

TAURANGA ASTRONOMICAL SOCIETY (INC)

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Novembers meeting featured a DVD presentation by Jim on some little known aspects of the 1969 Apollo 11 Mission.

Octobers Meeting:

THE TUNGUSKA EVENT

By Stuart Murray

This was a power point presentation I gave to the Tauranga Astronomical Society's October meeting.

The astronomical event was a collision between an incoming large space object and our planet that occurred exactly 100 years ago. The collision site was in a sparsely populated area of central Russia (Siberia) in mid summer and early in the morning – 7. 14 am local time, 1908.

Two points to note. This was the first time mankind was able to record such an event from eyewitness accounts and also to be observed by the scientific instruments of the day.

The second and pause to ponder this – if the incoming object was 4 ½ hours later in arriving and earth on its daily rotate had further revolved another 60°, the city of St. Petersburg could have been totally destroyed. How this would have changed world history over the last 100 years. Would the imminent Russian revolution or the 1st World War, or even the 2nd World War have taken place?



3 major areas I looked at.

- 1 - What was the object?
- 2 - Where did it come from?
- 3 - Why was there such a destructive and immense explosion and yet there was no evidence of any impact crater?

The following are points and comments as used in the presentation.

The Tunguska Event – June 30th 1908

An aerial explosion – 7.14 am

60° 55' Nth. 101° East. Siberia

Blast size 10 – 15 megatons

Felled over 60 million trees over 2,150 square kilometers

The Mystery of the Tunguska Event.

A comet that disintegrated in the atmosphere
An asteroid that exploded in mid-air
A mini black hole that passed through the earth
An anti matter rock that destroyed itself entering normal matter
A mirror matter rock nobody could see
A volcanic blow out (there is geological instability in the area)
A giant lightning ball
Geometeors that came up from below ground
A plasmoid surrounded by a strong magnetic field
An alien space craft that broke down
A zap from an alien laser
An experiment on a 'death ray' that got out of control – Tesla
(Obviously by today's standards many are beyond consideration)

Comets / Asteroids That Impact the Earth.

Gaseous shroud stops most asteroids smaller than 60 m. from reaching the ground intact
High velocity causes rocks to disintegrate – burn up. Theoretical modeling indicates
cometary material, ice/stones, up to 150 m., will not penetrate the atmosphere deeper than
16 kms. These projectiles are still dangerous when they explode, high energy blast shock
waves propagate downwards covering large areas, but don't imply impact craters formed.

What Really Was It ?

Astronomers today accept that this early morning event on June 30th 1908 creating this
gigantic explosion, blinding flash, burning and flattening thousands of sq. kms of forest,
was either an incoming comet or asteroid. Evidence today points to it being a low
density asteroid. The atmospheric shock wave circled the earth twice, scattered light in
the stratosphere for several days afterwards such that newspapers could be read at mid-
night as far away as London (10, 0000 km). It is now thought (2001) that it could have
been a rubble pile asteroid with a density very close to water. This would mean it could
explode and fragment in the atmosphere with ONLY the shock wave reaching the
ground.

Possible Origin and Orbits.

The analysed seismic records, flattened tree alignments etc. give its trajectory.
Using this information, its calculated speed of 11 kms per sec., 886 valid orbits were
defined. Over 80 % were asteroid orbits with only a minority being orbits associated
with comets.

Comments From Observers.

At Vanavara, a Trading Post 65 km away, a local described it as follows.

Suddenly in the Nth. sky ... it was split in two, and high above the forest the whole northern part of the sky appeared covered in fire. I felt a great heat as if my shirt had caught fire. At that moment there was a bang in the sky and a mighty crash. I was thrown 20 ft. from the porch and momentarily lost consciousness. The crash was followed by a noise like stones falling from the sky or guns firing.

The earth trembled. The sky darkened, a hot wind from the Nth. as if from a cannon blew past the huts – it damaged the onion crop



Another Witness in the Town of Kirensk noted

A ball of fire coming down obliquely. We heard separate deafening crashes like peals of thunder ... followed by 8 loud bangs as gun shots. A ball of fire appeared in the sky ... as it approached the ground it took on a flattened shape ... a flying star with a fiery tail ... its tail disappeared into the air. As it neared the horizon it appeared as a pillar of fire...

This comment was consistently described from distances of 400 kms.

From 200 kms witnesses called it a bright ball 2 to 3 times larger than the sun. Its trajectory was a fiery white band.

The Tunguska area in remote Siberia, is sparsely populated and covered in coniferous forest – Taiga. Trees under the explosive blast were left standing vertically, without limbs – a forest of telegraph poles, while radiating outwards like spokes from an axle, lay this large forested area. Branchless trees were found at a site of another massive blast – Hiroshima.

Energy from the initial intensive blast was sufficient to severely burn exposed herdsman 10's of kms. away, burn instantaneously the surrounding forested areas with many trees scorched on the side facing the blast.

Was it a stony rock type asteroid, minimal metallic material or was it a comet head.?

Both have potential for complete disintegration before hitting the earth.

It was probably a pile of space rubble – like the asteroid Mathilde.

It would appear not to be an iron based asteroid because of the lack of a crater, no tektites – small molten objects ejected from impact material.

The asteroid was reported as visible over East Asia, China. Had it arrived 4 hours later, with the earth's rotation, those countries, cities on a similar latitude of 60° would have been devastated: ie St. Petersburg, many European areas and in particular, Scandinavia. How the world's history may have changed.

Tungus natives and Russian settlers north west of lake Baikal observed a huge fireball moving across the sky, bright as the sun. A few moments later a flash lit up the sky, followed by a shock wave that knocked people off their feet and broke windows 650 km away.

The massive explosion packed a wallop. The resulting seismic shock wave registered on the newly developed sensitive barographs (barometers) as far away as England.

Dense clouds formed over the region at high altitudes, reflecting and refracting sunlight over the horizon. Asteroidal debris, earth dust or ionized atmospheric particles – were they also responsible for the high night time illumination thousands of km away?

The enigma is – there is no visible, or any evidence, of an impact crater.

The first expeditions of note into this area were not until the 1920s where swampy, mosquito ridden terrain hindered research. It wasn't until post W.W.2, and then later with the fall of the Communist State, that in-depth research took place.



Generally agreed theory today.

A large space rock 40 metres diameter approached the planet at about 30° to the surface, speed at 54,000 km per hour, weight 100,000 kilograms.

This asteroid heated the air surrounding it to 44,000° Fah. (NB. This is really hot)

At 28,000 ft. the combination of pressure and heat allowed it to completely fragment and destroy itself.

The forces holding it together were less than the build up of forces surrounding it. No discernible particles reached the earth's surface.

Known and Agreed Facts

Accurate time 0014 GMT 7.14 am local

Epicentre location Lat. 60° 55' Nth. Long. 101° 57' East

Large incoming object visible over 1,500 km.

Brightness comparable to that of the sun

Exploded mid air 5 to 10 km above ground

Energy of blast 10 to 20 megatons

Debris blown upwards into the stratosphere

No significant fragments except microscopic globules

Shock wave blast leveled 2,150 sq. km forest

200 sq. km forest burnt by heat wave

No impact crater

Devastated forest butterfly shaped. – epicentre lies near butterfly head

Heat and shock wave felt 70 km away - bright lights 700 km - loud bangs 1200 km

Blast created atmospheric disturbances – generated seismic waves

A local magnetic storm – as in nuclear explosion – lasted 4 hours

Explosion created very bright nights in Europe and Asia – lasted several days

Accelerated growth in young trees that survived the blast

Planetary Defence Timeline

1980s NASA studied evidence of earth strikes

1990s US Congress considered the risk

2005 united push to develop strategies

2007 believed to be 20,000 objects capable of crossing earth's orbit – 140 metres dia. or more

Possible collision – every 5,000 years

End of 2008 90% of objects larger than 1 km will have been identified

Past and Major Known Events

Earth collided with a Mars size object – debris coalesced to form the Moon

Chicxulub crater on the Yucatan Peninsular

Major impacts in Germany, USA, Canada, Africa, Australia where immense areas were destroyed

Consider the land area is only 1/5 of the earth's surface

Potential Future Problems

The Tunguska Event was the first large cosmic object, asteroid / meteor – comet, to be observed, witnessed and recorded by mankind.

In 2007 a NASA revision estimates that a piece of comet or asteroid hitting the earth maybe now at a higher frequency.

In 1972 a space object dipped into the earth's atmosphere, but 'skipped' back into space. This object estimated at 10 metres had the destructive energy comparable to the Hiroshima bomb.

It travelled through 1500 km of the earth's atmosphere, from near Salt Lake City, Utah, to near Calgary, Alberta, in about 100 seconds, reaching a minimum height of 58 km over Montana.

A new fire ball in the Siberian sky – Lat. 58°. Long. 113°. 11.15pm 24th September 2002.

Noted by an US Air Force satellite but lost track as it fell.

2nd satellite records fireball exploding in a clouded sky.

Not sighted but explosive sounds heard 60 km distant.

100 sq. km trees damaged – no impact site.

March 22nd 1989 - the 300 metre Apollo asteroid missed the earth by 700,000 km.

passing the earth where it had been 6 hours previously. If the asteroid had impacted it would have created the largest explosion on earth in recorded history.

2002 NASA reported an asteroid missed the earth by 120,700 km. With a dia. of 50 – 120 metres it was discovered AFTER its close earth pass.

July 2004 NASA also reported a N.E.O. only a week before its discovery and passing the earth at 400,000 km.

Future Events

2029 – object called Apophis will pass 6 earth radii of the earth's centre. Now revised with chances of impact as slight. Possible impact 2036

Future collision dates out to March 16th 2880 -----

And these are the objects that we can OBSERVE.

A Tunguska sized asteroid is estimated to enter the earth's atmosphere every 300 years.

Do we have another 200 years to go?

Who knows !!!!!!!!!!!

Novembers Meeting:

APOLLO 11 – MISTAKES REVEALED

By Jim Barrowclough

Only very recently have the mistakes been revealed about the Apollo 11 mission, which in hindsight, should never have gone ahead in the first place. I suppose the driving force was to ensure space supremacy from the Russians, who did have supremacy in the early years.

On July 16th. 1969 three astronauts, Neil Armstrong (Commander), Edwin “Buzz”, Aldrin (Lunar Module pilot) and Mike, Collins (Command Module Pilot) blasted off from the Kenedy Space centre bound. In fact it later transpired they were very lucky to have made it back.

The DVD shown to the Tauranga Astronomical Society on Wednesday 26th. November gave a graphic description of all the things that could have gone wrong with just about every stage of the journey and miraculously everything went as hoped – all the safeguards that had been planned to save the crew from disaster had never worked in the trials back on earth. The launch could have ended in disaster as a liquid hydrogen leak that was only fixed after the crew had boarded the space rocket – a stray spark could have blown everything to kingdom come. On the early launch the ejector cabin at the top of the rocket had never worked in trials on earth so would not have saved the crew. The ejector required two seconds to function and in a massive explosion at launch time they would not have had that time. There were a million gallons of liquid fuel which would have made a tremendous fireball. The astronauts were unaware of all this, so it really was a massive gamble.



A number of weird objects seen through the windows that looked like UFOs has never really been explained – also many bright flashes during night time which could have been charged particles hitting the spacecraft which in itself was extremely thin and easily damaged. Communications with Houston were not particularly good but when one considers the strength of the computers of that day on board were less than a mobile phone of today and more the equal of a digital watch it makes one wonder what an epoch affair it was. The communications seemed to regularly overload the onboard

computer which then sounded the alarm and was of no use at all. On the moon landing

the Lunar Module got lost and had a terrible time trying to find a suitable, reasonably smooth site to put down on and they ended up with only about five seconds of fuel left.

But fortune was on their side and all went well, except for one eventuality which no one had thought about – the clumsy space suits caught the switch on a circuit breaker relay while climbing out through the door which was noticed when entering again for the journey back home. With a broken Circuit Breaker switch how was one to start the engine to lift off the moon's surface? Calling up Houston didn't help at all and if they couldn't get the motor started; when the oxygen ran out they would go to sleep permanently on the moon's surface. With the same Kiwi number eight wire mentality one of the crew had a brainwave and managed to push a ballpoint pen down the centre of the circuit breaker, sufficiently to make the contact necessary to ignite the thruster jets. Buzz Aldrin still has that pen as a memento (wouldn't you?).

Fortunately the trip home went without a hitch with just the right angle of entry being chosen, Too slight of amount of angle and the Space module would skip away on the atmosphere and back out to space, too acute an angle of re-entry would increase the heat and all would burn up on re-entry. The whole epic journey took 8 days and I must say the Americans worked everything out right to a tee and should be congratulated on that and the crew landed in the sea where expected, but when one considers the unlikelihood of the project being successful and without more certainty, was it worth risking the crew's lives – I doubt if they would do it nowadays what with so many govt. departments such as OSH and many others all putting a stop to it. The DVD was a real eye opener and thoroughly enjoyed by those who saw it.

Building a compact 6" telescope

By Andrew Walker

In 2001 I completed the first telescope that I had made with a mirror that I had ground, polished and figured myself. Before I had finished this mirror I had begun contemplating a second mirror. For that second project I decided to make an RFT or Rich Field Telescope. These are scopes of short focal length that can be used to take in large areas of sky. They are easily transportable however the shorter focal ratios make figuring the mirror a greater task than my original spherical 6 inch f9 I had completed earlier.

The scope I decided on would have a 6 inch primary with an f4.5 focal ratio. When coupled with my 32mm plossl this would give 21 x magnification and a field of view of around 2.5 degrees. The reason for staying with 6 inches of aperture was that I found that size of disk easy to work with and enough aperture to show plenty of deep sky objects (personally I believe 6 inch scopes are extremely under rated).

A disk of 19mm float glass cut into a circle with a diameter of 155mm was purchased from a local merchant. I cast and constructed a tool from plaster of Paris and some spare hexagonal tiles which were epoxied to the dried plaster disk. I then proceeded to grind

the mirror in the traditional manner proceeding through finer grades of abrasive until I considered the disk ready for polishing. Unfortunately I did not go quite deep enough with the rough grinding and instead of having an f4.5 mirror I ended up with an f4.7 one. I decided this was of little consequence as the rest of the scope could be built to accommodate the slightly longer focal length.

As I started to polish the mirror I decided it would be best to construct the telescope tube at the same time. This would allow me to star test the uncoated mirror before sending it off to be coated. Polishing proceeded as usual. I managed to put in a spell of around two hours most days until the mirror was completely polished out. I tested the quality of the polish by using a magnifying glass to focus sunlight onto the surface. After only a few hours the mirror went from having a frosted look to totally clear, however when sunlight was shone on it the light formed a bright spot on the surface. After around 10 hours of polishing when this test was applied, the surface was mostly transparent, with the focused rays picking up numerous specks which shone when the light passed over them. After 15 hours of polishing the mirror was completely polished out. The focused rays of the sun passed almost completely through the first surface of the mirror forming a bright spot on the back and a mere shadow of light on the first surface, even when the edge was examined.

It was now time to move from polishing to figuring. The same tool was used for most of the figuring work however the spells of work became much shorter. I used two methods to test. The first was a ronchi test which involved placing the mirror on a stand and shining a light placed at the radius of curvature of the mirror at it. Once the mirror had been adjusted so that the return rays were shining on the opening to home made Ronchi grating (made from winding wire around an aluminium strip) a thin slit made from two razor blades was placed in front of the light source. Now when the mirror was viewed through the grating the surfaced appeared to be divided by alternating dark and bright lines. Under this test the shape of the lines shows the contour of the mirror amplified many thousands of times. By judging the bow and shape of the lines I could tell if I had any zonal irregularities and what shape my mirror was taking. The draw back of this test is that it is not quantitative, ie. It can show that you have a mirror tending towards parabolic but not to what degree. The mirror may be under corrected (an ellipse) or over corrected (a hyperbola) or it could be perfect (a parabola). The user of the Ronchi test has no way of knowing.

To overcome this problem I also used star testing. This test involves placing the mirror in the telescope and pointing it at a bright star. Using a medium to short focal length eyepiece the image of the star is examined as it is raked inside to outside focus. The defocused star images tell the story of the mirrors figure. It is an extremely sensitive test and in my opinion the best, although it does have several drawbacks. The largest being it requires clear nights with good seeing. Fortunately I was living in Auckland at the time where although light pollution is a major problem I found we had many nights of good seeing.

Under test the perfect mirror will show identical images inside and outside of focus at the same distance from focus. After months of figuring using both a full and sub diameter laps, the mirror was almost done. Star images were tight points and showed a good star test. I remember pointing the unfinished mirror towards Saturn after figuring during the day and after finishing my evening shift at Auckland International Airport. The image in the eyepiece was wonderful. The rings were crisp, Cassini's division was sharply defined and I could see numerous cloud belts on the planets disk.

After such a long time working on the mirror I was totally elated to the point of Euphoria,



it really was one of the greatest feelings to behold such a clear image. I decided I just had to share this wonderful experience and rushed inside to wake my wife so she too could share in the wonder and joy of it all. It was at this point that I learned that not every body shares a telescope makers feelings of excitement at 3.00 in the morning and I will simply say that waking her at this time after she had had a hard day at work was not such a great idea.



The telescope its self had been designed to be compact. I had incorporated a few ideas that I felt would make this scope easier to transport and store than the f9. Firstly I designed the base so that the tube could rest inside it for storage. The round trunions could pass through a hole in the rocker box allowing the minimum area to be filled when stowed. I also realised that such a small

scope would require all sorts of feats of gymnastics to reach the eyepiece if provision was not made to allow the tube to rotate. To this end I used an off cut of storm water pipe as the tube bolted two ball bearing races to the tube, one either side of the trunion box that held it. By making the hole through this box slightly larger than the tube and lining it

inside with carpet off cuts, the tube could turn freely and the bearings allowed movement of the tube rotationally but held it firmly to stop it moving fore or aft and upsetting the balance.

Originally I fitted an optical finder I constructed from the remains of a pair of 8x40 binoculars but realise that a unit finder such as a telrad would be better. The focuser was made from 32mm drain pipe and has proved adequate.

This scope has proved to be very satisfactory. The wide field views it provides are wonderful to behold. I find I now do almost all my observing through a 10 inch reflector but the RFT is still used for scanning the Milky Way and it is great for the kids as the eyepiece is at their height without having to stand on chairs or a ladder. One of the highlights for me was being able to bring this scope to work in November 2006 and showing my workmates the transit of Mercury as it happened through my little RFT fitted with a solar filter. They marvelled at the little disk of Mercury slowly making its way across the face of the sun. The following day as we watched the footage of the transit on the mid day news a few of them noted that the TVNZ footage used, "looks the same as through Andy's scope".

Constellation up close Canis Major and Canis Minor

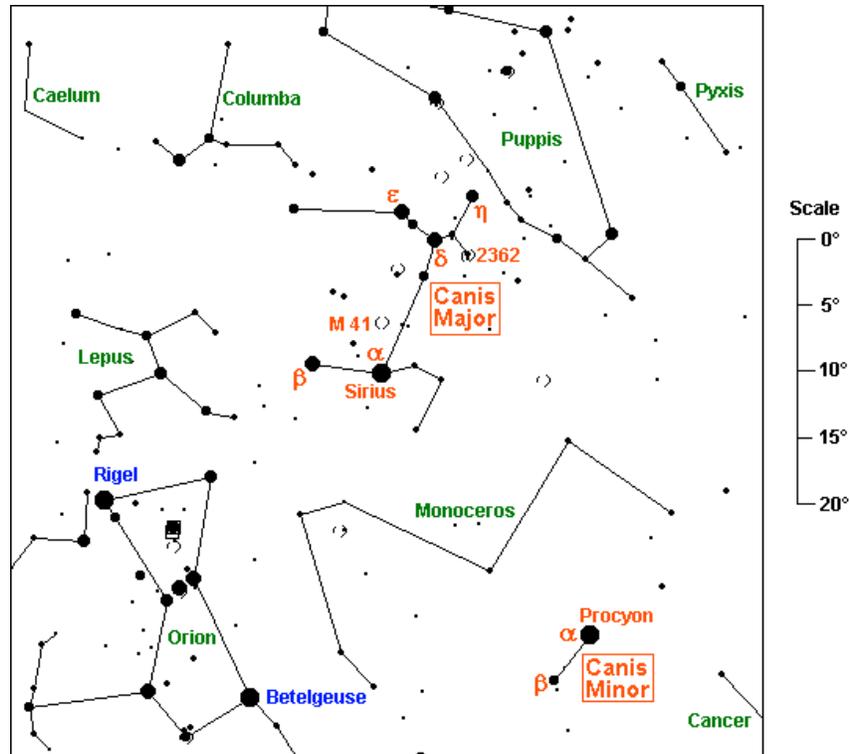
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CANIS MAJOR and CANIS MINOR, (pronounced KAY-niss MAY-ger and KAY-niss MY-ner) These are ancient constellations, representing the two dogs following at the heels of Orion. To find them look north late evening, find Orion (Pot) and follow the map.

Canis Major, the large dog, is a conspicuous constellation lying mainly just south of the Milky Way between Orion and the long train of bright stars from the old Argo Navis. The constellation is dominated by the brilliant white Sirius (the Dog Star) (pronounced SIH-rih-uss), the brightest appearing star in the sky. The ancient Egyptians based their calendar on its yearly motion around the sky.

Canis Minor, the small dog, had two stars assigned to it in ancient times. The brightest of these is Procyon.

Chart showing the two constellations as seen high in the sky to the north mid evening in February.



Details of some of the objects shown in the chart.

α Canis Majoris, Sirius (from the Greek, meaning sparkling or scorching) at magnitude -1.46 is exceeded only by some of the planets in apparent brightness. It owes its brilliance to being one of the Sun's closest neighbours at 8.7 light years away, and as well, is about 22 times more luminous than the Sun. Several other stars in Canis Major are in fact far more luminous, but not appear as bright due to their greater distance.

Sirius has a white dwarf companion that orbits it every 50 years. Closest approach was in 1993, while the widest separation will be in 2022. The white dwarf will not be visible to most backyard observers, however, until the early years of the 21st century. Even then it remains difficult to see because of the glare of Sirius. A white dwarf is only about the diameter of the Earth, but contains most (90%) of the star's original mass. White dwarfs are therefore exceptionally dense bodies. A teaspoonful of material would have a mass of thousands of kilograms or over 100,000 times that of water. Over thousands of millions of years they slowly cool off and fade.

β CMa, Mirzam is a magnitude 2.0 star which is 500 light years away. It has a luminosity more than 3000 times that of the Sun.

δ CMa, Wezen is a magnitude 1.8 star some 1800 light years distance. It has a luminosity more than 30000 to 40000 times that of the Sun.

ε CMa, Adara is a magnitude 1.5 star which is 430 light years away. It has a luminosity about 4000 times that of the Sun.

η CMa, Aludra is a magnitude 2.5 star and is 3000 light years away. This large distance means it has a luminosity some 9000 times that of the Sun.

M 41 (NGC 2287) is a fine open cluster recorded by Messier in 1765, but was known to Aristotle around 325 BC, being visible to the unaided eye. It is a beautiful object in binoculars and small telescopes, containing some delicate pairs and triplets, with a fine orange star near the centre. It lies about 2500 light years away.

NGC 2362 is a most beautiful smaller and fainter cluster than M 41, but it is easily found surrounding the 4.4 magnitude blue giant star τ CMa. Small telescopes and binoculars show about 40 stars in the cluster. τ CMa is also a member of the cluster which lies about 4000 light years away.

α Canis Minoris, Procyon (pronounced PROH-see-on), a brilliant yellow star about five times more luminous than the Sun lying 11.3 light years away. It's name comes from the Greek, meaning 'before the dog', referring to its rising before Canis Major. Like Sirius, Procyon has a white dwarf companion. This one orbits every 41 years, but is even more difficult to see than the companion to Sirius, requiring the use of large professional telescopes.

β CMi is a magnitude 2.9 star which is 170 light years away and has a luminosity more than 160 times that of the Sun.

BACK PAGE

The Tauranga Astronomical Society holds a monthly meeting on the fourth Wednesday of each month at the Otumoetai Soccer Club rooms, Fergusson Park, Tilby Dr, Matua. The meeting begins at 7.30pm and all are welcome.

New comers are invited to attend two meetings free of charge, however, after this a charge of \$5.00 per meeting will apply if membership of the society is not taken up.

Current membership fees are below and may be paid to the treasurer on any club night.

Full Time Student	\$15
Ordinary Membership	\$20
Family	\$30

Meetings consist of a presentation of roughly one hour either by a society member or an invited guest on an astronomical subject. After light refreshments this is followed by viewing through one of the society's telescopes, weather permitting, or the screening of an Astronomical DVD.

The Tauranga Astronomical Society Newsletter is published quarterly each January, April, July and October. The editor welcomes contributions from members provided they

are on an Astronomy related subject and are original. Articles for the newsletter may be submitted electronically by email too: andrew32walker@yahoo.com

T.R.O.G (Tauranga Roving Observers Group)

TROG is a list of persons interested in observing from a dark sky site. We have been currently meeting approximately once a month at the editor's home in rural Te Puke. Another location previously used is Bell Road Papamoa and other sites are welcomed.

If interested in observing contact either Ursula Macfarlane 5767283 or Andrew Walker 5738550. The group is informal and no previous experience is required. Just bring along a telescope or binoculars if you have them, any star charts you might need and your enthusiasm.

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