



SCORPIUS

The Journal of the
Astronomical Society of Frankston Inc.
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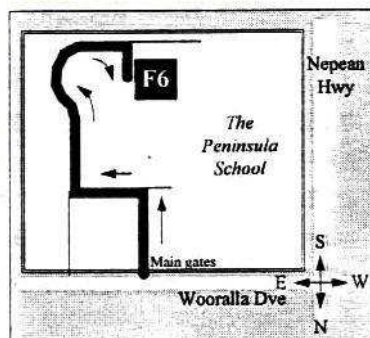
(May - Jun)

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/asf.htm>

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

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Committee
Ken Bryant, Roger Giller, Bob Heale,
Peter Lowe, Richard Pollard

All phone calls before 8:30pm please.

FUTURE EVENTS

General Meetings:

Wed 21st May '97

Session 1: Two videos explain all there is to know about Stars, Nebulae and Galaxies, and the Universe. A tall order by any standards.

Session 2: Various members will go *Back to Basics*, and explain brief Astronomical concepts for beginners, or for those who wish a refresher.

Wed 18th June '97

Session 1: What happened at the 6th VASTROC Convention we hosted?

Session 2: Bob Heale & David Girling will clean up *Messier Objects*.

Wed 16th July '97

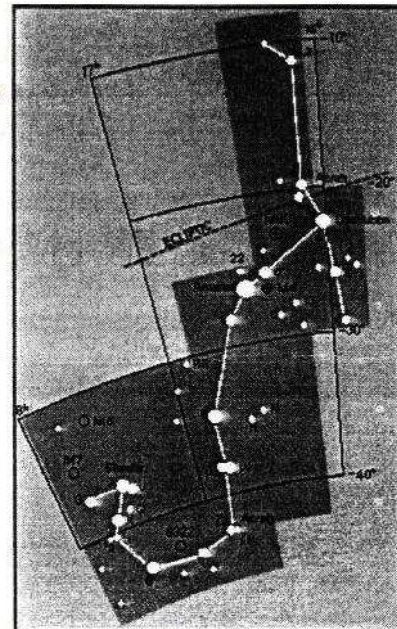
Session 1: Ian Porter will speak on *Spacestations*.

Session 2: A *Show and Tell* session of interesting Astronomical gadgets and equipment, and how they work.

Viewing Nights:

Members Only:

May 31 (May 10 cancelled), Jun 28, Jul 5 & 26, Aug 2 & 9 & 30, Sep 6 & 27, Oct 4 & 25, Nov 1 & 22 & 29, Dec 6 & 27 all at *The Briars*, Nepean Hwy, Mt. Martha (Melways 145/E12). For those unable to attend on Saturdays,



there will be a special Members' night on Wed Jun 4, running from 7-10pm.

If weather forecast for the Saturday looks bad, the Friday before may be used instead. New attendees must always confirm with David Girling on the phone number above 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.

The New Members' meetings held at the Peninsula school at 7pm on the Wednesday following each monthly meeting this year have been very successful. One recent gathering saw everyone outside monitoring the passage of the Mir spacestation overhead, while another saw Richard Pollard speaking ably about the planets. The final planned meeting will be held in May and will feature Telescopes. The 2nd session during the normal monthly meetings will take the place of this separate get-together.

Public, School & Community Groups Viewing/slide nights:

If you can assist, please contact the Secretary.

- St.Kilda Primary school will be visiting Camp Manyung at New Moon for a night on

Wed May 7 at 8pm. Melways 105/A6. About 60 expected and help required with telescopes.

- Comet Hale-Bopp public viewing night will be on Sat **May 10**, 5:00pm, at Seawinds National Park, Arthurs Seat, Dromana, Melways 159/D12. Help and scopes definitely required as it will be popular, being advertised beforehand.
- Toorak College Grade 5 girls on Fri May 16 at 8pm under a first quarter Moon. Melways 101/G10. About 60 Grade 5 pupils, parents and teachers anticipated. Help wanted.

Social Events:

- The dinner at the Dava, on Fri Apr 18 saw 15 in attendance and was enjoyed by all.
- The dedicated bunch at the Ballarat Astronomical Society are putting on a Workshop on *From Light Boxes to Quasars* on Sat May 10 at their Observatory from 9:30am-5pm, including talks, demos and a BYO meat lunch BBQ. Details arrived too late for our monthly meeting, though I have these if you're interested, or you may prefer to phone the BAS Secretary on (053) 432 2316.
- Come along and mark the Winter Solstice which occurs at 6pm on Sat Jun 21 at Bev and Roger Giller's house at 4 Spencer Court, Berwick, Melways 131/D1. The theme for the evening is Christmas, and the menu includes such traditional fare as mince pies and plum pudding. BYO drinks, though a limited supply of mulled wine is

included in the cost of \$12 per head. Partners are welcome. All names to be in and money paid to the Treasurer by May's meeting.

- The Victorian Art Gallery in St.Kilda Road is showing a special exhibit until May 11 of astrophotography by world-renowned David Malin from the Anglo-Australian Observatory. The exhibition is titled "*Night Skies - the Art of Deep Space*".

Phenomenal Events:

- The *Eta-Aquarids* All-Nighter planned for Sat May 3 saw meteors hidden by rain cloud.
- A Pluto planet hunt will occur with member's instruments at *The Briars* on Sat May 31 (May 10 cancelled). Never seen it before? Now is your golden chance.
- Comet Hale-Bopp is now visible in our twilight sky soon after sunset, low in a West North West direction near Aldebaran. First reports of members glimpsing it came in on April 23. Its coma is visible to the eye, or with binoculars, though its tail is fleeting due to the glare of twilight at the time of writing. It has given stunning tail displays for Northern observers as it passed its

www.skypub.com.

Unfortunately, it is now moving away from the Sun and hence will continue to dim. The brightness will also drop due to the low altitude above the horizon (it reaches its highest point on May 24 at 12 degrees above the horizon - about a handspan), and due to the contrast reducing effect of the Moon in the sky. It is in fact as intrinsically bright as comet Hyakutake that we saw in the sky last March, though Hale-Bopp is 10 times further away from the Earth and hence appears much fainter than Hyakutake. Remember that a comet's tail always points away from the direction of the Sun. If you don't see it, sketch it or photograph it this time in Taurus, try again in 3,500 years time when it returns.

- The planet Mars is certainly visible to the eye as a bright, red object in the early evening at the moment. Mars, named after the Roman god of war, has two small moons, suitably called Deimos (meaning dread) and Phobos (meaning fear). Both are too small to see in most telescopes.
- Predictions for seeing the Russian space station *Mir* are available at meetings.

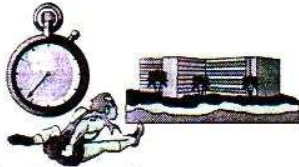
VASTROC 97:

The 6th *Victorian Astronomy Conference* on Sat/Sun Jun 7 & 8 at Norwood House Mt.Eliza is filling up fast, with many payments having been received. All who are interested in Astronomy are invited. The general theme is *Adventures in Visual Astronomy*. The cost is \$60 to cover the venue and catering of morning & afternoon



closest approach to the Sun on April 1, reaching around magnitude -1 in brightness and showing a 25 degree long gas tail and a 15 degree dust tail. Those with Internet connection should check out the URL sites at www.cometwatch.com and

tea, two lunches and a dinner. A dinner-only cost of \$18 is available for partners who only wish to attend in the evening. Members are reminded to book in and pay fast as spots are reserved on a first paid-first served basis, and seating is limited.



These fairly informal get-togethers are held every 2nd year in Victoria, and provide an opportunity for amateur Astronomers to experience talks, discussions, workshops, maybe some observing and making or renewing of long distance friendships. All payments to the Secretary, 4 Vellvue Court, Tootgarook, 3941.

While world-renowned Dr. Andrew Prentice was unable to attend, due to commitments overseas, Ken Bryant is coordinating an interest packed two days. Suggestions for speakers etc. are welcome, so call Ken on (03) 9789 1590.

YOUR SOCIETY

NEW MEMBERS

Welcome to the following new Society members:

Julie Foster (newsletter only)
Keith Gledhill
Tony Murphy (newsletter only)
Marlene Read
Russell Thompson
Ron Vassel

The ASF is the 2nd largest Society in Victoria, and one of the largest in Australasia. Membership is 106, with a few yet to renew. Please feel free to say hello at general meetings. Specialised badges, windcheaters,

T-shirts, planispheres, 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 find out "what is what" in the night sky.

HELP NEEDED

In the 7 years I have been in the ASF, I have seen it grow from being a nearly all-male concern, with attitudes that can unfortunately accompany this, to a more modern Society boasting over a third of women in its membership, with many being as active and enthusiastic in their interest of Astronomy as any I've encountered. It is very heartening to see this trend, and its change in maturity of the Society, which I'm confident will continue. I seek the assistance of one or more lady members of any age who can introduce themselves to new faces at meetings so as to make them feel welcome. Please don't feel shy, an in-depth knowledge is not needed, just a friendly and understanding character.

If you are unable to make it to meetings due to transport problems, let our Secretary know as we might be able to arrange a lift with another member.

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. Hand written material is fine, though computer text files are perfect.

SECRETARY'S JOTTINGS

Believe it or not, the Society now has a hefty 25 inch f/5 mirror, with 5 people being needed to lift it. Plans for it are underway. The Education Centre planned to neighbour us at *The Briars*, looks almost certain to get financial backing. Our lighting restrictions in the lease should ensure they do not interfere with our activities. Society T-shirts have sold out entirely, and another batch will await Spring time. Post holes have been dug at *The Briars* to take binocular H-frame rests in the near future. The Society has been fortunate enough to receive part of a photovisual gear grant it applied for last year.

Don Leggett

RECENT MEETINGS

March's meeting was chaired by the Vice-President, and saw about 50 in attendance. After the usual format and *Sky for the Month* by Bob Heale, the group broke for coffee, then reconvened to either hear Peter Lowe speak on the history of our understanding of *Gravity* and roll ball bearings down inclined planes, as did Galileo centuries beforehand, or hear Bob's session next door on the composition of celestial objects. Closed at 10:30pm.

April's meeting was chaired by the Vice-President and saw 50 in attendance. Tony Hales even had his 30cm Dobsonian telescope in the car park before the meeting, for those who were keen to view Mars. Bob Heale gave his traditional *Sky for the Month* and showed images of comet Hale-Bopp gleaned recently from the Internet. The usual format was raced through, with the single

post-coffee session being given by guest speaker Peter Nelson from the *Latrobe Valley Astronomical Society*, who captivated the crowd with Variable Star Observing and how to go about it. The meeting closed at 10:30pm.

LIBRARY MATTERS

Help! Some folk are still not taking seriously the one month borrowing time for Astronomy books/magazines, which makes it unfair to others who may be waiting their turn in line. It's very easy to have them re-issued if no-one else is waiting for them. Just tell me you wish an extension at a meeting, or simply phone me or any of the committee if you cannot make it to the meeting. To date there are 28 missing books and other sundries, so I need the cooperation of all borrowers. Please check at home to see if you have any Society materials today.

The library has a magnificently colour illustrated new arrival from the book section.

The Illustrated Brief History of Time - by Stephen Hawking. A brilliant international best seller book which tells the layman what the present generation of scientists believe the nature and origin of the Universe to be, including the Big Bang, Black Holes, Worm Holes, antimatter and subatomic particles & more.

Kathy Stabb

RECENT VIEWING NIGHTS

About 70 Langwarrin Park Primary grade 6 pupils were entertained on Mar 17, with all being warned that the telescopes would be hastily

redirected to view a Priority 1 minor planet event during the evening. As it happened, clouds saw the end of that plan, but nevertheless the educational side was a complete success.

Franks-ton Primary school was visited by our Secretary on Mar 20, who gave them a cracker afternoon's slide show.

We once again visited a cold Camp Manyung on Apr 2 when 70 from Mansfield Primary attended. Telescopes were in very short supply when the clouds dutifully parted, revealing the heavens above.

The heralded visit to Ballaarat Observatory went ahead as planned on Mar 8, and was well attended, with the weather being kind. This weekend also coincided with the Grand Prix and the Begonia Festival. Members were warmly received with the kind BBQ hospitality of our Ballaarat friends, and thoroughly enjoyed the visit. The evening saw viewing through the telescopes available, including a 5 inch domed refractor, an 8 inch, a 26 inch reflector accessed via a tall tower, and a 14 inch Celestron. A book on the origin of life was presented in thanks to the BAS President, John Hastie, and member Bill Fiddian for a most successful day and evening.

PRIZES ON OFFER

The 1997 science and technology competitions are here once again for students at all levels to Year 12, and are held at a national or state level. If you recall, one of our members, Simon Hamm, won the national section to attend the

International Space School in a past year, and enjoyed the experience thoroughly. For more details see the President at a monthly meeting soon.

JUST FOR STARTERS

GLOBAL NAVIGATION

In these days of satellites, locating your position on the surface of the Earth accurately can be readily achieved by using the *Global Positioning System*. Here, a veritable constellation of USA military satellites broadcast continuous signals that can be picked up by a small receiver in their line-of-sight. The receivers can be relatively cheap, for example a hand-held unit is available from Dick Smiths for about \$500. Once 3 or more signals are received, they can be translated into your latitude, longitude and height above sea level to an accuracy of about 100 metres in commercial units.

This advanced system, which itself is soon to be superseded, was not always around though, and on 1982 Oct 22, Victoria opened the Omega Navigation station at Sale, on the South Gippsland Highway (Latitude 38d 28m 45.6s, Longitude 146d 55m 42.0s). This base, a prime nuclear target and the last to be built, can be visited by the public, and is one of 8 around the world. The other stations are in Japan, Hawaii, North Dakota, Argentina, Liberia, Norway and the island of La Reunion.

The Victorian station is characterised by a staggeringly high 427 metre antenna tower. Compare this with the meagre 304 metres high for Sydney's

Centrepont tower. The Sale tower has 16 wire antennae reaching from the top of the tower down to the ground, arranged like the spokes of a bicycle wheel. These antennae are fed by an atomic caesium clock that broadcasts with a power of 150,000 watts, and with a unique signature frequency that identifies the signal as being from the Sale station (13.0 kHz for Australia).

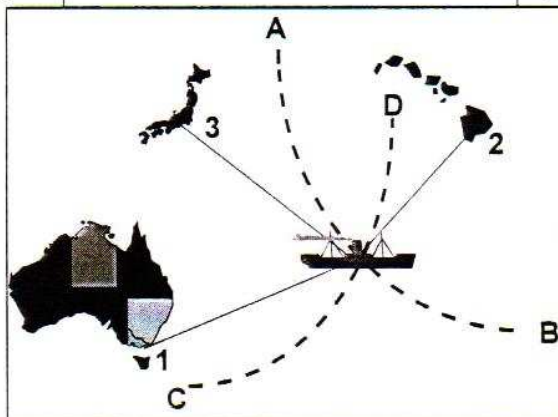
Vessels at sea, or aircraft in transit, can lock onto the signals broadcast from the transmitting stations (Victoria is well placed to cover the Pacific and Southern Oceans). The timing of the transmissions is controlled very precisely. The onboard receiver then compares the signals from two stations and is able to determine how much further it is from one station than from the other, based on the signal time delays observed. This gives a curved line along which the ship/aircraft is situated. In the diagram, signals from 1 (Sale) are compared with 2 (Hawaii), to determine the ship is somewhere on the curved dotted line A-B.

The receiver then determines a 2nd curved line by using another pair of transmitters. In the diagram, signals from 1 (Sale) and 3 (Japan) are compared to find the second curved dotted line C-D. Where the two curved lines cross over, gives the receiver's position on the globe. Therefore 3 stations at least are needed to triangulate the ship's location, typically to an accuracy of 4 kilometres - pretty rough compared with satellite methods these days, but nevertheless sufficient for most global navigation needs.

IN THE NEWS

WHEN IS EASTER?

The journal Nature reported in its Easter edition that the World Council of Churches meeting held in Syria this year proposed asking Astronomers to help set a common date for Easter. Ever since a similar meeting in the year 325AD, Easter has been celebrated on the Sunday following the first full moon after the March equinox. However, apparently different churches differ slightly in interpretation, resulting in different times for Easter. It is now proposed that from 2001AD that Easter be calculated by "precise modern Astronomical determinations", based on a meridian through Jerusalem. I notice that this weekly edition of Nature included the 1st of April.



PARKES SWEEPS SKIES

A \$3 million upgrade of the 64 metre Parkes radio telescope was finished recently when a multibeam device was hoisted to the focal point of the parabolic dish. The device is able to view 13 separate radio sources in the sky at once over a wide angle and will also greatly improve the sensitivity of the telescope to receiving weak

signals. It is claimed that the new receiver is also 1000 times faster than anything planned anywhere in the world for the next 5 years, and will enable the facility to compile a survey of distant galaxies in a few years, compared to decades with the previous setup. In the first couple of days, 3 new galaxies were discovered, one even hidden behind the dust and gas of the equator of our Milky Way.

MESSAGE IN A BOTTLE

In 1974, the Astronomers Frank Drake and Carl Sagan beamed a powerful radio message into space, aimed at the distant globular star cluster M13 in the constellation of Hercules. The signal from the Arecibo radio telescope will take 25,000 years to reach its destination, and contained a simple sequence of pulses and pauses (much like

the dots and dashes of Morse code). These pulses and pauses form a picture when received and suitably arranged. The picture was intended to convey to any extraterrestrials that might decipher it, what the building blocks of life on Earth are, the structure of DNA, and other facts about where we are in the Solar System. In

memory of the late Carl Sagan, this message has been turned into art at the Massachusetts Institute of Technology. An array of 18 horizontal racks contains 1,679 glass bottles (some empty and some containing water - sorry no wine) has been set up in such a way as to duplicate the exact message that was originally sent all those years ago. It remains to be seen if any intelligence can decipher it at MIT.

WATER ON EUROPA

The Galileo spacecraft in orbit around Jupiter has taken detailed images of the surface of Jupiter's second moon, Europa. These suggest a thin ice crust on top of an ocean of liquid water beneath. Earlier work has shown oxygen gas (possibly from the breakdown of water by sunlight) in the atmosphere. A follow up mission is envisaged to send a lander and even a driller which might be tested in Antarctica where a subterranean ocean exists deep below some areas of our ice. Galileo has also detected organic nitriles on the 3rd and 4th moons of Jupiter, Ganymede and Callisto. These compounds are essential for creating life as we know it. The spacecraft has yet to examine Europa for these molecules.

MORE ON COMETS

In 1994, the 21 fragments of Comet Shoemaker-Levy 9 slammed into Jupiter, leaving behind huge dark impact zones easily visible from the Earth. It was thought at the time that this was the first such impact ever witnessed. A Japanese amateur decided to comb the archives to verify this. It seems that 1690 Dec 5 was in fact the first time. Drawings and a description of impacts were made by Giovanni Cassini, the royal Astronomer to king Louis XIV. These showed several large spots over 18 days, probably caused by cometary impact. since they changed in shape over time in the same way as occurred for the 1994 impacts.

BURNT OUTSKI

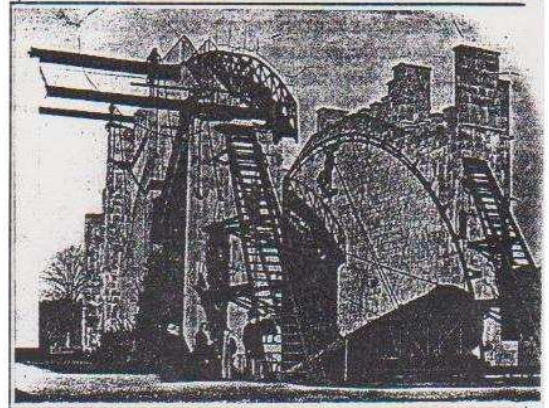
All oxygen generators aboard the Russian space

station, Mir, failed recently. This has meant the cosmonauts on board have had to chemically generate breathable oxygen by burning special emergency lithium perchlorate candles. Normally, all waste water is electrically broken down to form oxygen which is then breathed, however, due to pump failure and filter clogging, the units that perform this task had to be switched off. The backup candles can be very dangerous in zero gravity as flames are very hard to see in these conditions, and form a sphere of burning, rather than the familiar flickering flame shape we experience on Earth. Already, one fire incident caused the air in the space station to become contaminated, and all cosmonauts had to don filtration masks for two days. There are enough candles to last for 2 months, which should give time to send replacement generators on a supply mission.

A LEVIATHAN RISES

The world's largest telescope in 1845 is being rebuilt in a 17th century Irish castle, and is due for completion this year. The 72 inch diameter f/9 *Leviathan* telescope, which is 54 feet high, was built by William Parsons, the 3rd Earl of Rosse, over a period of 20 years at the princely sum of £30,000. Weighing in at 150 tonnes, it needed 4 men to operate it. The Earl actually ground the 4 tonne mirror himself, with servants building the rest. It was dismantled in 1908 by his grandson. but now the current Earl has decided to rebuild the instrument. commissioning a modern mirror. The telescope is credited with first observing

spiral shaped objects in the sky, later to be identified as galaxies. The Earl of Rosse is also noted for naming the Crab nebula in 1848 due to its peculiar shape.



FEATURE

OF WHAT IS THAT OBJECT MADE?

When we think about something in Astronomy, the science that usually comes to mind is physics. This includes the force of gravity holding galaxies together over 1000's of light years, the effects of nuclear fusion and fission in the life of stars, and radiation keeping everything in balance. These are all physical processes that naturally come to our attention. But chemistry is also vital to the Universe we live in. Chemistry takes atoms and joins them into molecules. Only the latter can radiate at sufficiently long wavelengths to cool down the gas of the early Universe, enough to condense into galaxies and stars in the first place. And, once these stars have built up appreciable quantities of the heavier elements and blasted them back out into the space of the interstellar medium, chemistry takes over again to determine how the enriched gas clouds will evolve. Without chemistry in the cosmos, there are no stars, no planets and no one to write this article.

Moving into the Sagittarius spiral arm, somewhere within the galactic plane of our Milky Way galaxy, we move around amongst familiar objects (the clusters M22, M24 and the star Antares) in a near black void. Some greyish clouds uniformly permeate our surroundings, but it's basically black. It doesn't matter which way we turn, they're everywhere: gas, dust, little

clouds, big clouds, the stars around us are duller, many submerged within these clouds. But at the same time no dramatic changes are occurring. It's as if all is in a state of flux, and the energy being absorbed or radiated is so strong!

If they could have seen this from Earth, their night sky would have been a jumbled mess (more than twice the stars and so much gas and dust - and they complained about light pollution). Anyway, when their solar system passed through a dense medium dust cloud, all life died from the ensuing very long lasting ice age. The Interstellar Medium (ISM) is suspected to have formed shortly after the Big Bang and is much as it is today.

There seems to be two kinds of diffuse clouds. Scanners have picked up Interstellar Cirrus. It's dragging in carbon, hydrogen and cosmic rays from neighbouring stars. We see optically the other diffuse cloud, but it has too much carbon monoxide, so it's going to snuff it soon. Neither cloud is letting ultraviolet light in - wonder why? Wow, its warm, -220°C , lots of single hydrogen atoms though helium atoms are sparse. Brrrr - colder, -270°C , single hydrogen atoms everywhere, helium here and there, must be now well in an Atomic cloud.

Time to move on into another lot of dust clouds. These seem a little larger, and our sensors indicate ions interacting with molecules very, very slowly to form new ones as the low mass stars within are emitting very little ultraviolet light. Cleaning organisations would have a field day here - so much ammonia, formic acid and other simple organics and radicals.

Over to the outer envelope of that low mass star for a survey. Before we do, fascinating to see the star's core so far inwards (like comparing the Earth's diameter to an average human height). Hmmm - quite a bit of carbon, a little silicon, stacks of nitrogen and traces of iron, magnesium and oxygen. Atoms everywhere, pressure is so low and very, very warm at -227°C , ideal conditions for forming molecules and dust grains - yes, dust grains.

Equilibrium table top chemistry is going on here. Time to check out the chemistry. Found some elongated particles, some are carbon in the form of graphite or soot, some are iron or magnesium silicates - the dust grains! There are traces of the above organics and radicals attached to the grains. The grain provides a surface for simple atoms and molecules to react by one of the carbon, silicon, iron or magnesium acting as catalyst, just as on Earth. Silicon is probably the best for providing a matrix for building solid grains to which atoms and molecules can stick.

Back to the clouds now, and we know what the dust grains do. We have chosen and gone into a dense molecular cloud and are seeing fairly uniform clumping of gas and dust. Gravitational forces must be acting, and the clumps are a marginally warm -240°C . Ions and molecules are interacting on the dust grains, some ultraviolet light is present, emanating from the 'warmer' luminaries, but



interestingly no ultraviolet is getting in. I wonder if the dense dust grains are doing this. These are the possible 'cores' from which stars are born.

We're out of this cloud! Now we need to find a molecular cloud that has obvious cores. Pressure and temperature sensors hint that a pretty warm (-100°C) giant molecular cloud is 2 light years away so we move to it. Suddenly we are severely knocked around; the pressure is phenomenal. Perhaps a massive star has formed recently and hopefully it is in the cloud we are moving towards. We're in it. The cores (condensations of clumps of gas and dust) are huge and even warmer (-70°C). Our sensors pick up

about 80 molecular species in the cores overall, ranging from carbon monoxide, silicon monoxide, potassium chloride through to formaldehyde, protonated water, cyanamide, ethanol and silane. Amazing, how does it happen? The competing processes are ion-molecule chemistry and grain surface reactions, both assisted by ultraviolet photons (from the hot cores) and cosmic rays (very high speed atomic nuclei), the latter suggesting that a supernova may be nearby. Ion-molecule chemistry relies on ultraviolet energy from mainly low mass stars forming, and the warm cores themselves (e.g. the dark Taurus Molecular Cloud and several others near Rho Ophiuchi).

Still in the giant cloud; this chemistry involves ions - atoms or molecules with electrons missing that interact with other molecules to form new ones, but how do the ions form? - cosmic rays! Cosmic rays are energetic enough to pass right through any interstellar cloud, leaving ionised atoms and molecules in their wake, and in turn, the free energy left allows ion-molecule chemistry to produce about 100 new molecules, some of great complexity. Pressure sensor is moving off scale again - we know what that means - we brace ourselves for another shock wave.

We don't believe it -so huge, seems similar in size to red supergiant Antares. We're seeing a massive star, still with a faint envelope around it, the latter perhaps being the old core. Chemical sensors detect moderate amounts of oxygen, a little iron and a fair amount of carbon and nitrogen. Our optical zoom lens detects dust grains, all in the cooling, outer envelope. Energy sensors indicate ultraviolet photons from distant stars are easily penetrating the circumstellar envelope and breaking up molecules stuck to grains - that explains the slightly heavier elements. But, the distribution of the materials making up this scenario seems greater in the outer layers, as if under pressure to eventually be swept out! Time to move on and find the supernova that must be in this giant cloud.

There is something 11 years away, better zip over. It seems a fairly early stage supernova. Better stay about 2 light years from it, so we and our equipment are not knocked about too much by the shock waves coming out, with a fair amount of material. Intense cosmic rays emanating everywhere. It probably explains why there are so many smallish stars seen faintly in distant dust clouds; the cosmic rays can penetrate all regions of interstellar space, providing large amounts of free energy for distant further chemical processing. In the same vein, the shock waves can trigger more star formation. Sensors indicate a lot of heavier elements being ejected into space: oxygen, iron, carbon, nitrogen, silicon, magnesium, to name just a few! One could say for a supernova that there is more going on outside than inside.

We leave the giant molecular cloud and pick up another smallish, lowish temperature, dense molecular cloud that is at a fairly advanced stage. We can see a substantially broken up molecular cloud with a small to medium white-yellow star and a lot of cooler type materials just inside the thin veil of the cloud. Warmer examples of the same are just visible in the star's outer envelope. Our sensors suggest the changes occurring are very slow. We wonder what would happen if rogue comets crashed into one or more of the cooled materials. The chemistry of life is clearly related to the chemistry of space - there are just a few missing links. And the organic mix required to make living things is common in the frozen depths between the stars. When a comet approaches our Sun, Astronomers eagerly search for the spectral signatures of its molecules. Comets are thought to be pristine samples of the debris left over from the formation of a solar system - and they may be the carrier between interstellar and prebiotic chemistries. One day, the list of molecules found in comets may be the same as the list of interstellar molecules. If it isn't, it's back to the drawing board.

Bob Heale

ANNIVERSARIES

It is now 200 years ago that Heinrich Wilhelm Matthius Olber worked out how to

calculate the orbit of a comet from observations. It is 250 years since the Astronomer Royal of England, James Bradley, showed that the Earth nods like a spinning top, and Leonhard Euler worked out how to remove chromatic aberration from refracting telescopes. It is 350 years since the wealthy Danzig brewer, Johann Hevelius, published his *Selenographia* which first mapped the Moon's surface and introduced the familiar terms of "mountains" and "mare" for lunar features.

RED LED FLASHLIGHTS

Red Light Emitting Diode (LED) flashlights are very handy when viewing under the stars. An article in *Astronomy* a few years back led me to experimenting and making quite a number of them. They are easiest to make where the torches are small and have screw bulbs, instead of the non-screw larger bulbs (they require removing lots of cement from the bulb casing - a tedious chore).

A typical normal flashlight costs \$1.50 at Dick Smiths, and the resistor costs 10 cents. You then have to decide the brightness level that you want, which determines the LED type. The dimmest light comes from the Jumbo Red LED costing \$1 at Tandy. This LED is handiest when you're looking for very faint galaxies. The next brightest LED is my favourite, the 500mcd Type ER300, costing \$4 at Tandy. The next brightest LED is the 1000mcd LED costing \$2 at Dick Smiths. This is a good all round flashlight. The Super Bright



2000mcd was that originally recommended in the *Astronomy* magazine article. It costs \$4 at Tandy, and is far too bright for my liking, but handy for finding things in the car. The Jumbo 5000mcd LED costs \$7.95 at Tandy. It's good for finding something lost on the ground, but not much else.

Here are the instructions for building an LED flashlight:

Flashlight and Bulb

1. Obtain a small flashlight powered by two AA batteries.
2. Unscrew bulb, place in a plastic bag, and crush bulb with a pair of pliers.
3. Carefully remove loose bits of glass.
4. Using two pairs of pliers, hold bulb casing with one pair, and the filament with the other pair, apply the soldered end at the base to a hot soldering iron.
5. As the solder melts, pull the filament out with the pliers.

LED Assembly

6. Cut one end of a 68 ohm resistor to a length of 10mm, and cut the long wire of the LED to 10mm.
7. With a thin pair of pliers, bend both 10mm leads into U shapes, interconnect them and press them together.
8. Apply solder to the join between resistor and LED.
9. Bend the other LED wire to the side, and cut it down to around 7mm.

Case Assembly

10. Press the long end of the resistor down into the bulb case, while applying heat from the soldering iron to the solder at the base (it may help if you hold the case with a pair of pliers).
11. Press until the resistor's wire slides through the solder, and the resistor hits the base.
12. Cut the excess wire sticking out from the solder in the base.
13. Solder the 7mm wire to the side of the case.
14. Screw the bulb case back into the flashlight, assemble the flashlight, and the job is complete - almost.

If you find that the LED delivers too

bright a spot in the centre of where you are aiming it, you will have to remove it, and gently rub the top of it against fine sandpaper. This diffuses the light somewhat. Check the soldering and reassemble.

As I am fairly proficient at this manufacturing activity, I will happily manufacture some of these LED torches at cost. However, I guarantee nothing other than I will resolder any of my sloppy soldering. If you should decide to buy some of the fancier torches from the USA, don't call them "torches". To the Americans, these are things with flames coming out of them.

Renato Alessio

TIPS – THE TETHER IMPROVED SURVIVABILITY SATELLITE

[This is the first in a series of articles on the strange and interesting objects sailing over us in Earth orbit]
Given that one of our members has had the luck of recently seeing this object by accident in the eyepiece, I thought I would start with some background on this interesting experimental object. [ed - I mistakenly referred to this as the satellite TISS in a past issue]

For some time now, satellite designers have been searching for more effective ways of providing power to Earth satellites. One concept that holds considerable promise is the generation of power using a conductive tether. The tether moves through the Earth's magnetic field at high speed as the satellite orbits, and generates a current in the tether that can be tapped as a power source.

Several orbital experiments, including one on the space shuttle, have tested this idea. However, all the experiments lead to the tether breaking after a short time, due to electrical

sparks or collisions with orbital debris. TiPS is designed to be a long lasting tether experiment, allowing engineers to test the dynamics of a space tether over a long period of time. TiPS uses a 4km long, non-conductive tether attached to two heavy masses. The masses are covered in laser reflectors, enabling precise measurements of the tether's position and dynamics to be made. The masses are called "Ralph" and "Norton" after the main characters in the classic American sitcom, "The Honeymooners"! Ralph and Norton were paid for, and launched, by the U.S Navy. The tether system was deployed in May 1996, piggybacking on a U.S Navy spysat launch. TiPS was, in fact, the first object launched on a U.S spysat mission to be publicly acknowledged, and for which orbital information was made available.

TiPS is a weird and ghostly sight in binoculars, but is not easy to find. It seems likely that TiPS will only be the first in a series of space tethers, with a 25 km tether due for launch later this year. Therefore don't be surprised if one drifts across your eyepiece!

Ian Porter

FROM AROUND THE PLANET!

Astronomical Societies as a rule 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. Alice Springs (NT) - They have an Internet page now. Articles on electromagnetic waves, Hubble images of Mars, comet Hale-Bopp and the lunar prospector mission.

Sutherland Astron. Soc. (NSW) - A thorough evaluation of all aspects of equatorial telescope mounts is given, and would be valuable for those about to embark on a major purchase, but wish some advise on mounts.

Astron. Soc. New South Wales (NSW) - Includes Treasures of the Small Magellanic Cloud, naked eye galaxies, the enigma of runaway stars, and the effects of smoking on your eyes' dark adaptation while observing.

Astron. Soc. Vic. (Vic) - Demonstrations at the Planetarium have ceased due to the pending closure of the state's museum. They intend to build a 27 inch scope at Heathcote (eyepiece 13 ft above the ground), and are asking their members to donate. A guide to Star Atlases is given.

Latrobe Valley Astron. Soc. (Vic) - Keeping busy with demonstrations at schools & considering an Internet page.

Ballaarat Astron. Soc. (Vic) - Includes tributes to the late Ian Thompson., and contact with an Astro Society in Ballarat in USA which was formed in the same year as the BAS.

FINAL PRONOUNCEMENT - VIGNETTING

In common use, a vignette is a photo or drawing with edges that are gradually shaded off. In Astronomical terms, it refers to a loss of some image in an instrument such as a telescope. This is pronounced "Vin-yet-ing", from the old French meaning "young vine". The usual cause is simply obstruction of the light by parts of the instrument. For example, if you were to look through a keyhole, the world you see on the other side of the door would be obstructed due to the shape and size of the hole, and the image your eye sees is vignetted. If the door were opened, you'd see the unblocked view instead. A typical telescopic instance of vignetting occurs when an eyepiece, or indeed an attached camera, does not match the telescope focal ratio optimally, causing some of the image to be lost.

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.



Solstice Party Hosted by Roger & Bev Gillard on 21st June 1997



The exploration of the outer Solar System has been made easier by using the so-called Gravity Assist "sling shot" effect, where a spacecraft passes closely around a planet and speeds up by robbing energy from the planet by using the gravitational pull. The Galileo spacecraft, currently operating around Jupiter, used close fly-bys of Venus and the Earth to throw it on its way to its target, Jupiter. In the process, Venus and Earth slowed down in their orbits. In a billion years time, the Earth will be about the breadth of this page behind where it would have been if Galileo had not interfered.