region

Buried within the wind is a fifth magnitude (5.5) hot (B2.5) class B companion star (only 3 seconds of arc away) that hides within Antares' bright glare. Although a blue-white star, it has the reputation of appearing green resulting from a contrast effect with its brilliant reddish mate, and the red nebula surroundings. Separated by roughly 550 AU, the two take about 2500 years to orbit each other.

This companion resides in a small ionised hole hollowed out within the wind by its own radiation. Having a mass of 7 to 8 solar masses, just below that required to collapse as a supernova, it will probably die as a massive white dwarf.

Antares, with a mass of 15 to 18 solar masses, is a different order of star altogether. It is massive enough to continue fusion of all its outer layers and develop an iron core eventually exploding as a brilliant supernova.



Stages of fusion in a red supergiant

It probably does not have much time left. The event may be a million years off, or it may occur tonight.

One thing is sure the Watcher of the West, one of the great stars of the night sky silently guarding his quadrant for millions of years, will not sneak away quietly. **IC STARS** 

# Mars in the Honey Pot

Bob Bee

This is a quick 'heads-up' for those who enjoy conjunctions or near-conjunctions. Currently Mars is traveling through the constellation Cancer and on 23<sup>rd</sup> May will be passing through the fringe of M44, the Beehive Cluster. It will be an opportunity to observe a very close conjunction with one of the Beehive stars, 39 Cancri (mag. 6.4) and its mag. 6.9 companion.

Mars is moving across the stellar background at a rate of 1.4'' per minute. Not a huge clip but discernable with binoculars or telescope. It is actually moving by its own diameter every 3.5 minutes. Put another way, it will move by one arc-minute (1') every 43 minutes.

By the 24<sup>th</sup> May, it will have moved just beyond the main cluster but still a pretty sight at low power. Why not take a peek on the 23<sup>rd</sup> and 24<sup>th</sup>. It should give you a buzz. Views of Mars's position in and near M44 at 6:30pm on the 23<sup>rd</sup> and 24<sup>th</sup> of May are shown in the chart below.

