

Journal

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PRESIDENT NOEL SHARPE

VICE PRESIDENT **IOHN ROMBI**

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Greetings to all our members

President's Report

and a warm welcome to guests and newcomers present tonight. Last month we held our Annual General Meeting. It's important to acknowledge official proceedings and it was pleasing that the meeting was efficiently conducted. My thanks to Dick Everett for acting as Returning Officer for the elections. It is now my privilege to list the results:

President: Noel Sharpe Vice President: John Rombi **Treasurer: John Koster** Secretary Ian Cook **Committee: Bob Bee, Daniel Ross, Phillip Ainsworth.**

I'm sure everyone will join in congratulating the elected members and at the same time acknowledge the excellent efforts of the out going

committee that have served us so well.

IAN COOK

After the A.G.M. formalities our guest speaker was to be Dr Ragbir Bhathal. Unfortunately this did not occur and Ragbir's talk has been rescheduled for next month

Peter Druery as always was well prepared and gave a great presentation on Auroras, Comets and Supernovas. The references made about "small brown dwarfs" and a certain M.A.S. President left me feeling a bit "short changed".

Tonight our guest speaker is one of Australia's foremost amateur astronomers. Peter Williams. Peter is a regular contributor to Sky and Space Magazine and will speak to us tonight on Variable Stars. The University Open Night on April 28th was in one word "HUGE". I heard that Dr Fred Watson's presentation was

fantastic and so was the turn out by the public. Well done to everyone. Think how great it would have been if we had something to look at, apart from the cloud !!

Important Matters

Membership Renewals are due by the end of this month. Please pay promptly and avoid having to pay the \$10 joining fee.

The next Observatory Open Night is on the 26th May. If the stars prevail it should be a successful night. I'm sure with the crowd numbers returning to 100 or so, Daniel can return his security guards uniform and red torch. My slide show now incorporates a segment featuring Samantha Kidd. Her talk on telescopes was very informative. Next month Samantha will talk about her favourite planet. Well done Samantha.

Personal Note

It's an honour and privilege to be elected as President of M.A.S. for a 2nd year. It's a great little club and I'm sure that the year ahead will be positive, rewarding and a lot of fun.

Noel Sharpe

Vice President's Report

Well folks, here we are again - another month (gee hasn't the observing been great?, more of this later!!) I would like to congratulate the members that have taken up the challenge to be office bearers of our society. I am very honoured to be V.P and I'll try to live up to the responsibilities of this position, I certainly have hard acts to follow. Remember we're here to represent YOU, so if there are any matters that you would like discussed. please see one of us at any of our meetings.

We might be an astronomical society, but I can't recall the last clear sky we had, either at The Oaks or Observatory nights. How frustrating. Maybe I should resurrect the "Dastardly Overcast and his sidekick Foggo the Thick" from P.F May 2000, at least that would keep us amused whilst we wait for the clouds to depart.

On to something more positive, this would have to be the Observatory night on the 28th April. After Dr Watson's

great lecture on Cosmic Illusions at one of the Uni lecture theatres, the 400 or so members of the public climbed our observatory hill bound for the two white domes perched on the top. The astronomically charged public, eager to see "What is out there" were greeted by a dozen of our society's astronomers armed with their scopes, ready for action. Unfortunately the clouds had different ideas, and we were left to play "spot the occasional star" with our enthusiastic but disappointed visitors.

Noel had set up the slide projector and proceeded to take the people on an extended tour of the Universe, with many great views of distant galaxies and closer to home photos of our own solar system projected onto the smaller of the two domes. The questions came thick and fast and the answers were handled with Noel's usual high standard of wit and information. Unfortunately some of the background noise drowned Noel out at times. I'm sure this can be fixed with the addition of a microphone and speakers.

One of our younger members Samantha Kidd also gave a talk on telescopes. Well done Samantha, I hope you will speak again at one of our future Monday meetings.

When I had a second to myself, I wandered around and listened in to the conversations taking place, I was impressed by the standard of the Q&As. The night finished about 10.00pm with a very happy observatory directort Ragbir Bhathal) and a dozen tired and hoarse voiced astronomers very pleased with the success of the event. A job well done M.A.S.

John Rombi

Lagrange Points

Josef Lagrange, an Italian-French mathematician discovered five points in the vicinity of two orbiting masses where a third, smaller mass can orbit at a fixed distance from the larger masses. In other words, the Lagrange Points mark positions where the gravitational pull of the two larger masses precisely equals the centripetal force (the force required to provide the centripetal acceleration that causes a body to move in a circle) required to rotate with them.

Of the five Lagrange points, three are unstable while the other two points are stable. The Lagrange point between the Earth-Sun system affords an uninterrupted view of the Sun and is currently home to the Solar and Heliospheric Observatory Satellite SOHO.

Atilla Kaldy

Ceduna Solar Eclipse Coach Charter

There has been a good response to the prospect of organising a charter coach to Ceduna for the Dec.4 2002, Solar Eclipse. At this stage I have obtained quotes from three coach companies regarding a 10 Day (9 night) charter. The quotes obtained are all very reasonable and are much better than I expected. The quotation was for a 5 star luxury coach fitted with seat belts, toilet and video (for our favourite Astronomy and Sci.Fi. videos of course!) The best quote obtained was for \$825 which includes transport and three star motel accommodation on a twin share basis. As all motel accommodation was booked out at Ceduna, when the coach operators devised their quotes, I have made contact with a Tourist Park operator for accommodation for those that require it during the two night stay at Ceduna. The tariffs are as follows: 4x1 bedroom units - \$44 per

double. (\$5 per extra person).
3x2 bedroom units - \$100 per night (max 4 people).
5x Budget cabins - \$28 per double (\$5 per extra person).
3x4 berth and 2x6 berth

available. The I and 2 bedroom units have en-suites. The budget cabins do not. The bathrooms for the budget cabins are in the amenities block. All accommodation at the Tourist Park are self contained and include air conditioning. If accommodation is required at Ceduna, in regards to the above, then please advise me ASAP so as not to miss out on accommodation at Ceduna as my tentative booking with the Tourist Park operator is for a limited short period.

The itinerary of the coach trip is as follows: Day 1 (29/11/02) - Depart Sydney for overnight at Nyngan. Day 2 (30/11/02) - Nyngan to Broken Hill. Day 3 (1/12/02) - Broken Hill at leisure. (Visit various Bush Artist galleries or the mines or have a rest). Day 4 (2/12/02) - Broken Hill to Port Augusta. Day 5 (3/12/02) - Port Augusta to Ceduna. Day 6 (4/12/02) - Solar Eclipse Day - Ceduna. Day 7 (5/12/02) - Ceduna to Peterborough. Day 8 (6/12/02) -Peterborough to Mildura.(Wineries). Day 9 (7/12/02) - Mildura to Lecton (Wineries). Day 10 (8/12/02)- Leeton to Sydney.

There is a return slip at the end of this article. Interested parties are asked to express their interest as well as indicating total numbers attending (i.e. friends, family members, etc.). If accommodation at Ceduna is also needed then this needs to be indicated as well.

Yes, I am interested in joining the coach charter to the 2002 Ceduna Solar Eclipse. Name Contact phone Number attending Accommodation required at Ceduna with the charter. Yes/No. **** Send the above slip to Lou Pagano, 13 Coolangatta Av., Cronulla, NSW 2230. or email to lipagano@start.com.au

An expression of interest is needed within a month of this publication. Compare this charter with a similar tourist trip organised by a tour operator and you will see that it is exceptional value. Beats driving there! Bring on the Solar Eclipse!

Lou Pagano (Sutherland Astronomy Soc)

Telescope Tip: Focal Length = Aperture(mm) x Scope F No. eg for a 8" F6 scope: FL = 200mm*6 = 1200mm Magnification = Focal length/Eyepiece size eg with a 40mm eyepiece Mag. = 1200mm/40mm = 30x

The Paradox of the Vernal Equinox

(Source of information: "The Cosmological Milk Shake" by Robert Ehrlich; "The Cambridge Encylopaedia of Astronomy")

The Vernal Equinox occurs when the Earth's North-South axis makes a 90° angle with the line joining Earth and the Sun.

The time of the Vernal Equinox changes by 1/25800 (about 20 minutes) every year, caused by the precession of the Earth's axis.

The seasonal change, however, doesn't drift along with the Vernal Equinox by the same amount each year and herein lies the paradox.

The reasoning is as follows:

a) The (constant) length of a 'sidereal year', (comprising 365.25636 mean solar days) is defined by the time Earth takes to complete one 360° orbit around the Sun; b) The length of one 'Tropical Year' (comprising 365.24219 mean solar days) however, is defined by the time Earth takes to complete an orbit from one Vernal Equinox to the next; c) The difference between the mean solar days of the Sidereal and Tropical years is 0.01421 days per year. This slow drift is compensated by the 'leap Year' correction, introduced into the Gregorian

Calendar in 1582, being in common use today; d) The result of the Leap Year corrections since the year 1582 is an annual drift of 0.0003 days from one Vernal Equinox to the next. Thus the sum of all annual drifts would amount to one single day in 3,333 years.

Frank Kish

Ursula's Observations

From the coast in Bundjalung National Park:

23/2/01: We are here north of Grafton in Bundjalung National Park (Black Rocks). It is our favourite place, good for bushwalking, fishing and swimming. We swim in the Jerusalem Creek and my husband is fishing on the beach.

It is peaceful here and I have a sky full of stars. It is 9.30pm and I saw a shooting star. There is still the triangle of Saturn, Jupiter and Aldaberan but I can see Taurus and all the other constellations better than in the city.

I thought, better to start with observing in the west and discovered Mira in Cetus which is a variable star. It looks beautiful with naked eyes and in binoculars is shining bright blue and red, and it is twinkling. Through the telescope I saw it not twinkling and more tiny.

Then I got the Pleiades in my telescope. They are nice and

clear, with the binoculars they are bigger and brighter because of the moist air.

I saw M!, the Crab Nebula, with binoculars as a fuzzy spot. Then I enjoyed looking at Orion with the Great Nebula and stopped observing for the night.

24/2/01: It is 10.30pm and I am observing Orion tonight with my telescope. I looked at "Orion's Sword" with the Great Orion nebula M42 only with the first eyepiece so I could not see the Trapezium. The I saw nebula NGC1977 with the stars 42 & 45 Orionis and star cluster NGC1981. Then I had "Orion's Girdle" with Mintaka, Atnilam and Alnitak, then I stopped because I was tired.

25/2/01: Tonight I was trying "Orion's Girdle" again with my telescope and saw the nebula around Alnitak. I tried the next eyepiece and the Barlow lens but the air is too moist. I am getting better with practice and it gives me more pleasure.

There were too many clouds on the next nights, then came the rain. On 9/3/01 we had to go home, narrowly escaping the floods that followed in northern NSW.

From the Snowy Mountains:

12/4/01: We arrived today with our caravan at the camp site at Old Adominaby on Lake Eucumbeene. It was a bit chilly here today but at night there is a clear starry sky and the air is not moist like on the sea. Old Adominaby Caravan Park is on the hillside and we are on the spot looking towards east over the lake. So the best thing for observing the stars is to watch what is going on in the east, which was really interesting.

I start observing at 8.55 pm when the ³/₄ Moon had risen over the lake and was completely orange. After a while the Moon was higher in the sky and it was shining silvery on the lake. I saw Mars on the right side and the Moon was 7° above Mars like it is written in Prime Focus. (Thank Goodness! - Ed). Then I saw Scorpius above the Moon and Mars, and higher up in the sky the Milky Way with the Southern Cross etc. I observed these with my binoculars.

13/4/01: It was a nice sunny day today. Our friends came and moved next to us in a cottage. In the night time, the men went fishing and I stayed with the ladies until 9 pm when I took my binoculars out to observe again. First I saw Scorpius, very large in the east. With binoculars I observed M6, M7 and NGC 6231 which is a nice cluster like a mini-Pleiades. At 9.15pm Mars has risen. For a while I went into my warm caravan to write down what I saw. At 9.40 pm I saw that the Moon had risen. Now it was like Prime Focus said - the Moon is 6° below Mars. Again the lake looked

beautiful when the Moon was shining. I stopped observing for a while but at 10.30 pm I saw that Antares, Mars and the Moon formed a straight line.

14.4.01: Tonight I went for a walk with my friends and we saw Scorpius and all the other stars, the Milky Way and Crux. We said 'good night' and went inside, but at 10.30pm I went out again and saw the 1/3rd Moon had risen and formed a straight line with Mars and Antares. I had my telescope out too but I gave up because I could not get Mars in the scope and my husband came back from the fishing.

15/4/01: It was a bit cloudy tonight. I took out only my binoculars and saw Omega Centauri (NGC5139) which is a beautiful star cluster in Centaurus.

16/4/01: Tonight I did not do much observing but I saw with the binoculars that Mars is now 6° above Lagoon Nebula in Sagittarius. Sagittarius is good to see now with its Messier objects.

Ursula Braatz

The Day the Night Turned Red

Well there we were, four very desperate astronomers hoping that clear skies would prevail. It's been an eternity since a good nights viewing took place and this led us to an unscheduled observing night at The Oaks on Saturday 31st March. Those in attendance were Lloyd Wright, new member Robert Van Den Noulwelant, John Rombi and myself.

It was Robert who noted the time at 11.10 pm which accurately recorded a once in a life time event. We were taken completely by surprise and now in sheer panic I fumbled to attach my camera to the telescope so I could capture whatever this was on film. The cause of all this activity was Lloyd's comment, "Why is the Sky reddening?" At that point John Rombi yelled "Wow, look at that." Knowing John as someone who normally casts a calm perspective such a comment carried immense attention.

Looking up I now saw a rapidly engulfing reddening hue that had streaks of green light piercing through it. The shape was dynamically altering second by second like a gigantic curtain blowing in the breeze. I'll admit to some apprehension and a strange sense of foreboding. I've never seen anything like this before, I didn't know how big it would get or what would happen if it touched the ground. By now John confirmed the sighting as an Aurora, "The Southern Aurora" to be exact as it was sitting just under the Southern Cross and measured some 30 degrees high by 40 degrees wide, a sizeable part of the sky.

Why was it so far north? I t thought it would be something t observed only by penguins e and seals in the Antarctic. g

and seals in the Antarctic. Luckily I had my camera but I left my tripod at home. Every second was precious, as we didn't know when the sky show would end. I could not afford the time to frame the shots so that's why they're taken on an angle.

The Aurora lasted about 40 minutes, the sky cleared somewhat and I took some photos of other objects. When packing up in the wee small hours Lloyd said, "A lot of time is spent setting up for photography." I agreed and many long hours over several years is a lot of hard work, but I'm sure all of our photographers pursue that one special shot, the one that makes everything seem worthwhile.

Why, What and Wherefores.

The Aurora we saw was a result of an explosion on the Sun's surface the previous day. The increase in charged particles (the Solar Wind) hits the Earth causing an increase in the Aurora's activity, the Northern Hemisphere was very active and sightings were widely reported. If the storm is severe enough we might get an increase in sightings even this far north at The Oaks.

When a storm that's pretty close to the mark, the Sun's increase in charged particles interacts with our magnetic field and in turn reacts with the atoms and molecules in the upper atmosphere in the example we saw. The red glow is the hydrogen atoms and to the lesser extent, the green is oxygen.

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Solar flares and coronal mass ejection speed up the Solar Wind, which can turn a gentle breeze of 400km a second into a 1000km a second hurricane. A mass ejection occurred over the weekend of the 31st March, the resulting geomagnetic storm fires immense activity which spiral along the Earth's magnetic field lines intertwined in the upper atmosphere. This imparts energy to atoms and molecules and this transforms into specific wavelengths of light.

The Solar flare and Sunspot which measured 11 times the size of Earth was located on the western limb of the Sun. This means we just caught the edge, the eruption on the Sun was at least equivalent to a **2 billion megaton nuclear bomb**. Oh, did I mention the Sun rotates every 27 days? Let's hope it's lost some intensity by then.

Noel Sharpe

New Discovery – Universe is 12.5 billion Years Old

Astronomers ask for centuries – How old is the Universe? They estimate that the Big Bang was 10 – 16 billion years ago. There was no 'correct' answer. That will change now. On the Very Large Telescope (VLT) of the European Southern Observatory (ESO) a team is working out the age of the Universe more accurately. The scientists use a method similar to the carbon dating of fossils on Earth. The astronomers, however, search the universe for the unstable isotope Uranium 238.

The astronomers study a star which already existed when our galaxy just started to develop - CS 31082-001. This could be one of the oldest stars in the Universe. The star has a built-in time measurement. When it was born, CS 31082-001 started ticking the U238 down. You can see the precise age from the unstable isotope from certain spectra lines of light from the star. This new technique is known as 'cosmochronolgy' and comes to the result that star CS 31082-001 is about 12.5 billion years old.

It is possible that astronomers made an error of 3 billion years so they are really no closer to an accurate result than they were in the beginning.

I translated this story from a German magazine. It shows that nobody knows the whole truth of the Universe.

Ursula Braatz

Measuring the Distances to the Stars – Part 3

CEPHEID VARIABLES

The darling of astronomers is the Cepheid Variable. No other star type has been more instrumental in allowing astronomers to make the leap to calculate distances outside our galaxy.

The science and use of Cepheids is quite complex but, in the end, the concept is relatively simple (if you don't think about it too much).

But first some history. In 1783, a young astronomer, John Goodricke, who was both deaf and mute and died before he was 23 (what a waste), was observing variable stars. This included the orbiting binary type (called Algols after Algol, the first observed). He also observed the star Delta Cephei which was, in fact, a true variable. That is, it varied in brightness in its own right.

He noted that Delta Cephei varied in magnitude from 3.5 to 4.4 with a strictly regular period of 5 days, 8 hours, 37.5 minutes.

Later, other stars were discovered to have similar strict periods of variation. These were described as Cepheid Variables, in honour of the first discovered by John Goodricke. In fact, Cepheids can have periods of variation from 1 to 50 days. Over the years, the following features about Cepheids have been discovered:

* They are yellow supergiants of great brilliance. Up to 10,000 times the brilliance of the Sun.

* The more luminous the Cepheid, the longer its period of variation.

* Their spectra exhibit Doppler shifts in synchronisation with the period change of their brightness. In fact, it is now known that these stars are actually pulsating backwards and forwards like an inflating and deflating balloon.

Now, why is this important?

In 1912, an American, Henrietta Leavitt was studying Cepheids in the Magellanic Clouds. She discovered many Cepheids in the Clouds, just as there are scattered around the Milky Way and in globular clusters.

After the collection of a huge amount of data, she plotted the apparent magnitudes of the Cepheids against their observed periods of variance.

She obtained a graph similar to this shown in Figure RB.4

Leavitt was able to show that the longer the period of variation, the brighter the Cepheid<u>appeared</u>.

As it was reasonable to say that <u>all</u> the Cepheids in each Magellanic Cloud were the same distance from us, it followed that the longer period stars were in fact the more luminous.



With this knowledge, she was able to provide a direct method of identifying a Cepheid's brightness by measuring its period of variation. (This was able to be done at great distances, when determining the star's spectral/luminosity class was impossible).

It turns out that Cepheid variables come in a number of classes. Population I Cepheids or 'Classical Cepheids' scattered within the disc portion of the Milky Way, are younger and brighter than the older Population II stars, found in the halo of the Milky Way.

The other type, also a Population II star, is the RR Lyrae (named after the first of its type discovered). These are old blue-white giant stars frequently found in the central region of the galaxy and globular clusters.

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RR Lyraes vary in magnitude by about 0.5 to 1.0 in less than a day.

Now, none of the Cepheids or RR Lyrae variables are close enough to measure their distance by either Trigonometric or Spectroscopic parallax methods.

A large array of indirect methods is used to calculate distances to the nearest variable stars, mostly RR Lyrae types in nearby globular clusters. (It is interesting to note that Delta Cephei is calculated to be 1031 l.y. away).

The main problem with using the Cepheids was that at first they couldn't calibrate the Period-Luminosity chart. That is, they could plot Period against apparent magnitude for groups of Variables in a common cluster, but they couldn't convert the apparent magnitudes to absolute magnitudes. This is where the RR Lyraes proved their value.

Astronomers were able to use statistical methods (amongst others) utilising proper motions and radial velocities of RR Lyrae stars in common clusters to obtain mean distances to the RR Lyrae stars. This allowed them to calibrate the RR Lyrae part of the Period-Luminosity chart and by combining the RR Lyrae and Cepheids on the chart, they had a calibrated chart for the Cepheids. So how can they use them? Let's take an example using hypothetical numbers.

An astronomer may observe a Cepheid in the Andromeda Galaxy and make the following measurements: Period of Variation = 5 days Apparent Magnitude = +21.5From the Period and the P-L chart, we 'know' that the absolute mag. of the Cepheid is -2.7. Using the Inverse Square Law equation $\log r = [(m-M) + 5]/5$ we get Log r = [(21.5 - (-2.7)) + 5]/5= 29.2/5 = 5.84Therefore, $r = 7 \times 10^5$ parsec = 2.2 million light years.

From this, we deduce that the Andromeda Galaxy is 2.2 million l.y. away.

In Hubble's first calculations, he incurred errors in the distances to Cepheids and the calibration of the P-L chart. When this was later corrected the distance to Andromeda Galaxy was corrected from 900,000 to 2.2 million l.y. and the size of the Universe doubled overnight.

Unfortunately, Cepheids cannot be detected further out than the nearer galaxies in our Local Group. However they are immensely useful for distance measures for stars and clusters in our own galaxy and the closer Local Group galaxies. This is another layer of the pyramid of distances.

Bob Bee

WEAK LINK IN MARS FLIGHT!

A 3 year mission to Mars, planned for 2020 will include six months space travel each way. The boffins are reasonably confident of the rocket science and mechanical aspects; but the real problems will be what happens to the people.

NASA, an agency dominated by engineers and physicists; now realises that resources to deal with medical challenges in deep space exploration are in short supply.

A 1997 review of 279 men and women who were on board space missions between 1988 and 1995 revealed that all but three people suffered some sort of illness during the trip. 175 medical incidents were identified and four of these could have caused the mission to be abandoned.

Results of being without gravity

The harmful results of being without gravity over an extended time caused most of the incidents. The fluid and small bones of our inner ear rely on the steady grip of gravity under which the body has developed. Without gravity the body lacks the signals that are essential for orientation and balance.

Even seasoned astronauts frequently vomit, overcome by vertigo and nausea, right

after lift-off. All movements are slow and careful and antiemetic medication is taken, but even minor things such as turning one's head too quickly can trigger space sickness. (Missing the special bag for this is considered very bad form among fellow travellers)

Gravity also affects the circulatory system. Blood sinks to our legs and lower torso normally. When we enter space, that blood suddenly becomes light weight and rushes upwards causing a pounding headache quickly. The heart beats rapidly to equalise the system by pumping blood out. This deceives the body into thinking there is an excess of fluid in the body and it works harder to lower it. Over two to three days a person can become dehydrated by a domino effect as the loss of water causes the blood to compensate by thickening. Thickened blood is a cue for the body to stop producing red blood cells and over some few months in space a person can become mildly anaemic.

Risk of bone fracture...more than 25 percent

Our musculo-skeletal system is balanced on Earth by working against gravity, a biological process called remodelling. In weightless space, this process slows and a person will lose 1 to 1.5% of bone mass per month; even tendons and ligaments will deteriorate with time. Minor stresses could cause supporting ligaments and muscles to tear more easily with less stress. Out of a crew of four, one is likely to break something!

Things like G suits and salt tablets are crude and not very effective.

People in the program don't talk about such things to preserve the dignity of the returning 'heroes'. Recent pictures of a Russian cosmonaut being assisted out of his capsule like an invalid surprised many of the public. Kennedy Space Centre has the crew from the spacecraft ride in robot people movers, and uses curtains over the catwalk from the capsule to prevent anyone outside from seeing the astronauts stagger and being carried. A month after return most still could not jog without becoming short of breath.

No rehab program

How will weakened astronauts who have been in deep space for six months adapt to Mars where there will not be a rehabilitation program waiting for them? How will they get used to the surface of Mars, having a gravitational force double that of the Moon? An Australian astronaut has said, 'An emergency abort, or escape via the hatch, has the potential for disaster'.

Artificial gravity could be created by spinning the spaceship. Two parts built in

a 'dumbbell' shape connected by a bridge, could spin the ship around a central axis. But this design is more likely to break catastrophically in mechanical failure or if hit on the bridge by space debris. Spinning just a central portion was found to create G forces which acted unequally on the astronauts head and feet. A 'G-chair' is being tested for astronauts to use like medication, for individual prescribed sessions worked out on body weight and other factors on long journeys, but progress has been slow. Another method is some kind of brain re-conditioning, like adapting to the change when you put new spectacles on, although it may take you some hours in the beginning, or even days, to reach that stage of acceptance.

A greater danger still

Beyond the protection of the Earth's surrounding magnetic zone, iron particles flying at speeds almost that of light penetrate anything in their path. Regular repair trips to Hubble Telescope replace parts perforated by cosmic rays. Our bodies, even the skull, have neither mechanical nor biological protection against these microscopic bullets. Cosmic Rays cause tiny multiple breaks in both strands of our human DNA helix, and we have not evolved anyway of repairing this.

Tests from newly developed equipment run on rats has

found changes to both brain chemistry and structure. Autopsies revealed microscopic lesions from the radiation as if they had been hit by buckshot. Changes in behaviour had been observed in these same rodents such as decreased memory and a general apathy. They lost interest in what was going on. There is a fear also that change to bacteria and fungi on human skin and in our gastro-intestinal tract could result in virulent pathogens resistant to antibiotics spreading in the cabin.

Manned mission to Marsillegal

Exposure to cosmic rays increases the risk of cancer. Mir astronauts show chromosomal breaks related to the levels of radiation they encountered during the flight. Experts estimate a 1-2% increase in their chance of getting cancer as a result. This is within acceptable OH&S standards. However a review by the USA National Research Council has estimated the lifetime cancer risk for astronauts on a trip to Mars could be as high as 40%, more than ten times the acceptable level. Consequently it is currently illegal for NASA to send a manned mission to Mars and it will remain so until protective measures are devised and implemented against radiation.

NASA firmly believes an acute medical crisis, that is an

open bleeding wound or broken bone, is most likely to occur on a trip to Mars. That means one crew member would be trained in general surgery and emergency procedures. However, consider the difficulties. Blood aerosolises into a fog in space, scalpels and equipment have no weight in the hand, human flesh loses its normal density, wound healing and effects of anaesthesia could all be different. Time delay of radio signals can be up to 40 minutes so all decisions would have to be made on the spot.

People working on these issues which includes psychological matters, believe that training will probably be in some kind of simulation environment for crew members, combined with sensor equipped instruments and artificial intelligence to guide operations.

So what kind of astronauts will they be? Highly trained most certainly. If young the advantage is they are very fit but possibly having to forego the chance to have children because of radiation. If older, then past child bearing, but prone to physical or medical issues. Astronauts asked the same question, all said they didn't care as long as it was someone who can fix things. Even knowing the risks all stated their enthusiasm and commitment to the journey if given the opportunity.

Whatever the challenges on the surface of Mars, getting

humans there fit and well, will mean some great discoveries on Earth first!

Ian Cook

Some Observations

When: 15 – 17th April. Site: Backyard at Bawley Point, South Coast. Viewing Aspect: South & East – unobstructed looking downhill over roof of house; North & West – some lower views obstructed by trees. Otherwise OK. Lights: Neighbour to NW had coloured Xmas lights on till ~11pm. Neighbour south (downhill) had floods lighting up giant gum tree till ~11pm. Dark site? - The Milky Way was very distinct with Coal Sack visible. A plethora of stars with w Centauri and Jewel Box easily naked eye. LMC was 'in your face.' And... no Moon.

BUT... the 'seeing' was very ordinary, due to the moist air over the nearby ocean (?) Still, a great night for viewing with my 9.25" SCT.

Some of my more deliberate observations were:

Orion: Due to the trees to NW, was unable to observe the individual multiple stars. I caught the 'sword' with M42 but it was very low and not very distinct. Seems that I'll be waiting for November to see old 'Orry' again.

Canis Major:

 v^1 is about 4° SW of Sirius and comprises a pretty optical double. The main mag 5.7 star is white, but I was not 'on the ball' at that early stage and forgot to check the colour of its mag 7 optical companion. (For next time.)

M41 is a binocular open cluster about the area of the Moon. I'm sure I could have imagined shapes in it if I took the time. (At this stage on 15th I saw sheet lightning far off to the east over the ocean and began wondering if I would have to do an emergency pack up. So I was a bit distracted. As it turned out the lightning disappeared and the stars brightened, so I stayed put till midnight.)

NGC2362 – an open cluster. No special impressions formed. Slack – I'll have to revisit this as well.

Puppis: I found this broad constellation (the Stern) tucked midway between Sirius and the False Cross. (In fact, those nights I found the False Cross a handy reference point for a number of objects in this area of the sky.)

M47: I observed this first as it is visually obvious to the naked eye and also the finder scope. Not a lot of stars but quite bright at x50. Though it has no distinct shape, there are some nice knots and star pairings to look at.

M46: In the finders scope, this is but a faint smudge about 1° E of M47, like an illicit finger mark in the eye piece. But in

the x50, it was a beautiful field of countless (OK, lots) faint stars, with no salient brighter stars. It is delightful to view, having no particular shapes but looking like a handful of sand thrown on a velvet cloth.

I did note something odd in it.



Just off centre there was a filmy shape attached to one of the stars. It appeared slightly leaf shaped (more triangular than circular) with a bubbly quality. I made a wild guess that it might be a planetary nebula. (Later, checking M46 in Burnham, he confirmed it is NGC2438, a small planetary nebula which is not part of the star cluster. Beauty!)

Vela (the Sails) lies due east of Puppis and starts from the top (κ) and western (δ) stars of the False Cross. I started with γ Velorum to the NW of δ . This split nicely into a distinct double of mags 1.8 & 4.3 (I knew their mags beforehand while planning my observations.)

Then I moved to δ Velorum which is supposed to be a 2.0/5.1 double, but for the life of me I could only see a single star. After double checking that I was actually looking at δ , it still looked like a single. I'll have to return to that star another night. (The down-side of a beautifully dark sky is that there are so many stars, it's difficult to spot the one you want in the finder scope.)

I had planned to view the clusters NGC2547, 3132 and 3228 but at that date/time they were directly overhead and I couldn't manage the SCT equatorial when almost vertical. (Finder and eyepiece too low to reach at the bottom of scope etc, even with the tripod at maximum height. Yeah, yeah, you Dobbers can laugh.)

Leo: Fortunately Leo was viewable between two large wattle trees to the north. I started with bright **Regulus** (α Leonis). The mag 1.4 primary was in wide contrast to its wide 7.7 mag companion.

Then I moved to γ Leonis, 8° below and 3° E of Regulus. This revealed a very pretty double of yellow-gold stars slightly closer in mag (2.2 and 3.5) than Regulus's pair.

Then my 'success' of the night. Considering the neighbour's Christmas lights to my left and the moistness of the sky (from the ocean only 400m away), I thought I did well. I tried to find **M95** and **M96**, located midway along the lion's belly and offset south by about 3°. Try as I did, tracking the scope back and forth in the approx area. I couldn't find them. Then I checked my book (Collins Pocket Guide to Stars & *Planets*) and realised that the Ms were located at $+12^{\circ}$ declination, the same as Regulus. So I put my scope back on Regulus, locked the declination movement and nudged my scope along RA towards the lion's belly. (Equatorials do have their uses, you Dobbers.) I was starting to suspect that I would miss them if I didn't have my alignment very close when - bingo! - there were two distinct but faint fuzzy patches side by side, $\frac{3}{4}^{\circ}$ apart. I centred them, then changed eyepiece to give higher mag (x90). This not only enlarged but brightened them.



M96

What I could see was the concentrated cores of the two galaxies as bright fuzzy patches. Using averted vision, I could 'see' the much fainter halo of their outer discs. (These are face-on spiral galaxies.) I could not distinguish any features of the outer structures.



12.

(M95)

It chuffed me immensely that I had found these two galaxies 22 and 25 million light years away in non-perfect conditions. Then I noticed an additional blur directly above the left galaxy (in the eyepiece.) In reality this was below (north) of the right (eastern) galaxy M96. I looked harder (avertedly) and there was definitely an elongated blur which stayed in position relative to M95 & M96 when I traversed the scope. Checking my book, I realised this was M105, an elliptical galaxy also 25 mill. light years away.

Then I tried to find M65 & M66 (a pair of 9th mag spiral galaxies) in the lion's hind leg, but for whatever reason, I could only see one candidate object. I suspect I was off target, so will make this a project for another night. At this stage Mars was well up, so I put my maximum mag (x90) on it for a peek. Ho hum! With the bad seeing, Mars appeared as a featureless orange circle, shimmering slightly in and out of shape. Like a full Venus with sun burn.

During the evening, I had the added dimension of a meteor shower. On 17th, I had a friend around. (He happens to be a member of Sutherland Society and was interested to see my scope as he is building his own, mount and controls as well.) We saw a few quick zipping meteors during the evening, but around 11 pm over a period of about 30 minutes, we saw three spectacular fireballs, each travelling relatively slowly (for a meteor) and leaving a distinct smoking trail behind them. They came from high ir the south. Each time, we heard ourselves exclaiming 'Wow, did you see that !!", just like excited school kids. When we went inside, we checked Astronomy 2001 and found that it was the meteor shower Pi-Puppids, to be seen from 15th to 28th April, with slow speed, bright and persistent trains, a large proportion of yellow meteors and occasional fireballs. We saw all that in one go.

As you can imagine, the evenings were great fun and I remain extremely pleased with my Celestron 9¼ SCT.

Thanks Terry.

RB

What's to See this Month?

May 21 – June 17, 2001

Highlights

24/5 Moon visits Jupiter
25/5 Mercury, Jupiter, Moon together in Taurus
14/6 Mars opposition to Sun
18/6 Venus 1.7° Moon 8 am

Trivia Question Answer

What is Planet X and where is it? No! it's not really a children's TV show on CH10. Planet X was the supposed tenth, hence X, planet of our solar system out beyond Neptune, which was suggested by wobbles in the orbits of Jupiter and Neptune in the late 19th C. The discovery of Pluto in 1930 did not end the search for X because its mass was too small to cause the wobble. However further observation proved the wobbles to be non-existent and therefore no such planet was needed. Interestingly, evidence for the wobbles in the first place was supported by the same person who saw canals on Mars. Some people think the Oort and Kuiper cloud/ asteroid belts out beyond Pluto should really have formed into a planet but Planet X has been revealed as just one more fanciful theory.

Evening Sky Moon & Planets

Mercury joins Jupiter in Taurus for the sunset and on the 22/5 will appear 6° below a thin crescent moon. Speedy Mercury circles the Sun every 3 months and between 1-12 June moves from Taurus to be very close to M35 just below Orion. You have to be quick as it sets within 2 hours of the Sun.

Saturn sets with the Sun as it reaches conjunction and will reappear in the morning around June 10-17, when it will be hooked on the tiny crescent of Moon on the 20/6 45 mins before sunrise.

Moon Movements

New Moon is at 12 midday on the 23/5 and Full Moon is 6/6. A thin crescent will promenade with Jupiter less than a degree apart on the 24/6 30m after sunset

Jupiter is between the horns of Taurus and will set before 6 pm till the end of the month when it will become a morning object. Not till October will it return to the evening sky in Gemini.

Mars now brighter than Jupiter at -2 and visible all night rises in the east during the evening. Still near M8 in Sagittarius it is slowing in its eastern journey and will mark time briefly before chasing the Sun from east to west. The 6^{th} June will find Mars just 7° above the Full Moon. On 14/6, it will be at opposition, which means furthest from the Sun on the other side of Earth, therefore brightest since 1988. Gear up now for fantastic views of Mars polar cap and terrestrial features. I have been assured, weather permitting, June/July are the

best months for the Red Planet this year.

Morning Sky

Uranus and Neptune are rising well before midnight. Still in the 'old Sea Goat' they are regularly visited by the moon in its phases. Both go into reverse this month moving back towards the east progressively until October

Venus visible during

daylight. On the 18th June it will be possible to find Venus all day by finding the last sliver of the Moon. It will be closest at 8 am slightly below, but if the weather is good it will be within a few degrees all day. Venus is actually often visible during the day because of its brightness but it is easier to find when close to something bright like the moon

Comets

24P Schaumasse has passed around the Sun and is fading fast travelling through Cancer and Leo. No other bright comets are expected this year but we may be surprised.

Trivia Question

Mariner was a NASA series of space flights. How many were launched, what was their aim?.

Favourite Star

Three people have chosen this month's favourite star. That's OK because it is a double star. Ursula Braatz, John Koster and Lloyd all like **Alpha Centauri**. Shining bright white - Rigel Kentaurus (its other name) is a G2 star -0.3 mag. and almost the nearest star to Earth. It is one of the Pointers to the Cross. Ursula likes it because she can split it with her own telescope, Lloyd and John like it because it is a reference star, it is big, complex, and points you to something else.

Constellation of the Month

Virgo is the only female figure in the zodiac and one of only three females in all the constel-lations. It is the second largest in area, and is removed from the Milky Way so there are no emission nebula or open star clusters, only one globular cluster, and any planetary nebula are very faint. However it lies in an area rich in galaxies known as the Virgo Cluster of Galaxies which is the nearest giant cluster of galaxies to our own Local Group. The majority of text which

follows is directly quoted from an article in Prime Focus June 1999 by Bob Bee.

"Images of Virgo are mixed. On one hand it is seen as the Goddess of Justice, holding scales represented by Libra in the east. On the other hand, it is seen as the Corn Goddess -Demeter, holding an ear of wheat (the star Spica).

Virgo is best known astronomically for its cluster of galaxies, which is about 45 million ly away and is contained within an area of approx. $12^{\circ} \times 10^{\circ}$ (if you overlook M104). There are thought to be over 3000 galaxies within the cluster though most of these are too faint for amateur viewing Some of the brighter ones may be viewed by 150mm reflector on a dark moon less night.

The Stars: α (Alpha) Virginis - Spica.

As well as being the 16th brightest star in the sky, Spica also serves as a good yardstick for a 1st magnitude star. ie. It is blue-white, 280 ly away and mag. 1.0. Spica is a 'helium' type star with a luminosity of ~ 2300 Suns. Spica has many ancient references from the Egyptians, Greeks, Romans, Syrian, Turks and Persians. Most meanings refer to "an ear of wheat". (RA 13hr 25m, -11°)

β (Beta) Virginis is an unexceptional mag 3.6 yellow star only 33 ly away.

 γ (Gamma) Virginis is recognised as one of the finest visual binaries. It is only 36 ly away and consists of two mag 3.6, virtually identical white-yellow F type main sequence stars. They have an orbital period 169 years and the overall brightness is mag 2.8. You will need a telescope aperture larger than 100mm to split them.

 δ (Delta) Virginis an unexceptional mag 3.6 red giant about 260 ly away.

ε (Epsilon) Virginis -Vindemiatrix 'The Grape Gatherer'. A G9 class yellow giant 2.8 mag about 100 ly away. ε is a good marker for locating the Virgo Cluster of Galaxies which falls halfway between ε Virginis and β Leonis" (end Quote)

The Virgo Cluster of Galaxies.

None of these objects are visible to the naked eye and indeed only one or two would be seen with 7 x 50 binoculars. However it is a significant deep sky field, visible and ideally sited for southern sky observers like us.

Where does one start? Some of the more interesting objects in Virgo are Messiers. One book suggests a start with M59 and 60 simply because they are closest to Vindemiatrix, appear together in a 1° eyepiece field and are easily recognised. The following 4 objects are in a straight line from Vindemiatrix to Denebola in Leo, starting right going left



M59 / 60 4.5° from Vin. WWN. In the eyepiece 60 is bigger and has a close NGC galaxy next to it, on the right of the picture. 59 appears more elliptical and small 25 min away to the lower left.

14.

M58 A barred spiral. Further to the left just over 1° from 59, a hint of the central bar is possible with 8" telescopes.

M87 A giant elliptical galaxy, one of the largest in the Cluster. Just under 2° from M58; 7.0 arc min in size. A source of radio and X-rays, over 2 trillion times our Sun. Boggling!

M49 is in a different part of the constellation further south on a line between δ Virginis and β Leo (Denebola)



M49 8.4 mag 9*7.5 min

We can not leave Virgo without making an attempt to see **M104 The Sombrero Galaxy** On line between Corvus the Crow and Spica small and difficult to find



A most spectacular galaxy M104 8.0 mag 9*4 min

This fair maiden has a lot to attract our interest. Hey! good looking IC **SECTION LEADERS** The following are the coordinators of these special interests in particular fields

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Milky Cannibal

US and Australian astronomers have coined a theory that the Milky Way was formed by the merging of a number of smaller galaxies. The theory evolved after the astronomers observed strange patterns of star motion and composition in the Milky Way that hinted at the presence of a remnant of a smaller galaxy consumed by the Milky Way billions of years ago. Official M.A.S. Program Key: Oaks = Airfield (members only) GM = Monday General Meeting OPN = Observ. Public Night

21st May	GM
26th May	OPN
18th June	GM
23rd June	Oaks
30th June	OPN
16 th July	GM
TBA July	Oaks
28 th July	OPN
TBA Aug	Oaks
20 th Aug	GM
25 th Aug	OPN
17 th Sep	GM
22 nd Sep	OPN
TBA Sep	Oaks
13 th Oct	OPN
15 th Oct	GM
TBA Oct	Oaks
10 th Nov	OPN
19 th Nov	GM
TBA Nov	Oaks

Borrowing MacDob

The Society's own telescope, a 6" Dobsonian, is available for loan to financial members. It is easy to transport, set up and use. If you would like to borrow MacDob for a month, speak to Bob Bee (at Meetings or on 46251623) who is its custodian. Though there is no hiring fee, members are invited to make a donation of their choice which will go towards the upkeep and upgrade of MacDob

16.

First Sighting of Dark Matter

I recently discovered an awesome website covering everything you want to know about physics and, in particular, astronomy and cosmology. It is up to date and very topical.. The site is: www.physicsweb.org

Try it, but be warned, you will need at least an extra lifetime to digest its contents. Yeah!

An article I found was titled as above and dated 22 March 2001. I quote:

Astronomers have seen dark matter directly for the first time. Ben Oppenheimer of the University of California at Berkeley and colleagues in the US and UK have discovered a new kind of white dwarf that could account for up to a third of the 'dark' matter in the Universe. The extremely dim burnt out stars were found in the 'galactic halo' that surrounds the Milky Way. Oppenheimer's team believes they represent part of the invisible matter that binds together galaxies and galactic clusters with its gravitational pull.

Oppenheimer and co-workers suspected that some very faint objects in existing photos could be white dwarfs – Earth sized remnants of ancient stars. The team collected spectra of the mysterious bodies and found that half of them were a new breed of ultra-cool white dwarf. "We've found a previously undetected population of stars in the galactic halo that represents a fraction of the dark matter in the galaxy" said Oppenheimer.

It is thought the 'cold' white dwarfs (so-called because their surface temperatures are below 4500°K) are very faint because of the way hydrogen molecules behave in their atmospheres. Astronomers believe the molecules collide and take on temporary molecular moments, which make them absorb light at most visible wavelengths.

This leads to some interesting questions asked and answered in 'Frequently asked Questions' found in www.astron.berkelev.edu

Q: What is a white dwarf? A: 94% of stars end their lives as white dwarfs (our own Sun will.) In the last stage of stellar evolution, before turning into a white dwarf, stars begin to shed a large fraction of their mass into the surrounding interstellar space. (This results in what we see as a Planetary Nebula, like the Ring and Helix Nebulae.) During this time the star is consuming the last of the fuel used in nuclear fusion, the process that makes stars shine. Once this stage ends, only the dense core of the star remains. This core is approximately the size of the Earth but contains about half the mass of the Sun. (This makes them very dense.) White dwarfs,

because they have no more nuclear fuel and no capacity to fuse elements and therefore generate energy, cool as they age. They may start out at temperatures near 100,000°K but after 10 or 12 billion years cool to near 4,000°K. For comparison, our Sun is near 6,000°K although it is not cooling off the way white dwarfs do.

Q: Why should we be able to see dark matter at all? A: Some dark matter, such as dim stars, is extremely faint but does emit a very minute amount of light. Other forms of dark matter may emit no light at all.

Q: What about non-baryonic dark matter outside the galactic halo?

A: Studies concerning white dwarfs in the galactic halo don't have much bearing on the question of non-baryonic dark matter. Although it is possible that white dwarfs may comprise a substantial fraction of the baryonic dark matter, non-baryonic dark matter must still exist and by most estimates it dominates the mass of the Universe. (The current theory is that about 70% of the nonbaryonic dark matter is made up of 'dark energy', the now famous Cosmological Constant that is believed to be making the Universe's expansion accelerate.)

Bob Bee