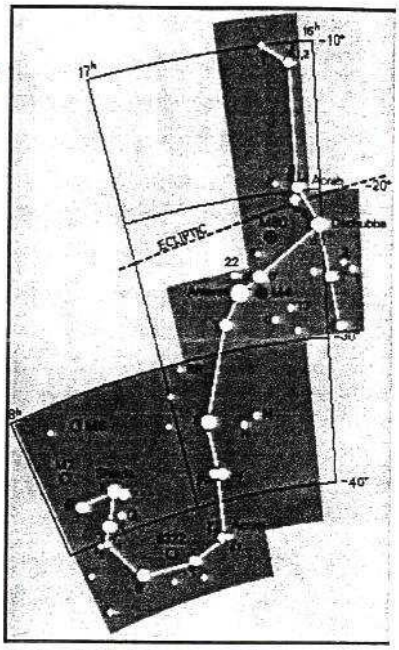
SCORPIUS

The Journal of the Astronomical Society of Frankston Inc.

P.O. Box 596, Frankston, Victoria 3199

Volume VII, No. 1 1998

(Jan - Feb)

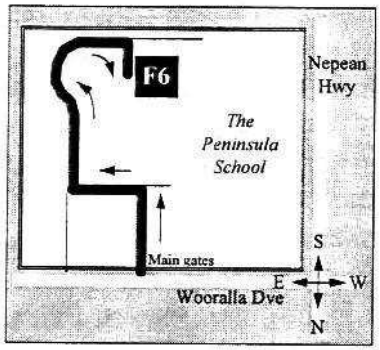


The Astronomical Society of Frankston was founded in 1969 with the aim of fostering the study of Astronomy by amateurs and promoting the hobby of amateur Astronomy to the general public. The Society holds a General Meeting each month for the exchange of ideas and information. Regular observing nights, both private and public are arranged to observe currently available celestial objects. For decades the Society has provided *Astronomy on the Move* educational presentations or observing nights for schools and community groups exclusively in the area bounded by Moorabbin, Dandenong and Tooradin.

Meeting Venue: *Peninsula School*, Wooralla Drive, Mt.Eliza (Melways map 105/F5) in room F6 at 8pm on the 3rd Wednesday of each month except December.

Internet: http://www.peninsula.starway.net.au/~aggro

Visitors are always welcome!



Annual Membership	
Full Member	$30
Pensioner	$25
Student	$20
Family	$40
Family Pensioners	$35
Newsletter Only	$10

DUE 1ST OF JANUARY EACH YEAR

President & Editor
Peter Skilton (03) 9776 5898

Vice President
Peter Lowe (018) 318 920

Treasurer
Bob Heale (03) 9787 1748

Secretary
To be appointed by Committee

Committee
Ken Bryant, Roger Giller, Don Leggett
Richard Pollard, Ian Porter

All phone calls before 8:30pm please.

FUTURE EVENTS

General Meetings:

Wed 21st January '98
Session 1: Excellent NASA video of *An Astronaut's View of the Earth.*
Session 2: Informal chat session.

Wed 18th February '98
Session 1: David Girling streaks in to tell us about *Meteor Observing.*
Session 2: Video on *The Planet Hunters.*

Wed 18th March '98
Session 1: Video on *Sputniks, Bleeps and Mr.Perry*, telling the true story of the Russian Sputnik craft in 1957.
Session 2: Informal chat session.

Viewing Nights:

Members Only:

Sat Jan 24 & 31, Feb 21 & 28, Mar 28 all at *The Briars*, Nepean Hwy, Mt.Martha (Melways 145/E12).

If weather forecast for the Saturday looks bad, the Friday before may be used instead. New attendees must always confirm with David Girling on (03) 5976 2806 before attending. Follow the signs at *The Briars* from the Visitor Centre. Remember you can only attend on planned Members' Nights, unless by prior arrangement with David.

Public, School & Community Groups Viewing/slide nights:

If you can assist, please contact the Secretary.

- The traditional weekly public viewing nights at *The Briars* will be held on the first 4 Friday evenings of January 1998, starting 8pm (i.e. 2nd, 9th, 16th & 23rd). These have been advertised in local papers and elsewhere by the Shire. Any assistance is appreciated with telescopes.

Phenomenal Events:

- Predictions have arrived for the eclipses of Jupiter's moons for 1998. These can be easily viewed in the smallest of telescopes, and observations of these eclipses are still eagerly sought by the *Jet Propulsion Laboratory.* For printed predictions, and a helping hand, see the Editor, or forward an email address.

- The *South Pacific Star Party*, is being held 27-30th Mar at Ilford, 230km West of Sydney. Info at meetings.
- The 18th *NACAA* (National Australian Convention of Amateur Astronomers) is being held next Easter 10-13th Apr in Sydney. Register by 31st Jan.
- *Ballaarat Astron. Soc.* are having a *Back-to-Ballarat* event to celebrate their 40th anniversary on 8-10th May. Starting on Friday evening with a dinner and private viewing of world renowned David Malin's astrophoto exhibition next door, this will be followed over the next two days by talks from visiting speakers, including David Malin, Raymond Haynes from the Australia Telescope, Barry Adcock of the BAS and others. Further info will become available soon. This is being co-ordinated by the tireless Bill Fiddian of the BAS (phone 0353 432316).
- Predictions for seeing the spacestation *Mir* are available at meetings or on the Internet.

Social Events

- The annual Christmas break-up at *The Briars* on Saturday afternoon 6th Dec went ahead, with 19 in attendance, but regrettably some missed out on the early start advertised, rather than the traditional evening time. Having it this early in December also seemed to reduce numbers, so next year may be different. Special thanks to Ian Cuthbertson for offering to contact Santa on the day.
- A Summer barbecue will be held on Sat 24th Jan at *The Briars*, 1pm, BYO all.
- The *Astron. Soc. Vic.* will visit our *Briars* site on Sat 28th Feb. About 10-20 demonstrators are anticipated, BBQ'ing beforehand, and a 50cm Dobsonian is expected to visit. This coincides with our members' night.

YOUR SOCIETY

NEW MEMBERS

Welcome to the following new Society members:

Boyd McGregor
Dayle Moriarty
Karen and Shaun Simonsen

The ASF is one of the largest groups in Australasia. Membership is currently at 106. Please feel free to say hello at general meetings. Specialised badges, windcheaters, T-shirts, books & posters are available at meetings. Society name tags are free to new members who attend meetings. Members are able to borrow library books and are entitled to attend special viewing nights at *The Briars* where you can discover the secrets of the night sky.

HELP NEEDED

Articles, features, book reviews, member observations and points of general interest for this journal are always welcome. New contributors are encouraged. For example do a bit of reading and pass on some information, but remember not to plagiarise. Hand written material is fine; computer text files are perfect.

SECRETARY'S JOTTINGS

The Secretary is a bit of a phantom at the moment, so the editor has stepped in.

The society's 20cm Meade Dobsonian for use by full members has arrived and was assembled by Ken Bryant. Members can hire it for $20 per month. Those potentially interested should contact Richard Pollard to go on the waiting list. The *Bendigo District Astron. Soc.* has declined hosting the next VASTROC due to their limited membership, so we are writing simultaneously to all other Victorian societies requesting expressions of interest. Our grant application for a telescope was unsuccessful. Andrew Klop has been grappling for some time now on our new-look internet home page, however, available storage space has been a major challenge. We have discovered that our new laser collimator is actually out of collimation itself, so it will be returned for correction.

RECENT MEETINGS

November's meeting was chaired by the President, and saw 55 in attendance. The Annual General Meeting was duly dispatched in 22 minutes, followed by the usual line-up of Bob Heale's *Sky for the Month*, Ian Porter's *What Goes Up*, and Peter Lowe's *Lowe Down on the Internet*. Following coffee, baked slices care of Bev Giller, and a brisk trade in *Astronomy 1998* books, most reconvened to hear Peter Skilton talk on *The Cranbourne Meteorites: A Tale of Sex, Lies and Cannibalism*, while the others viewed a video from David Malin on *Image Manipulation in Astronomy*, care of Bruce Tregaskis. The evening finished at 10:35pm.

AURORA RETURNS

After a very long absence from Peninsula skies, a clearly visible *Aurora Australis* was reported by David Girling and Richard Pollard on the night of 23rd Nov, around 11pm daylight savings time. Fifteen witnessed the phenomenon on a warm, clear Saturday night at *The Briars* members' night. This included two who came from the UK especially to see all the planets in the sky together,

which we duly accommodated.

The *aurora* was very red, with green and white patches, and was readily visible to the naked eye as waving columns reaching towards the South, lasting about half an hour. To add icing to this treat, a predicted pass-over of one of the new Iridium satellites was seen by all at a truly magnificent magnitude -6 brightness (that's even brighter than the planet Venus in the sky!). All went home late, thoroughly in raptures.

NEPTUNE OCCULTATION

On 29th Nov at 22:11 AESuT, the star SAO188797 was occulted (hidden) by the planet Neptune. This event was visible in eastern Australia, though at low altitude. The planet was 3 times brighter than the star, and hence was a difficult observation visually, needing filters ideally. The *International Occultation Timing Association* in the USA sent out special camera equipment for the event, and several results were obtained in the northern states.

Thanks to the following members who participated in one or more of the viewing nights below: Ken Bryant, Ian Cuthbertson, Roger Giller, Bob Heale, Richard Pollard, Ian Porter, Peter Skilton.

About 70 grade 5/6 pupils and teachers from Skye Primary school received some *Astronomy on the Move* on 7th Nov. Unfortunately the sky was totally clouded, however, the kids enjoyed the talk and later used one of the telescopes to at least view a distant window.

A somewhat reduced turn out occurred on 4th Dec at Mornington Secondary where weather conditions blocked all views of the heavens. Coffee and biscuits was great though, as was inspecting Ian Porter's new Dobsonian telescope.

LIBRARY MATTERS

A drill punch has been obtained for putting holes in thick astronomy magazines, enabling better storage on the library shelves. Another reminder to please return any borrowed library material after 1 month, or by arrangement.

Kathy Stabb

A few copies of the year book ***ASTRONOMY 1998*** are still available to members. Inquiries to the editor.

WATCH THAT QUASAR

An alert has been issued for variable star observers to watch the BL Lac quasar object known as PKS 2155-304. A gamma ray outburst was detected in mid-Nov, and astronomers want to know when any optical activity occurs i.e. when you notice it changes in brightness through your telescope. This could happen at any moment. It is normally magnitude 13.1, but could very well brighten to magnitude 10 at least, putting it within reach of 4 inch telescopes. J2000 co-ordinates are RA 21h58m52.1s, Dec -30d13m33s, with a mag 12 star immediately to the West of it. Observation of any changes should be directed to Peter Nelson (LVAS), phone 0356 278 516 AH anytime around the clock, or 0356 230652 BH.

JUST FOR STARTERS

THE NEW CANBERRA PLANETARIUM

In mid-November, I was lucky enough to be in Canberra attending a conference for work. Knowing that the *Canberra Astronomical Society* had opened a new Planetarium only 2 months previously, I dedicated an evening to visiting both it and the nearby observatory, with high expectations of a great evening out. Funded by the Canberra Tradesmen's Union Club, both facilities at the Downer Club in Canberra are housed in excellent aluminium domed buildings.

The Planetarium seats about 60, all facing forwards, and able to recline back to almost horizontal to view the 11 metre dome overhead. The projector is a Zeiss Skymaster, which is surprisingly compact at about a metre long. It is supplemented by a circumnavigating array of standard projectors recessed in the walls, together with a video projector at the theatre rear.

On the night I attended, the Zeiss projector was unfortunately having teething problems, and the full house sat in the dark for 20 minutes as the operator repeatedly attempted to initialise the system and get both sound and visual effects in sync. Nevertheless, his persistence prevailed and, once the show began, it was well presented, concentrating on some of the colourful wonders of the Southern skies, such as the Jewel Box and eta Carinae. I would say, however, that I believe the now defunct Melbourne Planetarium had far more

character, if that is what you like in a Planetarium. There were a couple of minor errors, though I doubt any member of the general public would detect them. For example, as the sky rotated, the Southern Cross rose above the horizon. This was disturbing as this constellation never sets in Australian skies and I think it was rising in the West at that, but I would have to see it again to be sure! Maybe this was a problem on this night only. In addition, there were several very strange pronunciations of astronomical terms during the show; something that could be corrected with more research. I attempted to find out more about the Planetarium, but the operator knew very little about it, and indeed did not even belong to an astronomical society. After this, I browsed the souvenir shop, and I would have to say it was one of the best in astronomical paraphernalia for the general public I've seen, with much *Sky and Telescope* gear on offer.

Then on to the observatory next door, with its displays and large "research grade" telescopes for the public (a 14 inch Celestron, a 16 inch Newtonian-Cassegrain, and a 6 inch refractor, the latter being unavailable on the night). One of the instrument operators indicated they cost well over $250,000. The high tech scopes were then swung round onto Jupiter, Saturn, 47 Tuc and the Moon, for the group of 15 of which I was part. The Moon was unsurprisingly painfully bright at full aperture with an unfiltered 2 inch eyepiece. Jupiter's moons were not circular, and Saturn's rings could be made out, but with no divisions. The globular cluster appeared uninspiring. I would say sadly without doubt, these instruments gave the worst view I have ever had of these objects, these views being markedly inferior to a 2 ½ inch refractor. The sky was very bright from the lighting of Canberra and the spotlights in the club's carpark, to the extent that aircraft engine condensation trails were easily visible in the night sky. The stability of the images was average (probably due to the number of people in the domes), and the shape of the Jovian moons was decidedly smeared, with no detail visible on the planet. I was also somewhat surprised by some of the commentary being given to the public about the Solar System in one of the domes, and had to bite my tongue so as not to correct some of the information being given. I was ambivalent of the overall experience of the Canberra Planetarium and observatory, as clearly much commendable effort has gone into it. I would recommend that you visit the facilities, when in Canberra, for the experience.

IN THE NEWS

CHEAP AS CHIPS

Raven is a network of object tracking telescopes in Hawaii that gives the US air force and NASA up-to-date locations of all 8,000 satellites and other bodies they track, in order to help protect the space shuttle and other craft from potential collisions. When the air force issued a tender to build the system, most estimates quoted around $200,000 for the software. One, however, was $500, presented by a backyard developer. Oddly enough for the US air force, this cheaper version got the nod. It can even be run over the internet, and round the clock. The low cost arose because the bidder simply used existing amateur telescope control software and hardware, virtually off the shelf. Makes you appreciate the power already available to the amateur.

AND THAT MAKES 63

Two new moons have recently been discovered around the planet Uranus, using telescopes in New Mexico and Hawaii. This brings its tally to 17 moons, with the additions having imaginative designations of U1 and U2. It is believed they are enormous, irregular lumps of dark ice and rock that were in their own orbit about the Sun, before being captured by Uranus' gravity. One of the new moons is bright red, possibly indicating the presence of hydrocarbons on the surface. The *known* count of moons for the Solar System is therefore 63, distributed as follows:

Mercury	nil
Venus	nil
Earth	1
Mars	2
Jupiter	16
Saturn	18
Uranus	17
Neptune	8
Pluto	1

UPCOMING MISSIONS

A mission to gather samples of the wind flowing from the Sun and a mission to fly by 3 near-Earth comets have been selected as the next flights in NASA's Discovery Programme of lower-cost, highly focused scientific spacecraft.

The *Genesis* mission is designed to collect samples of the charged particles in the solar wind and

return them to Earth for analysis. Due for launch in Jan 2001, it will return the samples to an airborne capture in the Utah desert in Aug 2003. Such data are crucial for improving theories about the origin of the Sun and planets, which formed from the same primordial cloud.

The *Comet Nucleus Tour* (CONTOUR) will study at least 3 comet nuclei and analyse the dust flowing from them. It is scheduled for launch in July 2002, with its first comet flyby to occur in Nov 2003. This flyby of Comet *Encke*, at a distance of about 100 km, will be followed by encounters with Comet Schwassmann-Wachmann-3 in Jun 2006 and Comet d'Arrest in Aug 2008.

CONTOUR and *Genesis* follow four previously selected NASA Discovery missions. The *Near Earth Asteroid Rendezvous* (NEAR) spacecraft was launched in Feb 1996 and returned sharp images of the asteroid *Mathilde* from a distant flyby in Jun 1997, on its way to orbit the asteroid *Eros* in early 1999.

The *Mars Pathfinder* lander, carrying a small robotic rover named *Sojourner*, landed successfully on the surface of Mars on Jul 4, 1997, and since has returned hundreds of images and thousands of measurements of the Martian environment.

The *Lunar Prospector* orbiter mission to map the Moon's composition and gravity field is scheduled for launch early 1998, and the *Stardust* mission is designed to gather dust from Comet Wild-2 in 2004 and return it to Earth, following a planned Feb 1999 launch.

CHALLENGING THE BIRTH OF OUR MOON

New research seems to cast some doubt on the origin of our Moon. Up until now it was firmly believed to have been born from a glancing impact of a body the size of Mars some 4 billion years ago. This impact then tore sufficient quantity of Earth's outer mantle material into space, which then cooled and reformed the spherical Moon we see today.

However, an American physicist has suggested a body of Mars' size would form a disc of impact debris that was too small to form the Moon we see today, with nearly half the volume falling back to Earth. Instead, it is suggested a body 2.5 to 3 times the size of Mars was the impactor. Upon collision, a disc of debris would have formed about the Earth and stretched out into space many Earth radii. Some of this debris would have fallen back to the Earth. Over time, moonlets would have formed inside the remainder of the disc and eventually merged to form our Moon over several tens of thousands of years. Calculations suggest the place of coalescing was at about 3.5 Earth radii. One thing, however, the calculations do not explain is why the Moon does not orbit a lot faster about the Earth than we actually observe. Maybe this theory is also incomplete.

NEW MOON DISCOVERED

German astronomers viewing a small asteroid called *3671 Dionysus* have discovered it to have a tiny companion. This asteroid actually occasionally crosses the Earth's orbit, and hence is a future impact candidate for Earth. The asteroid itself is only about 1 kilometre across. In July 1997, *Dionysus* missed the Earth by 17 million km. The close approach enabled astronomers at Mauna Kea Observatory to view the amount of light that reflects from the body over time, and they found it varied in a way that suggested a dark, unseen body was in orbit about the main asteroid, causing it to dim as it was periodically eclipsed. Moons about asteroids therefore appear to be quite commonplace, even though this one was not directly photographed.

STOP PRESS - GREENLAND BOLIDE FALLS !

At 8:21UT on 9th Dec, an enormous meteorite (or bolide) fell onto the southern part of the Greenland icecap (latitude 63N, longitude 45W) near the town of Qaqortoq. A 120 kilometre long cloud or plume was visible on images from a polar orbiting weather satellite and from the NOAA-14 satellite for 26 hours, and from the shadow cast onto the ice, its altitude was determined to be 6-8 km. The plume was seen to rise and drift East. In the infrared, the weather satellite images showed a brilliant white column. The phenomenon was witnessed by people on the West coast of Greenland, and by offshore fishermen, and was recorded by seismic instruments as a 10 second event, and by a carpark video security camera at Nuuk, capital of Greenland. The video showed an extremely bright flash of light from a moving source. From the cloud size, it is estimated the Qaqortoq meteorite had a mass of 4 million tonnes. A search is underway for debris on the ice.

FEATURE

COMET ENCKE

The NASA *CONTOUR* mission (explained earlier in this edition) will visit periodic comet *Encke* early next century (this is not far away now).

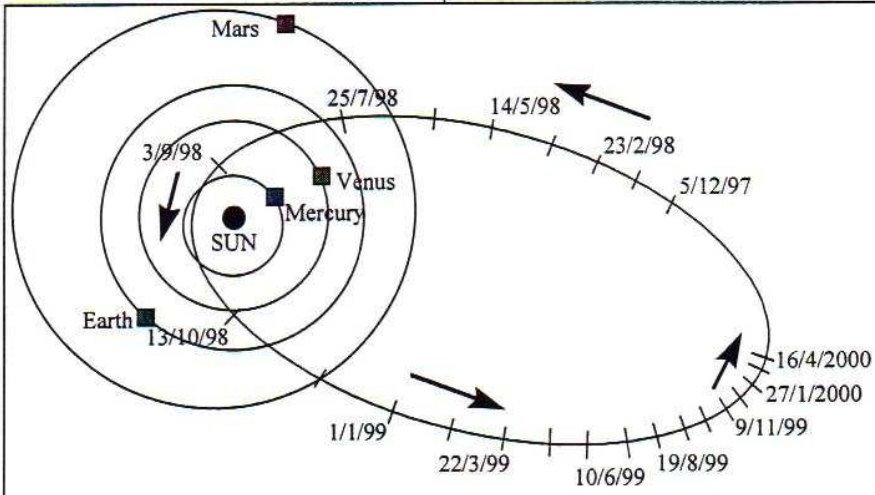
The comet is named after its German discoverer, Johann Franz Encke (1791-1865), who predicted that it was a short period comet that would return in 1822. The prediction was based on earlier comet sightings in 1818, 1805, 1795 and 1786, and Encke did the horrendous calculations by hand to show that only the one comet was involved, and that it swung around the Sun every 3.3 years, seemingly as a new comet in the skies each time round. This was only the second time in history that anyone had predicted the reappearance of a comet; the first being Halley's comet.

Subsequent passages around the Sun proved troublesome, with non-gravitational effects causing the comet's period to change with time. Many theories were suggested, and astronomers devoted large parts of their careers in trying to pin down the cause, before realising this century that the effects were due to gas escaping from the comet's nucleus and acting unpredictably like a tiny rocket engine attached to the comet itself. The favourite theory during the 19th century was that the comet was encountering friction in outer space, and this friction changed depending on where the comet was positioned relative to the Sun. The problem with this idea was that the comet should eventually lose energy and spiral into the Sun, which is not seen.

While the comet was first mathematically predicted by Encke, it was, however, first observed by the astronomer Jean Louis Pons in both 1805 and 1818, and in fact Encke himself always referred modestly to it as *Pons'* comet.

The positions of the inner planets of our Solar System, and the comet, are shown as on 4th May, 2000, taken as if you were positioned above the Solar System looking down from a distance of 50 AU's away. (1 AU, or Astronomical Unit, is the mean distance of the Earth from the Sun).
The diagram shows on the left, the Sun in the centre of the Solar System, being orbited by each planet out to Mars. These orbits are traced out by the near circular ellipses on the left. The orbit of Jupiter only just falls outside the scale of the diagram. All of the planets orbit anti-clockwise in the view here. Comet Encke also orbits anti-clockwise around the elongated ellipse on the right side of the diagram (following the arrows). The tick marks on its orbit start on 5th Dec 1997, then mark off about every 40 days as the comet moves into the inner Solar System, rounds the Sun towards the end of 1998, then swings back out to the asteroid belt in the year 2000. Therefore at the moment, comet Encke is moving in towards the Sun.

In this diagram, notice one of Kepler's astronomical laws in action; that a body in orbit sweeps out equal areas in equal times. By looking at the distance between adjacent tick marks, notice how this increases near the Sun, but the ticks all bunch together away from the Sun. As the comet approaches our Sun, it speeds up under the Sun's gravitational influence, and quickly whips around it. However, as it leaves the Sun's immediate domain, it slows down again as it competes with the gravitational pull. At all times as comet Encke is in its orbit, its tail will always point directly away from the Sun. Therefore on 3rd Sep 1998, when it is near the Sun, the comets tail will be pointing towards the top of the page in this diagram. In Dec 1997, on the other hand, the tail is practically pointing to the right on the page (if the comet is warmed enough to create a



Orbits of the inner planets of our Solar System, and that of comet Encke (on right).

viewable tail at this distance from the Sun). Comet Encke completes one orbit around the Sun in the shortest time of all known comets, 3.3 years, and usually provides a reliable view for backyard observers as it nears our celestial energy source.

Once a year, debris discarded from its tail, and littering the Solar System, intercepts the Earth, giving rise to the *Taurids* meteor shower, in Oct and Nov each year, with a peak number of meteors on 3rd November.

Peter Skilton

STARBOUND CHAIR

It's amazing you know. I've owned five telescopes over a ten year period and it has taken me until now to wake up to what I think is a very important aspect of successful observing (it makes you wonder!). You need to be able to comfortably hold your eye to the eyepiece, often for prolonged periods of time!

If you're like me, the stresses and strains of bending and stretching to keep a steady gaze into the eyepiece, depending on where the telescope is pointed, inevitably results in some degree of fatigue, especially when it's a cooooollld night! Believe me, an aching back, sore neck and weak knees can quickly dampen your resolve to observe! Maybe I'm just getting old, but I like to be comfortable and relaxed when I observe!

So how then does one solve this dilemma? The solution is a variable height seat that can be quickly adjusted. The seat must be variable in height so that you can comfortably look into the eyepiece wherever the telescope is pointed. In this way, you can be comfortably seated and maintain a steady gaze into the eyepiece for long periods with no problems at all. I find that because of this, I am actually observing more.

I guess this is not the sort of ground breaking discovery for which I could win the Nobel prize now, is it? Well now, apart from the creature comfort side of things, there is most definitely an observing advantage here too. Since I started using an adjustable seat, I am finding that I can see far more detail on Jupiter, purely because I can spend longer at the eyepiece without breaks. Subtle details such as festoons, white spots and other features can sometimes only be seen after a prolonged gaze, requiring time for the brain to integrate the image fully.

For the first time, I have clearly noticed the size differences of Jupiter's moons' disks. Io and Europa look roughly the same size, but both Callisto and especially Ganymede appear distinctly larger. I have also started watching satellite events on Jupiter. Such activities would be difficult if you could not observe comfortably for long periods.

My particular seat is a 'Starbound' viewing chair. These are advertised in Sky & Telescope, although I bought mine from York Optical. However, I have seen other designs and if you're handy with carpentry skills you may wish to make your own.

What I am saying here is nothing more than common sense, but it has taken me long enough to realise such a simple concept, and few observers I know of use a good observing seat. All I can say is that this has made an immeasurable difference to my observing, both in terms of comfort and more importantly, to the quality and breadth of observing I am now finding.

Russell Thompson

THE CROWDED SKY - THE SPIES

Most of us have seen the dramatic scene in the movie *Patriot Games* where we witness the film maker's rendition of live images from a US spy satellite. While the capabilities shown on the movie screen owe more to science fiction than to reality, the capabilities of the US and to a lesser extent, Russia, to "spy from the sky" are to say the least considerable.

How many are up there?

Despite the suspicions of conspiracy theorists the world over, a rocket launch is not an easy thing to hide. The size of the launcher and direction and time of launch can tell us much about the probable cargo on classified launches. The "Spy satellites" launched by Russia and the US fall into a few main categories:

Photorecon - Large heavy "blackbirds" in low Earth orbit, these satellites are easy to see and are tracked by an international network of amateur observers.

Radar Imaging - Also large and in low orbit.

Low ELINT - ELINT (ELectronic INTelligence) satellites search for radar signals

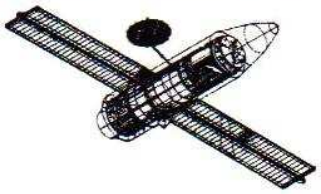
from ships, aircraft and ground transmitters.

High ELINT - These satellites, in Geosynchronous or highly elliptical orbits hunt down voice and data transmissions by radio, or sniff out signal leakage from telephone communication systems.

Early Warning - Equipped with heat sensors, they detect missile launches worldwide.

What can they see and hear?

From the size of the payload section on the US Titan 4 launcher, an upper limit of about 1.5 metres for the primary mirror size of a spysat can be deduced. This gives a maximum resolution of about 10cm. This is sufficient to pick out human figures (in favourable conditions), identify vehicles and get very good views of buildings. It is not sufficient to read newspapers or license plates! The resolution limit is the diffraction limit of the scope and cannot be avoided. So until the US beefs up the size of its launchers you need not fear sunbaking nude in your back yard (but they could tell that someone was sunbaking there!)



The Keyhole reconnaissance satellite KH-11 has a mass of 14,100 kg, is 13.4 metres long and 4 metres diameter. Shown enclosed in its Titan-4 rocket shroud, the recon sat can return near real-time images of the Earth using its 15 inch primary mirror.

The Lacrosse series satellites use synthetic aperture radar imaging (SAR) to gain pictures of the surface of the Earth in any weather. It is suspected that the resolution of the images obtained is in the order of 1-2 metres. This allows buildings and vehicles to be detected, if not identified. One advantage of SAR is that it penetrates cloud, snow, and even light foliage.

The ELINT satellites in Geosynchronous orbit can easily eavesdrop on radio and mobile phone communications. There is even speculation that phone conversations can be recorded via the Electromagnetic "leakage" from phone lines (a demanding task).

To give you an idea of the sort of coverage these recon satellites give, I have run an analysis of the satellite coverage of "known" spy satellites over Melbourne for Sunday 7th December 1997.

2:59 am The Russian Cosmos 2344 ELINT sat passes over, sampling the frequencies and characteristics of radar transmitters in the area.
3:30 am The US NOSS 2-3 triple satellite group passes over. Any radars in the area are triangulated and fixed in position.
5:08 am USA 81, suspected to be an ELINT sat, passes over.
10:43 am USA 129, the latest Photorecon sat passes down the East Coast of Australia, passing over Mildura and then Portland. Its sensors easily tilt to image Melbourne.
11:04 am The NOSS 2-3 trio makes another pass.
12:11 pm Cosmos 2344 returns.
12:17 pm USA 86, the oldest US Photorecon sat passes over Adelaide at 1000 km height. Again its sensors can easily train on Melbourne.
1:54 pm USA 116 , another photorecon sat may have passed over. The orbital data for this object is suspect.
4:09 pm The NOSS 2-1 trio triangulates radar emissions.
5:14 pm USA 81 again samples radar frequencies.
5:20 pm NOSS 2-2 trio passes over
5:32 pm Lacrosse 3, the most recent SAR radar sat, passes over Melbourne, and sees if your car is parked in your driveway, even under the trees.
7:59 pm The Russian Photorecon sat Cosmos 2335 gets a nice shadow contrast shot of Melbourne.
11:23 pm Lacrosse 2 passes over and sees if your car is back yet.
11:23 pm At the same time USA 32, an ELINT sat, takes a final look at Melbourne's radar emissions that day.

All in all, 14 passes over Melbourne by known spy satellites in one day! Of course, 24 hour coverage is also provided by the geosynchronous ELINT satellites flown by both the USA and Russia. The Photorecon satellites also have the capacity to image in the infrared, (they know if you left the heating on). The sky is indeed crowded with spies!

Acknowledgements:
Technical Data: Federation of American Scientists (http://www.fas.org).
Satellite Elements: Seesat network of observers.
Pass times generated by *Quicksat*, freeware by Mike McCants.

Ian Porter

FROM AROUND THE PLANET!

Leading Astronomical Societies exchange each other's newsletters to assist in sharing items of interest. This column grabs some of the highlights of recent receipts. You can find out more in the library.

Astron. Soc. South Australia (SA) - Details provided of a possible occultation of a star by the nucleus of comet Hale-Bopp. Article on astronomy at the South Pole. No longer producing their own yearbook, preferring instead *Astronomy 1998*. Review of the 5th edition of Frank Bateson's *The Observation of Variable Stars*. Series begins on the Sun-Earth environments with part 1 being *Events on the Sun*.

Astron. Soc. New South Wales (NSW) - Membership is currently 250, with 30 attending their twice monthly meetings. They are preparing for the South Pacific Star Party already. Galaxy sketches from the eyepiece are provided for Centaurus. Detailed notes on finding planetary nebulae in Triangulum Australe constellation, including one mysterious one that does not appear in most star atlases. Some easy double stars are given to check out, including naked eye ones. Revegetating the Wiruna site with 250 natives. An in-depth, illustrated article on the factors affecting dark adaptation of the human eye (recommended reading). More on the Pistol Star.

Latrobe Valley Astron. Soc. (Vic) - A former President has passed away. Membership is 37. Considerable vandalism was had to their observatory and toilet block, so they are planning to relocate to the new Wirilda site by end of 1998. A rundown is given of the new Canberra digital planetarium, funded by the Downers Club pokies' money.

Astron. Soc. South West (WA) - Much work has been underway on the facilities at their observatory. Overview of Cassini mission underway to Saturn. A flattering reprint of a couple of our earlier articles of interest, including the Crowded Sky.

Astron. Assoc. Queensland (QLD) - Their club house is having parts repainted. Members are being advised to monitor the variable star T PYX for an overdue outburst. Article on focusing your telescope precisely with a razor blade and PVC pipe. The 1997 Queensland 7 day Astrofest was successfully held at Camp Duckadang in Aug, with 62 attendees contending with icy conditions and smoke from annual burn-offs. Getting started in piggy back astro-photography. Results on the 1997 July 18 Triton occultation from around the world. All about CCD detectors and the star of Bethlehem. The Nov 29 Neptune occultation was not successful in Eastern Australia because of weather.

Astron. Soc. Victoria (Vic) - Interesting hint of putting heavy telescope drive batteries in a small esky, where a hole is drilled in the side with a suitable plug attached. Cables can also be stored in it. Members nights have restarted at the old Melbourne Observatory after a break of 2 years. Book review given of *Under an English Heaven: The Life of George Alcock.*

Astron. Soc. Tasmania (Tas) - Their immediate past President has passed away. A timely series of articles on how to observe and report aurorae. Some thoughts on the Cassini mission and its Plutonium controversy. Very favourable reviews given of the film *Contact* (which was viewed 4 times), and is based on Carl Sagan's novel, and the film *Event Horizon at Neptune* which is recommended for a single viewing.

West Cornwall Astron. Soc. (UK) - Their fund raising launch for the 200 seat Planetarium at Falmouth was featured in a recent edition of *Astronomy Now* magazine. The grand opening is planned for the solar eclipse of 11th Aug 1999, provided they can get sufficient corporate support in the meantime. An excellent effort for a Society that's only 11 years old, though private sponsorship will be a major challenge to them.

FINAL PRONOUNCEMENT - KT BOUNDARY IRIDIUM

The fossil record indicates that the dinosaurs became extinct some 65 million years ago, coinciding in time with a globally dispersed, thin layer of dark clay buried at this depth below the surface. The layer is called the KT boundary (pronounced *"kay-tee"*), and coincides with the interface between the Cretaceous and Tertiary periods in history (I do not know why it was not alternatively called the CT boundary - maybe another gap between geological periods holds this designation).

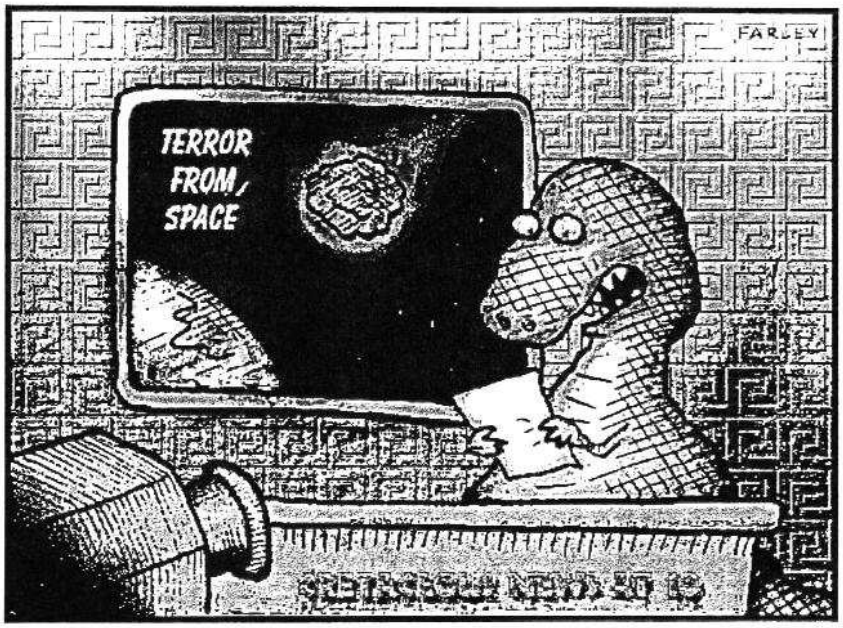
When analysed, this clay is found to be rich in the rare chemical element *Iridium*, pronounced *"Ear-rid-ee-um"*. It is rare on the Earth's surface today, but is common deep inside the Earth, in meteorites and in asteroid cores. The implication is that a large meteorite or asteroid collided with the ancient Earth, breaking the dominance of the dinosaurs and dispersing itself as *Iridium*-rich dust around the globe. The dust eventually settled to form the clay layer we see today.

But why is *Iridium* rare on the Earth's surface if the Earth itself was formed by the continual bombardment of *Iridium*-rich asteroids and meteorites over the aeons? The answer is due to the phenomenon of differentiation.

The small, fledgeling Earth was most likely quite an even spread of different materials throughout, with *Iridium* being evenly distributed. Once the Earth grew and reached a critical size (typically that of a large asteroid) the radioactive decay of rare elements, such as Uranium, in its rocks caused the surrounding rocks to heat up and eventually melt and flow.

Once this occurred, the heavier elements, including Iridium, Iron, Nickel and others, simply started to sink down in the liquid, moving towards the centre of the Earth (which of course is as low as they could possibly sink). This formed Earth's heavy metal core. The lighter materials, such as silicates and rock, then floated to the surface, in much the same way as curds and whey separate. Therefore *Iridium* is very rare on the surface today, but once upon a time in the distant past this would not have been so.

If you have any Astronomical query that has been niggling you, drop it in the question box at a General Meeting and let us look into it for you.



CRETACEOUS NEWS AT 10 - "Today's asteroid encounter was a near miss, but some scientists warn that an actual impact could have serious long-term effects on life on Earth as we know it."

Left - BBQ at the ASF Briars site on the 24th January 1998

Photo - *By John Cleverdon*

☐ If this box is ticked then membership needs renewing and this may be your last edition of the newsletter, so please contact the Treasurer in this case. Newer members who join late in a calendar year will have this time taken fairly into account when renewing in January, and should remind the Treasurer of this.

Australia has several satellites in orbit, providing communications to the nation. The first *Aussat* (owned by Optus), A1, was apparently launched very quickly into high geostationary orbit by the space shuttle on 28th Aug 1985 to broadcast Sydney TV signals around the continent, so as to prevent Kerry Packer establishing his own satellite empire first. A2 followed by shuttle in the same year, followed by A3 on an Ariane rocket 2 years later. A1 was retired to the junkyard in 1993, and only A3 is working today. More powerful replacements called B1 and B3 were launched in 1992 and 1994, and are currently in orbit. Why not B2? Is it something to do with *Bananas in Pyjamas*? No, B2 actually lasted 37 seconds before it blew up on launch in 1992. These B satellites are intended to provide high definition digital TV signals, and rapid internet services for quick file downloading. With deregulation in Australia, the *Iridium* series of low orbit satellites will provide competition to Optus, by providing for example phone conversations without the annoying long time delays, as they are in lower orbit, and hence signal trip times are reduced.