MACARTHUR ASTRONOMICAL SOCIETY Inc.

Journal

PRIME FOCUS

Volume 9 Issue 5 **May 2004**

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President's Report

Last Month

Welcome to all members and guests. Last month we held our Annual General meeting. The reports were tabled and elections held. I must thank Ned Pastor for acting as the returning officer on this occasion. Well done.

For the record I now present to you the Management Committee as follows.
President: Noel Sharpe
Vice-president: John Rombi
Treasurer: Dick Everett
Secretary: Ian Cook
Committee Members: Bob Bee, Daniel Ross and Lloyd Wright

It's a great team and I pass on my *congratulations to you all. Also on the night* Ian Cook gave a fantastic talk on John, Caroline and William Herschel. The talk gave us insights on how this incredible family progressed forward the science of astronomy, the discovery of the planet Uranus, and construction of huge telescopes. Thanks Ian

Tonight and Beyond

We should have a demonstration around how to safely observe the Sun through a telescope, just in time for the transit of Venus. Also one of our most accomplished speakers Bob Bee will be giving a talk on white drawfs. I'm sure we will have lots of other news to pass on as well.

If all goes well our guest speaker for next month will be Dr John O'Byrne from the School of Physics, University of Sydney. His topic will be on adaptive optics - should be great

Exciting News No1

I'm pleased to announce that we now have the opportunity to engage members of the public into the wonderful world of astronomy, we have arranged two open nights as follows.

Saturday May 22 and Sunday May 23. Start time for the public will be 6.00 pm and finish around 10.00. The venue is the Dudley Chesham sports ground Burragorang Road, The Oaks. For those familiar with our observing field at the airfield, it's right next door. These nights should feature views of Jupiter, a thin crescent moon, star clusters and of course if conditions are good the two comets. It would take really bad weather to call off a night but commonsense has to prevail. I thought of the idea of having consecutive nights as one night's weather might not affect the other. This would give us the best opportunity of having at least one successful night. Dates further on are not an option due to rapidly disappearing comets and the brightening moon.

Its just a trial run at the moment but I'm positive there is a lot of future potential to be had. We are having some advertising via newspaper and radio, and of course word of mouth. As much as we need telescopes on the ground, we also need some members to provide general assistance, i.e. car parking, making sure children don't run amok etc, so there's plenty for everyone to do!

Exciting News No2

The transit of Venus occurred over 121 years ago and was of course the reason for Captain Cook's visit to the Pacific Ocean a bit before that. He then bumped into Australia - how nice!

I have been approached by Dr Frank Stootman from the University of Western Sydney and Andrew Eaton from Macarthur Anglican High School to hold a transit of Venus observation afternoon at the high school. Details are just coming to hand but this would incorporate a star night and BBQ as well. Parents and students will be along as well as Frank and Dr Miroslav Silipovic.

Miroslav is a professional astronomer who is well regarded around the world on his work on supernovae. He has published over 50 papers and will be giving a presentation on sunspots. This is an opportunity I couldn't pass up. The date is June 8 late afternoon then onto night. It will be at the high school and all members and guests are invited

I will make sure I keep John Rombi informed of any late changes but as always please confirm details just before the events in case of late changes that can't be avoided.

The Dates

17/05/04	Monthly Meeting
22/05/04	Public Night The Sportsground
23/05/04	Public Night The Sportsground
08/06/04	Macarthur Anglican High School
12/06/04	The Oaks
19/06/04	The Forest
21/06/04	Monthly Meeting
10/07/04	The Oaks
17/07/04	The Forest
19/07/04	Monthly Meeting

The above dates can be taken as confirmed. However, poor weather conditions can result in a cancellation, so contact John Rombi or myself on the day to confirm if it looks doubtful. My mobile is 0410 445 041.

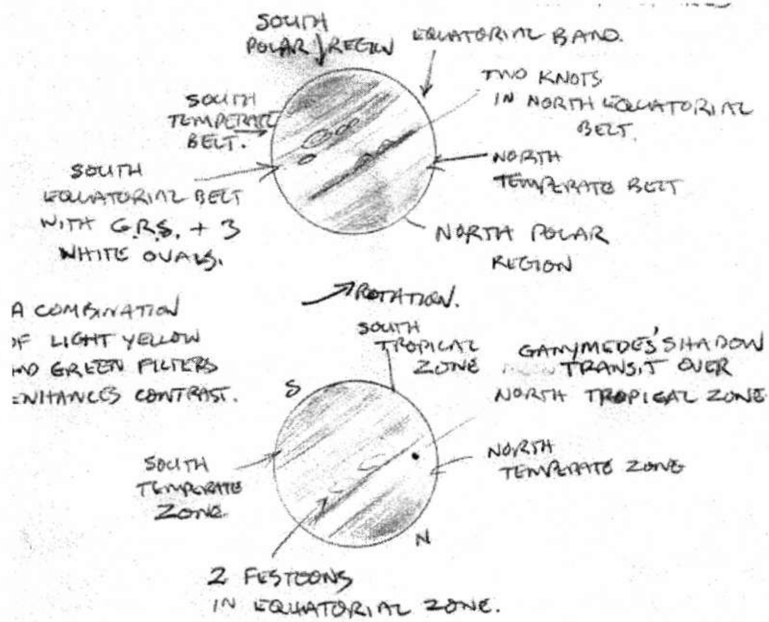
In Closing

I am very pleased to have been re-elected as President. Going forward I can see some fantastic things happening for our club. I thank everyone for all the great support you give me.

Noel Sharpe (President)

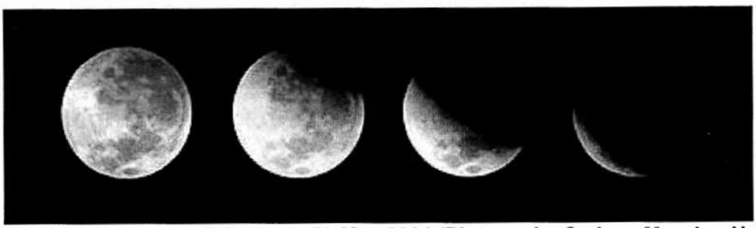
Observations of Jupiter

Over a year of observing Jupiter with my 150mm (6") F8 refractor, set at 160 magnifications, the following diagrams record some of the high light features.



These bands are surface manifestations of gas clouds due to the rotating zonal winds deep within Jupiter's fluid interior.
The colours and hues are a combination of active chemistry in the cloud belts as well as the altitude. The brown hues are high altitude clouds; white hues are middle level, whilst the Great Red Spot is a very high and cold feature.

Ned Pastor. ■



Images of the Full Lunar Eclipse on 5th May 2004 (Pictures by Sydney Morning Herald)

Why do pulsars pulse?

Pulsars do not actually turn on and off. They emit a constant stream of energy. This energy is focused into a stream of electromagnetic particles that are ejected from the stars magnetic poles at the speed of light. The magnetic axis of the neutron star is at an angle to the rotational axis, just as magnetic north and true north are slightly different on the Earth.

As the star spins, this beam of energy sweeps through space like the beam of a lighthouse or an ambulance light. Only when this beam shines directly on the Earth are we able to detect the pulsar with radio telescopes. Even though pulsars emit light in the visible spectrum, they are far to small and far away for us to detect any of the visible light. We are only able to use radio telescopes to detect the strong high frequency radio energy they emit.
A "pulsating" experience.

Lloyd Wright. ■

Holiday Astronomy

I always take my telescope with me when we go away for a weekend or on holidays, because away from Sydney it is always a beautiful starry sky when there are no clouds.

On the 19th March 04 we visited our son and his family near Corowa on the N.S.W, VIC border. At night the sky was perfect, so I took my telescope and we all went to the front yard of the house. First I had Jupiter in focus, but it was disappointing, we saw only one moon close in. Reading Astronomy 2004 I found out that it was the moon Ganymede. The next object we looked at was Saturn with its great rings. I tried to find the star Alpha Centauri but with no success.

Looking through binoculars I saw the cluster Omega Centauri. On the 20th March we were luckier with Jupiter - we saw 3 or 4 moons. I showed it to my eight-year-old grand daughter Elli, she found it very interesting. I showed her the Jewel Box and the many nebulas and clusters around the constellation of Orion. Later Elli made a drawing of my telescope.

Elli Braatz
Eight years

At Easter we went to the Snowy Mountains on Lake Eucumbene at old Adaminaby for a camping weekend. After celebrating Easter I started observing the stars at about 9.00pm. Scorpius was very large on the horizon; I managed to see Zeta 1 and Zeta 2.
I swept the sky with my binoculars and found Omega Centauri and Jupiter, I saw Ganymede clearly but the other moons were hard to see.

On the 14th April I noticed a nice star cluster. I think it was Coma Berenices, a V shaped binocular cluster. It was too big to see in the telescope. I then saw NGC 6231 in Scorpius with my binoculars. I then saw Jupiter with 2 moons, Io and Callisto. The others were hiding. On the 15th the sky was cloudy and on the 16th we went home.

Ursula Braatz ■

Carbon stars.

Carbon stars are evolved cooling giants (and some dwarfs) with outer shells or clouds of carbon dust. Typical surface temperatures of carbon stars range from 2000ºK to 3000ºK.The apparent colour of these stars is deep " RED". All are irregular or semi-regular variables. Carbon stars appear relatively dim in the eyepiece. If you are "star" hopping to find them they can be easily swept by and overlooked. They can demand some patience to coax them into view The presence of other stars in the field can exacerbate (or on the other hand diminish) the degree of difficulty Try bleeting the star images by defocusing. This can also reveal colour nuances in other stars. At the very least, finding most carbon stars will require a clear dark sky. Good luck.

Lloyd Wright. ■

Internet News

In the German magazine "Der Spiegel" I read that astronomers have found for the first time a planet, using gravitational microlensing. All the other planets have been found by measuring the wobbling of the suns that they orbit. This planet is in the constellation of Sagittarius 17,000 l.y.s away from Earth.

Together with its sun the planet acts as a lens, magnifying the light of another star 24,000 l.y. from Earth stronger. The planet is 1.5 times bigger than Jupiter.
It was an international effort, the teams were: Poland, Optical Gravitational Lens Experiment, "OGLE" based in Warsaw and contributions from Japan and Chile.

Ursula Braatz ■

What IC this Month
May 17 – June 20, 2004

The Moon Diary

19/05 New Moon;	27/05 First Quarter
03/06 Full Moon;	10/06 Last Quarter
18/06 New Moon	

Evening Sky Planets

Venus is trailing the Sun in the far west these days so will rise in the daylight and set at 6.30pm in May and much earlier as we move into June. It is preparing for that transit across the face of the Sun beginning 3 pm on June 8. (see Astronomy 2004). All the people who saw that last transit are dead; so get ready, prepare well, and be among the living this year. On its way to the Sun you may catch a thin crescent Moon close to the planet on the 21st May late afternoon, with Mars and Saturn higher up. Venus will return as the Morning star mid to late June.

Mars is not too far behind Venus in the sky rising in Gemini for the whole month. It will rise in daylight and set between 7.30–7.00pm through this month. On the 23rd May it will be 3° south of the crescent Moon and two days later 2° north of Saturn. This along with Venus will make that line of bright planets to point out to your friends.

Saturn rises in the morning daylight and resides in Gemini with Mars this month. It will set between 8 – 6 pm sinking faster than Mars which will appear to hang for a while. Again on the 23 – 25 there will be close passes to the Moon and Mars as above but sadly we will say au revoir to "the star with ears" very soon.

Jupiter rises in the underbelly of the Lion during the day and sets by midnight in May and by 10.30 pm in June. On 27th May it will be 4° south of a first Quarter Moon, and although always worth viewing it is now less than –2 magnitude and getting smaller in size. The planet will resume its easterly movement now and set off for a meeting with Spica in Virgo.

Morning Sky

Uranus is taking an early morning shower in Aquarius, but will move towards midnight as the month progresses. **Neptune** is still communing with the Sea Goat Capricornus rising before midnight.

Comets

By the time you read this we will know whether the two comets have lived up to their potential but **NEAT Q4** has been eerily dramatic as we have followed it from a dark site moving through Dorado, Puppis, Monoceros and Cancer. **LINEAR T7** is moving so fast coming from out of the Sun we haven't been able to follow it for long. During June it should still be visible in Hydra but only half its brightness. If both live up to expectations it could be the event of the decade. If you want to know more ask Dick Everett.

Meteors

If you happen to be out late you may see a few **eta Aquarid** meteors from north of Leo in May and in June catch one of the scarce **Sagittarids** from the south-east direction.

Portraits in The Sky

Circinus – The Compasses

Transit Date of principal star: 3rd May

Circinus, The Compass, is a Southern Hemisphere constellation introduced by Nicolas Louis de Lacaille in the mid 18th century. Although high overhead and in prime position at the reverse end of the Pointers, only seven stars are brighter than sixth magnitude, so it is easily overlooked.

Double stars*:*

Alpha Circini is a visual double with faint companion: 3.2, 9; separation 15.7".

Gamma Circini is a very close double of contrasting stars (blue and yellow): 5, 5; separation 0.9"

Deep Sky

There are three objects worth seeking out, a cluster, a galaxy and a planetary nebula.

NGC 5823 is an open cluster 8th magnitude 10 arc seconds in size, 6° NNE of Alpha Cent. It has a dark lane running through the star field.
The Circinus Galaxy is a large 10th mag. elliptical galaxy lying on the same latitude as Alpha Circinii but 2 – 3° to the west.
NGC 5315 is a small 10th mag. planetary in a star field near the border with Musca.
US Astronomy June 2003 has a map for all these objects.

Good seeing IC ■

Calculating the Astronomical Unit from the Transit of Venus

Being a bit of a maths buff but with no formal training in astrometrics, it has always fascinated me how the astronomers of the 18th century actually used the transit of Venus to measure the Astronomical Unit (AU.) For that's what the fuss was all about – getting an accurate measurement that once and for all would tell them the true scale of the solar system.

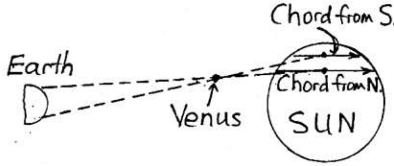
They had Kepler's 3 Laws and knew the relationships of all the planets' (those they knew about then) periods of orbit about the Sun, and all their relative distances from Earth and the Sun, but they needed to know an absolute value of the distance of one of the planets from the Sun (or even from Earth) in order to work out the Earth's distance from the Sun (the AU) and the distances of all the remaining planets from the Sun.

The transits of Venus in the 18th century gave them this opportunity. But how? I have finally found an explanation and will humbly try to explain it here. Please excuse the maths. You can ignore that if you wish and just catch the principle.

In effect, it is all done by parallax.

They sent a number of teams north and others south (including the intrepid Captain Cook.) The idea was at the time of the transit, to have teams separated from north to south by as large a baseline as possible. Once the teams established their geographic locations (Harrison's clock came in handy here for Cook to determine his precise longitude), they could determine the precise length of their earthly baseline for the parallax calculation.

Now here's the trick. When Venus transits across the Sun's face, it follows a straight line (a chord) from ingress to egress. But due to the different angle as seen from the north or south of Earth, the chord seen from the northern team would be closer to the Sun's centre and therefore slightly longer than that seen by the southern team. (See the sketch below – not to scale.)

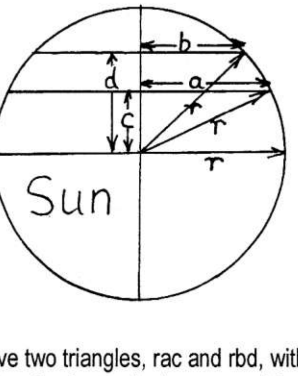


By measuring the time taken for each transit (north vs south) compared to what it would have taken Venus to transit exactly across the centre of the Sun, it is possible to mathematically compute Venus' parallax (that is, the angle that Venus has subtended by the two observing teams' Earth baseline.) Then, using the known length of the baseline, they compute the distance of Earth to Venus. This allows them to compute (from earlier knowledge from Kepler's Laws) the distance of Venus to the Sun, and hey presto, the distances of all the other planets, including Earth, from the Sun.

For you maths buffs, here's how it is done (...I think!) Obviously I can only use basic calculations. There would be numerous 'corrections' astronomers would make for the movement of the Sun etc.

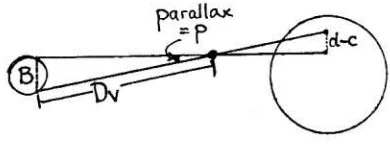
Firstly, how long is the chord across the centre of the Sun? This would be expressed in units of time, as at this stage, they don't know the physical size of the Sun.
We know that Venus takes 224.7 days to orbit the Sun. And we know that the Sun has an angular size seen from Earth of (say) 0.5°. Therefore, Venus covers its full orbit, 360°, in 224.7 days. This means it would cover 1° as seen from Earth (when between Earth and Sun) in 224.7/ 360 days. Thus, to cross the 0.5° width of the Sun it would take 224.7/(360x2) days or 7.49 hours. From this, we equate half the 7.49 hours (3.745 hours) to the angular radius of the Sun in radians. (2π rad = 360°. Ergo, 0.5° = 0.00873 rad.)

Now, suppose North Team observes a transit time of 2a hours. (The 2 makes the geometry simpler.) This can be converted to an angle in radians (=0.00873x2a/7.49). And suppose South Team observes a shorter transit time of 2b hours (=0.00873x2b/7.49 radians.)
Let's show this on the geometric sketch below. (Doesn't this bring back your school days of Pythagorus and Euclid?)



We have two triangles, rac and rbd, with the sides' lengths (or angles) expressed in radians. Using Pythagorus' theorem, we can calculate the angles of the sides c and d.

The parallax, p, of Venus is then 'simply' the difference between d and c, = d-c radians. Then, from the next sketch, the distance from Earth to Venus (D_V) is calculated.



The baseline is in km, which will give the distance of Earth to Venus (D_V) also in km. The parallax in radians, is a very small angle (less than 10"). The formula is $p \times D_v = B$. Therefore, the distance $D_V = B/p$.

The accuracy of the whole process depended on a number of factors. Firstly, how accurate was their measurement of their north-south baseline? They didn't have GPS in the 1700s (or even the 1800s.)

Then there was the problem of measuring the transit times. There was the infamous 'black drop effect' which made precise timing of start and end of ingress and egress difficult. Still, they managed to achieve a measurement of the AU of 153,340,000 km which was a vast improvement from previous estimates. More modern techniques (like bouncing radar off the surface of Venus) give us the currently accepted value of 149,492,000 km.

You can imagine how complicated an exercise it was for the astronomers and observers in the 1700s. No computers! The numbers were still being crunched up to 1826. So remember when you watch the transit next month – it was once more than just a pretty sight. It was real astronomy.
RB ■