

TAURANGA ASTRONOMICAL SOCIETY NEWSLETTER

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Recent meetings.....

The March meeting saw George Stewart, our vice-President, giving a presentation on the history of radio telescopes.

George told us how it all started in 1894 with Sir Oliver Lodge attempting to detect the Sun's radiation, up to the equipment being used in the present day including the 76m 'scope at Jodrell Bank and the dish at Arecibo, which is the largest radio telescope in the world.

He also told us that as recently as a few weeks ago some exciting discoveries were made whilst searching for pulsars. These turned out to be a new type of object sending out radio flashes of extremely short duration, from different parts of the Milky Way. They have been given the name of 'rotating radio transients' or rotating neutron stars, but are different from pulsars.

George played some radio signals that which have been recorded from objects such as 47 Tucanae, the Vale pulsar, and the pulsar centered in the Crab nebula.

The recordings were full of 'noise' and the radio signals could be heard quite easily. An internet search on Jodrell Bank, and Parkes Observatory will give you more information to digest, and if anyone wants to take their enquiries further, start with the Wellington Astronomical Society, and they will be able to give you more information on activity in New Zealand.

April's meeting was an interactive session discussing black holes, led by one of our newer members, Janine Neustroski.

Forming from the collapsed core of stars, Janine explained how black holes are thought to be composed of a very dense singularity at the centre, which warps (twists) the space and time surrounding. In the same manner that the Earth's density warps space to cause things to fall towards it, the density of the singularity at the centre of black holes warps space around it to cause things to fall towards it. She explained that this is why black holes can't be seen, because nothing, not even light, can travel fast enough to escape the singularity's gravity.

Janine then discussed how physicists talk about the singularity at the centre of a black hole as being "infinitely dense," curving space/time "infinitely," yet having "no volume". Janine said that these statements, which go against commonsense, were really just a product of calculation used to calculate density.

As an object gets smaller (with its mass remaining the same) density is calculated to get larger. If an object continues to contract forever (which according to current theory, the stellar core of a black hole is predicted to do), then it (the singularity) will have (virtually) infinite gravity.

density = mass

volume

$$10\text{kg/m}^3 = \frac{1\text{kg}}{0.1\text{m}^3} \quad 1,000,000,000 = \frac{1}{0.000,000,000,1} \quad \infty = \frac{1}{0}$$

Since matter warps space and time relative to its density, an infinitely dense object would seem to twist space and time "infinitely".

For those of us still finding this all a bit confusing, Janine told us to not worry. Ultimately these statements about black holes were the result of incomplete theory. Physicists don't really know what happens inside a black hole and that advances in quantum theory will most likely bring a more comprehensible explanation.

Janine Neustroski

(Edited version)

Auckland Observatory Tour.....

Andrew Walker and other members from the Society, went up to Auckland for a tour of four observatories. Here is what they found;

On Sunday 12th March Janine Neustroski, Robert Taylor and I travelled to Auckland to attend a tour organised by the Auckland Astronomical Society (AAS). The tour was of four Auckland Observatories. Before leaving I hoped that this trip would give me a better understanding of what is involved in building and operating a fixed instillation. I was not disappointed!



We assembled at Auckland's Star Dome observatory at One Tree Hill, along with around 15 others at 1pm. Grant Christie gave us a tour of the observatory with an in depth description and history of it's instruments and the observations made there. In the lobby stands a beautiful

S & S Jones refractor dating back to c1854. This has recently been restored by Gordon Hudson to its former brass-tubed glory. For many years this scope looked impressive but neglected with a green base, white tube and various dents and scratches. It now looks much as it did when it was used to observe the 1874 transit of Venus. An examination of the objective lens by Graham Jonas in Wellington was inconclusive as to whether or not this was the original lens. Pieces of a postage stamp used to air space the crown and flint elements of the objective lens date from 1909, and show that the lens was at least disassembled in the early part of the last century.

We then went on to the "Edith Winstone-Blackwell" telescope in the main dome. This is a Classical Cassegrain telescope made by the Zeiss Company in Germany. It has an aperture of 500mm and was purchased in 1967 with money donated to the Society by Mrs Edith Winstone-Blackwell. This telescope has seen much use over the years and has been used for many different types of observation. Also in the dome was an instrument called a Photo multiplier that has seen years of service on this telescope, measuring the brightness of stars. This was constructed by Harry Williams, the curator of instruments for the society for many years, and whose observatory we were to visit later in the day.

From the Zeiss dome we were taken to a smaller dome at the observatory that housed the Nustrini telescope. This is a very powerful scientific tool that has been involved in the discovery of two extra solar planets. The telescope is a 14inch Celestron Schmidt Cassegrain attached to a state of the art, computer controlled mount, and fitted with a very large CCD camera.



Grant demonstrated how he uses a computer to very accurately point the telescope and take images. This set up can be used for astrophotography as well as for measuring star brightness (Photometry).

From the Star Dome we made our way to Pakaranga and the home of Jennie McCormick. This was the Farm Cove Observatory which Jenny owns and operates. The observatory houses a 10 inch Meade LX200 telescope fitted with an SBIG ST7 CCD camera, as well as a computer to drive them both. Jennie is an amateur who spends most of her observing time contributing observations and measurements to international teams for research purposes. These include the Centre for Backyard Astrophysics (CBA) and MicroFUN, the Micro lensing Follow Up Network. She is currently providing observations of a suspected black hole in the

constellation of Cancer to the British Astronomical Association. All this from a small building at the back of a house in suburban Auckland!

Jennie was kind enough to put on a very nice afternoon tea that just hit the spot. She explained how this observatory is just small enough not to require building consent from the local council as its size means it is considered (for the council's purposes) a garden shed!

From Farm Cove Observatory we made our way to the home of the aforementioned Harry Williams. From the roadside his house is just one neat, well presented house in a street of neat, well presented homes, but a short walk down the drive and you get a glimpse of the large dome at the back of Harry's house that contains a pair of very impressive instruments.

Harry has a background in engineering and it shows in the craftsmanship of his instruments. The dome houses a very substantial torque arm mount fitted with a 21 inch Cassegrain telescope and a 14inch f2 Schmitt camera. Harry made the entire observatory including the optics in the telescope and camera. The telescope was begun in 1968 and saw first light in 1974. The camera was made more recently and is still undergoing final construction. Two other instruments on display were a photoelectric photometer and a spectroscope, which Harry has built with the sort of precision that would make a Swiss watch maker proud. Grant Christie told us the story of how the observatory and its instruments were constructed and answered questions along with Harry (now in his mid 90's).

The final observatory on our list was that of Steve Calveley, the president of the Auckland Astronomical Society. Situated in rural Kumeu 20 minutes North West of Auckland, this observatory houses a number of instruments. The main dome houses a 10 inch Meade Schmidt cassegrain mounted on the fork arms of a Celestron C14. Also at the site is an equatorially mounted 22inch cassegrain by Graham Loftus, and a number of other telescopes owned by other AAS members including the fantastic 16 inch binoculars of Dave Moorhouse. The site is used by members of the AAS looking for dark skies and is well equipped with running water, electricity and even a bunk house for those all night imaging runs.

The hospitality of the Auckland Astronomical society cannot be faulted. Not only did they provide a tour of some wonderful observatories but also a very nice BBQ dinner was hosted by Steve Calveley at the Kumeu site. We finally hit the road for home around 8pm, and I for one had a head buzzing with ideas for the construction of an observatory.

By Andrew Walker

Barn-door tracking....

Less to do with farming and livestock than you would imagine !

The purpose of this contraption is to allow anyone to build a very cheap method of tracking the night sky with a camera. This allows long exposures of 5mins or more without producing star trails on the photos. Well, that's the intention - in practice it becomes a little bit more difficult in the Southern Hemisphere (more later)

The Barn Door Tracker is two platforms hinged together at one end. They are held apart by a threaded rod which is driven manually by turning a wheel (Vegemite jar top) A camera is mounted on one platform and can thus track the stars during a long exposure.



Basically, the theory goes like this: if we take the sidereal length of a day (the time it takes for the stars to make one complete apparent revolution of the Earth) and divide it up in such a way that we can track it with a threaded rod at a speed of one revolution per minute, then we arrive at the following dimensions.

The threaded rod must be 1/4 inch diameter with 20 turns per inch and is mounted 11.7 inches (11 and 7/16ths) from the hinge. This will allow us to (gently) turn the Vegemite wheel at a speed of 1/4 turn every 15 seconds. The maths involved is available on the Internet (Google: Barn Door Tracker) and there are literally hundreds of websites devoted to the subject - especially detailing different methods to get better accuracy. Most also show examples of sky photos that have been taken with a BDT.

In practice, the whole contraption is mounted on a tripod and aligned as follows : the edge of the hinge (it's axis) must be pointed at the South Celestial Pole (SCP) which in our neck of the woods is at a vertical angle of 37.7 degrees above the horizontal and aimed due south. The latitude of Tauranga being 37.7 degrees.

In order to make this easier, we can build a "latitude wedge" to mount onto the tripod with the BDT platform attached to this wedge. In practice, finding the SCP in the Southern Hemisphere becomes the most difficult part to achieve with any accuracy. This is because we don't have a counterpart to the Northern Hemisphere's Pole star, Polaris. In fact we have no near bright stars to assist with alignment. So we have to rely on either utilising a compass and/or star charts.

Barry Raynel

May 2006 AGM.....

Vice President's Report for the Annual General Meeting : Wednesday 24 May 2006

The first thing I would like to do tonight is to acknowledge the terrific work which our former President Toby Tobias put in, to get the Society moving forward. Toby resigned in February for family reasons. But while in office he was successful in obtaining an excellent grant from COGS, (the Community Organisation Grants Scheme,) had numerous discussions with the Tauranga City Council and the Matua Sport and Recreation Trust over the future upgrade of this building, and generally kept a firm hand on the Society, at both Committee and meeting levels.

But I must also hand out a few more accolades to the committee.. Secretary Jim Barrowclough has been a tower of strength after I took over as Vice President in March, while Treasurer Lew Lawson has kept an eagle eye on the finances. Les Smith has looked after the society's 10 inch telescope while Graeme Mills has supervised the operation of the 23 and a half inch telescope, formerly housed at Cassimir Lodge. This is presently stored at the Aviation Museum but has not been purchased by the Society.

And during the year there were a number of "Star Parties" ...some held outside on the street or in parks, while others were in local primary and intermediate schools. In fact around 560 children, including their parents, have experienced the thrill of looking through our telescopes to see planets, the Moon and star clusters. These lectures include a selection of Astronomical DVD's which the Society had purchased during the years.

Our members also contributed to the smooth operation of our monthly meetings, with some excellent lectures on a diverse range of topics. It would be hard to pick out any winners, except to say that Ursula Macfarlane's construction of an icy comet, using household ingredients, plus the comet's re-entry into our "space" at Fergusson Park, was well worth watching. Ursula has also been responsible for collating material and publishing our Newsletter, which continues to be sponsored by one of our local law firms, Harris-Tate. A very big thank you Ursula.

Thanks also to Jim Talbot for maintaining the Society's web site which has links to the Royal NZ Astronomical Society's web page, along with some excellent sites to visit.

Secretary Jim and committee member Les Smith were in the headlines this month, with an article and photo published in last Saturday's Bay of Plenty Times. This was as a result of Jim's submissions to the Tauranga City Council's 10 year plan.

The Society indicated that three years was too long to wait for an upgrade of this building and we fully supported the Otumoetai Sport and Recreation Trust in pushing for an accelerated works programme, with council to bring forward

construction to start in 2008. The addition would include a 15 metre square observatory on the north east corner of this building, along with a 15 metre square concrete viewing apron out front. The ideal set up would be for a "roll away" roof so that any telescope could be permanently mounted within the observatory. We have also asked for secure storage facilities for our telescopes and electronic equipment. Whether we are successful is now up to the city fathers.

George Stewart....(Vice President)

Lunar Standstill.....

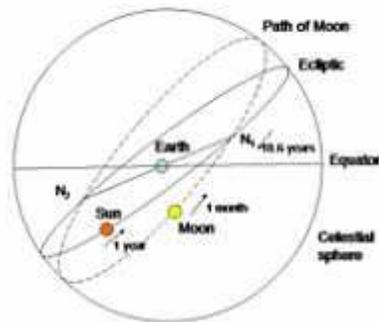
This particular phenomenon occurs when the path of the moon reaches its southernmost position in the sky, and as the movement is then reversed for it to come back the other way, we have what is called a 'standstill'. In other words, the declination of the moon reaches a maximum.

To explain further, an understanding of how the celestial sphere moves, combined with seasonal variations, will help.

Right ascension is the celestial equivalent to earthly longitude, and declination is equivalent to earthly latitude. Positions of stars and deep sky objects are defined by these values.

The Sun and Moon behave a little differently from the stars, however. As the Earth travels around the Sun, the Sun's declination changes from $+23.5^\circ$ in December to -23.5° in June due to our axial shift of the same value. This is how we come to have seasonal variations, with the Sun high in summer, but low in winter.

The Moon also changes in declination, but it does so in only a month, instead of a year. Hence we find that the declination changes dramatically from $+25^\circ$ to -25° in just two weeks, returning to $+25^\circ$ two weeks later.



Unlike the Sun, the maximum and minimum declination reached by the Moon also varies because its orbit around the Earth is inclined by about 5° to the orbit of the Earth's rotation about the Sun. From this we find that the maximum declination of the Moon varies from $(23.5^\circ - 5^\circ) = 18.5^\circ$ to $(23.5^\circ + 5^\circ) = 28.5^\circ$.

The effect of this is that at one particular time (the minor lunar standstill), the Moon will change its declination during the month from $+18.5^\circ$ to -18.5° , which is a total movement of 37° . This is not a big change, and may not be noticeable in the sky unless you were regularly monitoring the movement.

A major lunar standstill then, occurs 9.3 years later, during which time the Moon will change its declination during the month from $+28.5^\circ$ to -28.5° , which is a total movement of 57° . This is enough to take it from high in the sky to low on the horizon in just two weeks and is therefore far more obvious.

The graph shows the moon's orbit at the start of 2005: the *ascending* node was then a little way east of the March equinox, and the descending node was approaching the September equinox. And the extreme northern and southern declinations of the moon were now *greater* than those of the sun. When we reach June 2006, the nodes will again coincide exactly with the equinoxes, and this time we shall have a *major standstill*: the moon will reach declinations of $+28.5$ degrees and -28.5 degrees.

Further Society Information

TROG.....Tauranga Roaming Observers Group

This is a phone/email list which you can put your name down for if you are interested in 'spur of the moment' observing. This has normally been down at Fergusson Park in Matua, Tauranga, but other sites are being checked out constantly. Contact Ursula or Jim if you are interested in joining the observing group. Andrew Walker has agreed to help man this list too, so you could co-ordinate a time/place with him if you are keen to go out. Andrew's phone number is 573 8550.

NOTE: Public Meeting Visitors;

Casual visitors to public meeting nights will be able to come along free of charge for two public meetings or viewing nights, thereafter a charge of \$5 per meeting or viewing night if the person does not pay the annual subscription.

Other Astronomical Events.....

Waharau Deep Sky observing weekend – 21st July – 23rd July – See Waharau link on <http://www.astronomy.org.nz/aas/pub/home.asp>

RASNZ conference – New Plymouth – June 2006 – David Levy is the invited speaker – www.rasnz.org.nz

(Royal Astronomical Society of New Zealand)

Tauranga Astronomical Society Committee members AGM results;

The assigning of individual positions on the trust board of the Society are not yet completed. The trustees are as follows;

George Stewart Jim Barrowclough Lew Lawson Les Smith Stuart Murray Janine Neustroski Andrew Walker Graeme Mills

Good luck for the next year of running the society !!

Ursula Macfarlane

Newsletter editor