



SCORPIO

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Meeting Venue:

The Peninsula School
Wooralla Drive, Mt Eliza
(Melways Map 105, F5)

Room F6 at 8.00pm on the third
Wednesday of each month

Visitors always welcome

Annual Membership Fees

Full Members	\$20
Concession Members	\$15
Family Members	\$30
Family Pensioners	\$25

Membership fees due 1st January
each year.

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COMMITTEE NEWS

The drawings for The Briars Observatory have been completed as have the structural calculations. We have been fortunate in that the original structural calculations were quoted at \$2,300 however thanks to Peter Norman we found an engineer who offered to do the whole project for \$200. Committee member Ken Stratton has been putting in enormous hours to get the details of the observatory structure ironed out with the design engineer. These have been submitted for council approval and we are now in their hands concerning the council plans for The Briars. I would like to thank Ken for the time and effort he has applied to the project. There has been some argument within the committee about how best to spend our monies and at this stage it is agreed to concentrate on the observatory.

The social program is going well with another successful society dinner at the Dava Hotel. The Ballam Park Public Viewing Night with an open air slide show was a real crowd draw and I would like to thank Peter Skilton for presenting the slide show at short notice.

The future activities are a bit vague at present as we have been concentrating all our efforts onto the observatory but this will be sorted out at the next committee meeting.

FUTURE EVENTS

GENERAL MEETINGS

19 July 1995

Topic: Show & Tell Night
See David Girling

Presidents Note.

They say a week's a long time in politics; well that applies in industry too. Last month I announced I would be leaving the Society to work in UK on a one year assignment. Well it's all off: at least until later in the year. Oh well, as we say on Earth: Ce la vie.

It would have been a bit disappointing to leave the ASF at this time because we are going through an exciting period. During the past few years we have been following a plan agreed by the members to set the society on a firmer footing. Central to this was developing the social basis for the society and building our own observatory. We are approaching the time when our observatory at The Briars can be started.

I look forward to the completion of this project later in the year. What should be the next phase in our society's development? I would be interested in your ideas say over coffee at one of the general meetings.

Peter Lowe.
President

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. In addition the Society provides the services of its members for educational presentations or observing nights for schools and local community groups.

ASTRONOMY IN CANBERRA

By John Cleverdon

During the New Year we spent 1-2 weeks in Canberra. On the way down, we spent four nights at the Point Hicks lighthouse over Christmas. While there, I enjoyed extremely clear and dark skies - in fact the darkest I've seen. The views through my 20x70 binoculars were stunning. At one point, I was doing some observing from the lighthouse balcony, 30 metres above ground, in darkness, and with a strong wind blowing.

My first stop when we got to Canberra was the Canberra Observatory, a professional observatory run in conjunction with the Canberra Astronomical Society. The observatory is extremely well set up, and contains four telescopes, all digitally controlled. These are: (1) A 40 cm IK6 Newtonian-Cassegrain; (2) A 35 cm Celestron C14 Schmidt-Cassegrain; (3) An 18 cm AstroPhysics Starfire refractor; and (4) A 15 cm AstroPhysics refractor.

The walkways between the domes contain posters and photos related to astronomy. When I visited during the day, the observatory was not staffed; however public viewing nights are held daily. Unfortunately, I wasn't able to make it to one of the viewing nights, although it would have been a good way to see the New Year in. The observatory has plans for expansion - a 100 seat planetarium is to be constructed next to the observatory.

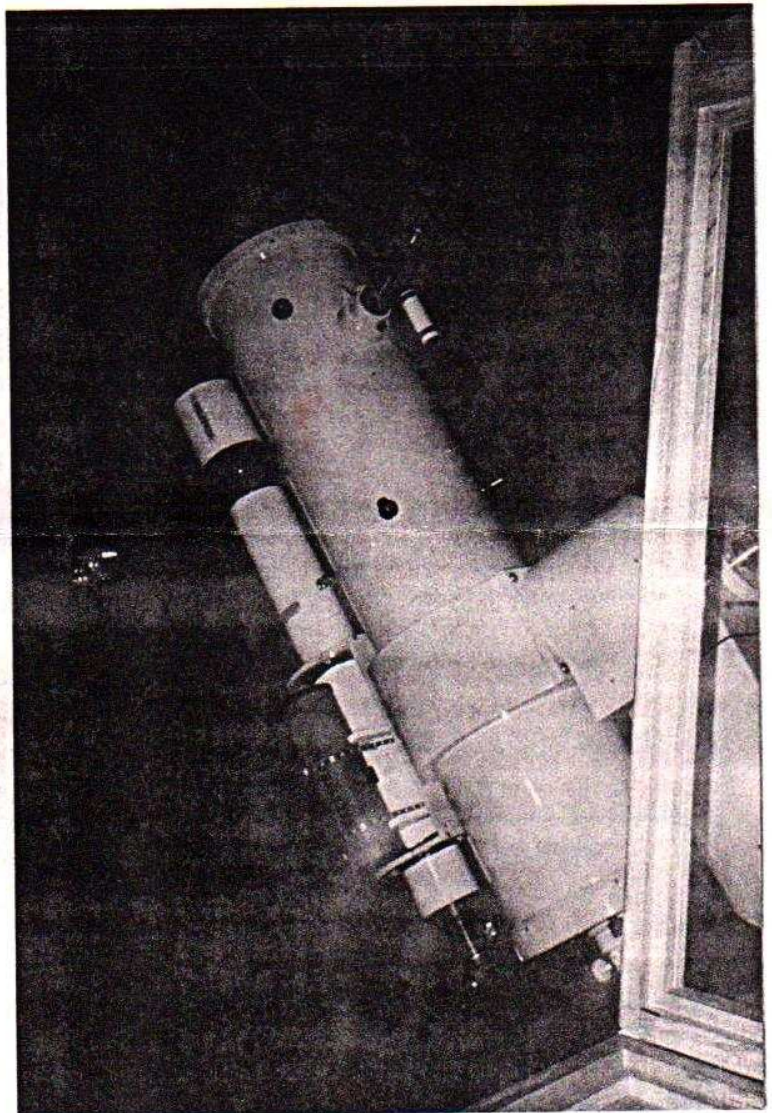
After the wettest day in Canberra for 2 years (our rain-making ability again?), we drove up to a near-deserted Mount Stromlo (We must have started a rush as a few cars came up after us). The visitor's centre consists of a static display of photos and posters (some of which are a little bit aged). A sign inside the door states that "Due to funding cuts, we are unable to provide adequate visitor facilities at present". The visitor's centre is adjacent to the 1.9 m telescope, and a window provides visitors with a view of the telescope. This is the only one of the 7 or so telescopes on display to the public. There is also a good view of the Murrumbidgee valley, although yet more rain blocked the view intermittently while we were there.

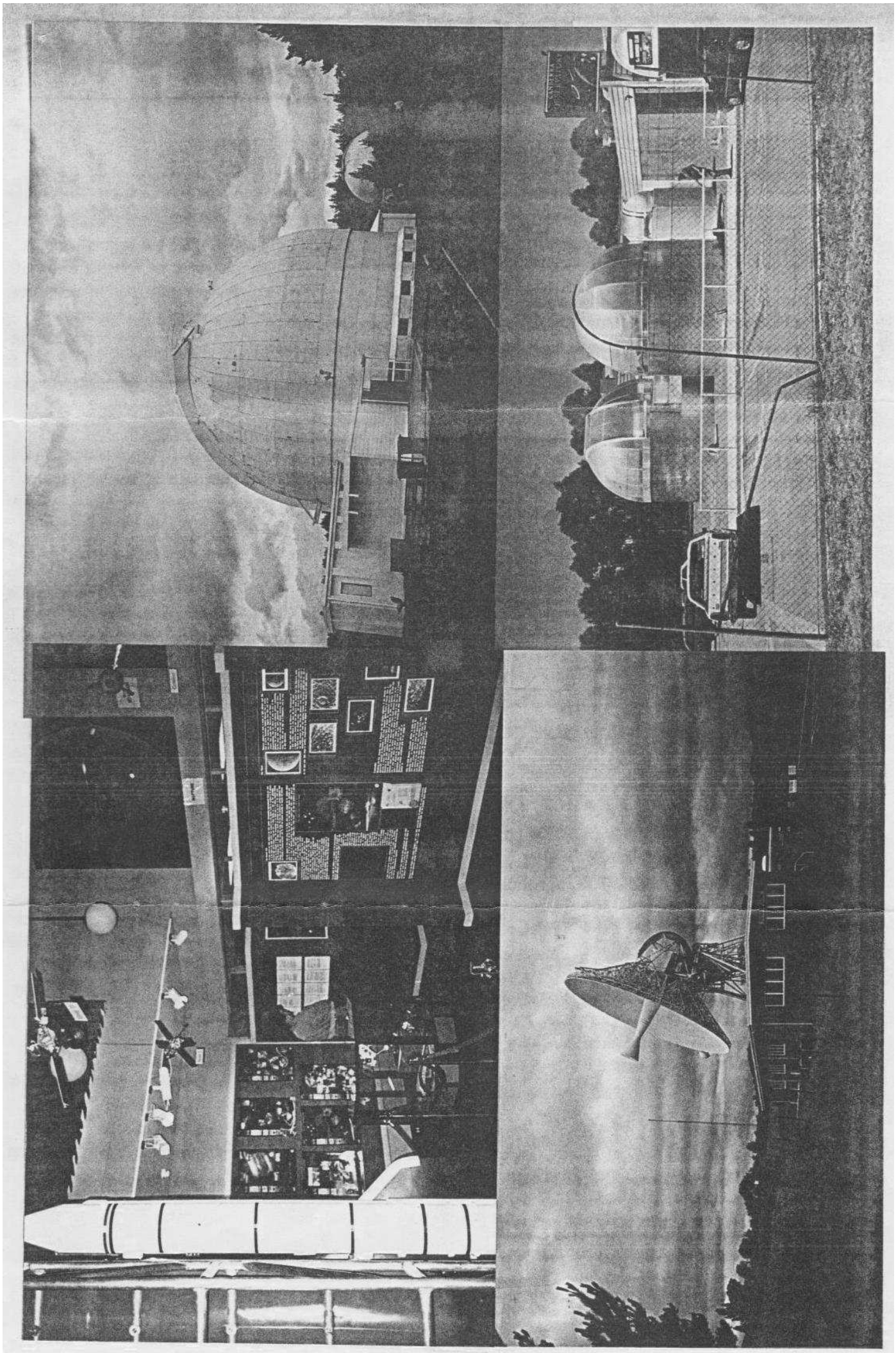
After Mount Stromlo, it was on to the Tidbinbilla Tracking Station (also known as the Canberra Space Centre). This is one of 3 NASA deep space tracking stations worldwide, the others being at Goldstone, California, and Madrid, Spain.

The visitor's centre here was modern and well-equipped. It has extensive displays (including some hands-on ones) on space and the American space programme. There are also models of spacecraft, a piece of moon rock, a NASA spacesuit, and examples of space food. A panoramic window provides a view over some of the dishes.

There are four dishes (or antennae) at Tidbinbilla; a 70 m dish, two 34 m dishes, and a 26 m dish (the latter used to be at Honeysuckle Creek). Also on site are two small dishes to overcome problems communicating with the Gamma-Ray Observatory satellite. At the time of my visit, the Galileo and Voyager probes were among the spacecraft being tracked. There is expansion going on at Tidbinbilla; an 11 m dish and a third 34 m dish are under construction. Adjacent to the visitor's centre is the "Moon Rock Cafe" which sells food/drinks and space-related souvenirs.

John.Cleverdon.





Dinosaurs Sulphured Out

The end of the Cretaceous period occurred some 65 million years ago. At this time there was an species extinction period from which no large bodied animal survived, including the dinosaurs. The evidence is quite firm now that a meteorite hit the Yucatan Peninsula in Mexico. Surveys in the area have found an enormous 300 km crater in the oceans of the coast of Mexico.

Scientists studying the geology of the area estimate the asteroid that produced the crater was between 10 -20 kilometres across. The impact would have thrown several hundred billions tonnes of material into the atmosphere. The impact site is a geologically unique sulfur rich region and the impact is estimated to have thrown between 35 and 770 billion tonnes of sulfur into the atmosphere. The result was about 6 months of total darkness after which the skies would have been murky for at least a decade. The planets surface temperature dropped below zero and remained near freezing for some 10 years. If the asteroid had not hit this sulfur rich area the atmospheric aftermath of the impact would have cleared much quicker. The entire Earth ecosystem was subjected to environmental conditions that only the hardest and well protected from cold could survive. This did not include the dinosaur species.

Spinning Up a Quick Experimental Telescope Mirror

The February 1994 edition of *Scientific American*, available in most libraries, gives an interesting way in which amateur telescope makers can make a quick primary mirror for a telescope, without the necessity to do any grinding or polishing. The mirror, instead is made by spinning a liquid until it sets.

A spun liquid assumes a concave shape called a parabola, which is the aim for most reflecting telescope primary mirrors, since this special shape has the property of being able to focus light rays to a point and thereby enables an image to be formed.

The technique employed is very similar to one used on a few much larger telescopes that arrange to have a giant furnace of molten glass spun at a certain rate. The spinning causes the liquid glass to assume a perfect parabolic shape. The furnace is then very slowly cooled until the glass solidifies and voila, one instant mirror without much grinding at all.

Other operational telescopes in existence use a bed of the liquid metal mercury at room temperature, which is also spun to cause it to assume a parabolic shape. Of course in this case you cannot aim the telescope anywhere, since tilting the assembly will pour the mercury on the floor. Instead you have to wait for the object of interest to

come exactly overhead - if it ever does!

But how can you do it yourself?

The answer is with Epoxies, Silicones, Urethanes or Acrylics. There are safety considerations if you are mixing sizeable quantities of epoxies, as the chemicals are noxious and can ignite if mixed in a large volume. But with adequate ventilation and gloves a reasonable size mirror should not prove too arduous.

The epoxy, or other setting liquid, is placed into a plastic container and spun up on the stereo system record turntable. Yes the stereo system. Of course you have to remove the pick up arm first, otherwise the container doesn't fit. The recommended liquid consistency is about that of maple syrup.

If making a small 30 centimetre mirror, the authors recommend spinning the mixture for 1 to 2 days until it is fully cured. Simple 5 minute Araldite is not recommended as it dries too quickly before the system can reach shape equilibrium properly. While spinning, the bowl is to be covered with Glad Wrap to prevent draughts causing ripples on the surface. Should the surface have flaws in it when solidified, you simply pour a new thin layer of liquid epoxy on top and try again. Simple.

Once solidified, the mirror is removed since it does not stick to the plastic cling wrap.

The focal length of the mirror depends on the speed of spinning.

At 45 rpm, a 22 centimetre focal point will be achieved. At 33 rpm, it will be about 41 centimetres. Chemical silvering is then used to coat the final mirror, or it can be silvered by a silver plating company. For the less fearless, even silver paint or aluminium tape (horror of horrors) might give a useable image.

The formed mirror is of a much lesser quality than a conventional glass one created by grinding and polishing, but it nevertheless can be produced much faster and reproducibly, and you can make much larger mirrors, depending only on the size of your container to put the resin into. The experimental mirror may be adequate for building a solar telescope or an infrared telescope as these may not require any silvering step.

Peter Skilton

How Old Did You Say?

In a recent newsletter article, it was pointed out that the Hubble Constant of the Universe had been determined by measurements from the Mauna Kea telescopes to be 87 ± 7 kilometres per second per megaparsec. This suggested that the age of the Universe was only **7 billion** years old, whereas the oldest known stars are apparently **16 billion** years.

The article indicated that the Hubble Space Telescope would soon take measurements to confirm or refute this curious claim. The orbiting telescope is of course above our atmosphere and

free from distortions to incoming starlight due to movements of air. These Hubble measurements have now been reported, where scores of Cepheid variable stars in the Virgo cluster of galaxies have been resolved and measured over a period of many weeks, enabling very accurate light curves to be drawn up.

The result is 80 ± 17 kilometres per second per megaparsec, meaning our Universe is **8 billion** years old. Not much better. Clearly something is astray when your oldest stars are older than the apparent Universe age. Maybe it simply signifies that the assumption of fairly constant expansion since the days of the Big Bang is incorrect.

The Hubble Space Telescope team intends to measure the distances to other galaxies in the Virgo cluster and two in the Fornax cluster in the near future to see if there are any systematic deviations between sampled galaxies.

As the article in *Nature* announcing the latest measurement says, "we live in a special time: after millennia of not knowing the size and age of our Universe, we soon will. We also live in a time of crisis, for we may be forced to accept something new about the ages of the stars or the nature of the Universe".

Peter Skilton

That's a BIG Planetarium

In the town of Peoria, Illinois in the USA, there exists what has to be the largest scale model of our

Solar System built to date (other than the real thing of course). At the Lakeview Museum, the Sun is painted on the dome of the Museum's planetarium. The planet Mercury is situated in a nearby shop. At the scale of 8 metres equals a million kilometres, the Earth is placed in a nearby petrol station. By the time you reach Uranus, a model of the planet is in a nearby town, and Pluto is 60 kilometres further away in a furniture shop. Apparently, intense lobbying is underway at the moment to set up model comets and asteroids at locations in Antarctica, South America and Russia. This is truly a big model.

Peter Skilton

MISSIONS TO THE MOON, SUN, VENUS AND A COMET PICKED FOR DISCOVERY

A mission to study the Moon has been selected for funding as part of NASA's Discovery Program, an on-going Agency effort to foster the development of frequent, low-cost solar system exploration missions. Missions to study the Sun, Venus and a comet have also been selected for further detailed study under the Discovery effort.

The mission to the Moon, known as Lunar Prospector, was judged mature enough to proceed directly to full development and construction, following final technical definition. Scheduled for launch in June 1997, the \$59

million project will map the chemical composition of the lunar surface and the Moon's global magnetic and gravity fields at a level of detail greater than that achieved by previous missions. The mission should locate any significant quantities of water ice in shadowed craters near the lunar poles, a key issue for any future human exploration.

The other three Discovery missions will undergo detailed study for the next six to nine months, after which one will be pick for development and flight.

They are:

+ Stardust, which would fly through the extended coma of the active comet P/Wild 2, taking images and returning a sample of its cometary dust to Earth laboratories;

+ The Venus Multiprobe Mission, which would drop 16 small probes into the thick Venusian atmosphere to enable study of its unusual atmospheric circulation;

+ Sues-Urey, which would collect samples of solar particle matter streaming outward from the Sun and return it to Earth for laboratory study.

HUBBLE FINDS OXYGEN ATMOSPHERE ON JUPITER'S MOON EUROPA

Astronomers using NASA's Hubble Space Telescope (HST) have identified the presence of an extremely tenuous atmosphere of molecular oxygen around Jupiter's second moon, Europa. The planets Mars and Venus are the

only two other solar system objects beyond Earth known to have traces of molecular oxygen in their atmospheres.

Europa's oxygen atmosphere is so tenuous that its surface pressure is barely one hundred billionth that of the Earth. If all the oxygen on Europa were compressed to the surface pressure of Earth's atmosphere, it would fill only about a dozen Sydney Opera houses.

Scientists had predicted that Europa might have an atmosphere containing gaseous oxygen, but had to wait on Hubble's sensitive instruments for confirmation. The HST researchers caution that the detection should not be misinterpreted as evidence for the presence of life on the small, frigid moon. Located 780 million kilometres from the Sun, Europa's surface is too cold, measured at -230 degrees Fahrenheit (-145 degrees Celsius), to support life as we know it.

Unlike Earth, where organisms generate and maintain a 21% oxygen atmosphere, Europa's oxygen atmosphere is produced by purely non-biological processes. Europa's icy surface is exposed to sunlight and is impacted by dust and charged particles trapped within Jupiter's intense magnetic field.

Combined, these processes cause the frozen water ice on the surface to produce water vapour as well as gaseous fragments of water molecules.

After the gas molecules are produced, they undergo a series of chemical reactions that ultimately form molecular hydrogen and oxygen. The relatively lightweight hydrogen gas escapes into space, while the heavier oxygen molecules accumulate to form an atmosphere which may extend 200 kilometres above the surface. The oxygen gas slowly leaks into space and must be replenished continuously.

Europa is approximately the size of Earth's Moon, but its appearance and composition are markedly different. The satellite has an unusually smooth and nearly craterless surface of solid water ice. Mysterious dark markings crisscross the surface, giving the moon a "cracked eggshell" appearance. Under the apparently fragmented icy crust, tidal heating by Jupiter might heat the icy material enough to maintain a subsurface ocean of liquid water.

Of the 61 identified moons in the solar system, only three other satellites are known to have atmospheres: Jupiter's volcanically active moon Io (sulfur dioxide), Saturn's largest moon Titan (nitrogen/methane) and Neptune's largest moon Triton (nitrogen/methane).

The definitive detection of Europa's tenuous atmospheric oxygen was made possible by the ultraviolet sensitivity provided by HST's Goddard High Resolution Spectrograph (GHRS) instrument. The GHRS recorded the spectral signature of molecular oxygen

(O2) on Europa in ultraviolet light during observations made on June 2, 1994, over a period of six Hubble orbits. Europa was then at a distance of 684 million kilometres from Earth.

The Hubble observations will be invaluable for scientists who are planning close-up observations of Europa as part of NASA's Galileo mission, which will arrive at Jupiter in December 1995. During its initial entry into the Jovian system on Dec. 7, Galileo will fly by Europa at a distance of less than 35,000 kilometres.

NASA SCIENTISTS TO CONTROL RUSSIAN ROVER EXPLORING VOLCANO

From a laboratory in California, NASA scientists next week will drive a modified Russian planetary rover around the most active volcano on Earth.

Scientists at NASA's Ames Research Center, Moffett Field CA, will use Russia's modified Marsokhod rover to conduct field tests simulating remote-controlled exploration of the Moon and Mars from laboratories on Earth. Tests will be conducted Feb. 13-18 in Hawaii Volcanoes National Park on the Big Island of Hawaii.

The Marsokhod is capable of traversing both Martian and lunar terrain. The same Russian team that developed the successful Lunakhod rovers has been developing the Marsokhod for possible future missions to Mars. Its superior mobility makes it suitable for more ambitious lunar

investigations. It is equipped with six cone-shaped titanium wheels, each with its own drive motor, which enable it to climb over large boulders nearly 3 feet (90 centimetres) high. It also has a robotic arm built by McDonnell Douglas to retrieve objects and video cameras to transmit live stereo images.

"The combination of the Russian rover chassis with western avionics is an excellent example of the benefits that are possible from international cooperation," said John Garvey, project manager for the McDonnell Douglas team that is sponsoring the use of the Russian chassis for the activities in Hawaii.

"The rover takes advantage of new technologies from other programs such as last year's Clementine mission to the Moon and NASA's upcoming Mars Pathfinder," he added. Both are examples of small, capable, relatively cheap spacecraft for planetary exploration. "We now have a sophisticated prototype of a long-distance rover that could start exploring the Moon in the very near future."

The test site in Kilauea Volcano's summit caldera and southwest rift zone is located about 48 kilometres southwest of the town of Hilo. This barren, volcanic terrain is similar to what scientists expect to find on another planet. At an elevation of 1,200 metres, the remote site has sparse vegetation and is comprised of ash deposits, jagged rocks and loose, crumbly lava. During the first

three days of tests scientists will control the Marsokhod using a Virtual Environment Vehicle Interface (VEVI) software program to simulate a Mars mission. Scientists are hoping to make the tests as realistic as possible.

Upon completion of the Mars and lunar simulation tests, the team will then transport the rover to a site in the park where lava flows into the sea at Lae Apuki. From Feb. 27 to March 11, the Marsokhod will participate in the JASON VI "Island Earth" Project, a nationwide educational outreach program.

ARCHEOLOGICAL SITE IN CAMBODIA FROM SPACE

Images from the international Space Radar Laboratory (SRL) may help researchers find previously unknown settlements near the ancient city of Angkor in Cambodia.

The radar data was obtained during the October flight of NASA's Space Shuttle Endeavour, processed and sent to the World Monuments Fund (WMF) in January. The group had approached the radar science team about observing the Angkor area after SRL's first flight in April 1994.

"I had read about the radar mission while the April flight was in progress and instantly surmised that it would have applications to the international research efforts at Angkor," said John Stubbs,

program director for the fund. "I didn't really know where to start, but I was hopeful NASA would be willing to image the area around Angkor."

Angkor, a vast complex of more than 60 temples dating back to the ninth century A.D., served as the spiritual center for the Khmer people. At its height, the city housed an estimated population of one million people and was supported by a massive system of reservoirs and canals.

The April flight of SRL's complementary radars, the Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar (X-SAR), first demonstrated their capability to obtain vast amounts of data applicable to ecological, oceanographic, geologic and agricultural studies.

"We realised after the huge success of the first flight that we could be more flexible in adding new sites to the timeline of flight two," said Dr. Diane Evans, the SIR-C project scientist at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA. "Since our science team was interested in studying as much of the tropical rain forest as possible, Cambodia and the Angkor site seemed to be a great complement to our ecology objectives."

Today, Angkor is hidden beneath a dense rain forest canopy. Its temples have been ravaged by weather, war and looters. Its extensive irrigation system has fallen into disuse.

"The radar's ability to penetrate clouds and vegetation makes it an

ideal tool for studying Angkor," Stubbs said. "I can see the canal- and reservoir system very clearly in the radar imagery, and preliminary analysis reveals what may be evidence of organised settlements of large tracts of land to the north of the present archaeological park, which until now, has gone unnoticed."

The SIR-C/X-SAR data will be used by the WMF, the Royal Angkor Foundation and research teams from more than 11 countries to understand how the city grew and then fell into disuse over 800 years.

"The 'temple mountain' monuments at Angkor, such as Angkor Wat and the Bayon, are not unlike some of the pyramidal forms encountered in Central America," Stubbs said. "The sheer size and sophistication of Angkor's great city plan, now enveloped in dense jungle, sets this ancient capital apart as the ultimate jungle ruin."

Far Out Planet

In recent times astronomers have been searching for and finding small planets out beyond the orbit of Neptune {currently Neptune is further away from the Sun than Pluto and is thus the furthestmost of the major planets - ask Peter Skilton for an explanation}

The latest find has recently been detected using the European Southern Observatory's 3.5-metre telescope. Designated 1994TG2 the object is believed to be about

200km across and is some 6,300 million kilometres away.

This object is the seventeenth body to be found beyond Neptune and has astronomers puzzled. Trans-Neptunian objects are an entirely new class of body. To date two distinct bands seem to exist between 31-36 astronomical units (AU) and 40-45 AU.

The gap between the two groups may be associated with gravitational resonances with Neptune in much the same way the asteroids exhibit resonance gaps associated with the other planets.

The nature of trans-Neptunian objects is a subject of hot debate. They are too close to form part of the Oort cloud of cometary bodies and may be more closely related to asteroids perhaps a class of asteroid shepherded into stable orbits by Neptune's tiny gravitational tug.

Shining at magnitude 24 the objects are extremely hard to detect and for the time being astronomers can do nothing but look for more and hope that the story will become clearer as more bodies are studied.

Quasars-What are they?

Since their discovery mid-century quasi-stellar objects or quasars have been a mystery. As the name suggests these objects look starlike but detailed observations show them to be compact, very distant and very bright.

In recent times astronomers have come closer to an explanation

suggesting a quasar is a massive black hole at the core of a distant galaxies into which matter is falling thereby releasing vast amounts of energy. This theory has been thrown into doubt however after a search using the Hubble Space telescope failed to find any galaxy associated with 8 out of 14 quasars.

The new data is not yet conclusive and more observation is needed but it might mean a total re-think.

FORWARD PROGRAMME.

Our forward programme has taken a bit of a beating lately. As the saying goes: "Due to unforeseen circumstances" we couldn't go ahead with the Mid-Winter Lectures and the weather has been hopeless for viewing.

We are looking for some ideas. The society dinner went off well but we don't want too many of them. Other possibilities might be:-

A film night (Apollo 13)

Mid-Winter Bon Fire

An International Night

Car Rally

Trip to a dark sky site for viewing (overnight)

Remember if you don't give us some ideas of what you want to do, the committee will do the things we want to do.

Deep sky viewing nights are held at The Briars on the Saturday closest to the New Moon. Contact David Girling for details. (phone 015-883 165)

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SOUTH PACIFIC STAR PARTY

While on holidays this year Viv and I went on an Observatory Tour of NSW ending up at The Third South Pacific Star Party on 17 May.

After a long drive direct to Canberra, we visited the Downer Club which contains the Canberra Observatory. This observatory possesses a beautiful set of instruments and after everyone had left we had the 16" Newtonian to ourselves.

Unfortunately the car park lighting is not really suitable for much deep sky work. A interesting feature is the computer generated charts shown in real time with the telescope. As the scope is moved the computer updates the chart and displays a cross at the centre of the field. And it really worked!! From there we visited Parkes, Tidbinbilla, Gilgandra, Narrabri and Coonabarabran. A very interesting private observatory near Cowra is the Darby Falls Observatory. This would have to be the darkest observing site I have ever seen. Believe it or not The Milky Way was casting shadows. If you are ever up this way, this observatory is a must.

The South Pacific Star Party is run by the Astronomical Society of NSW at their dark sky site near Ilford. The area is quite pretty and the seeing very good although the weather was not particular kind this year. The first night we had quite a storm with snow predicted. Some of the tents were

blown down but through superior camping skills (!!) our tent survived. Cloud and dew were a constant problem this year however there was sufficient clear skies to satisfy the ardent deep sky observers.

I didn't take a telescope this year preferring instead to check out some of the others at the site. The official count was 100+ telescopes and 247 people. (depending on which official you asked)

The beauty of these types of events is the opportunity to talk with others of similar interest and suss out the good ideas in telescopes and things. My biggest discovery was the cold weather wear some of the people had; industrial freezer suits. All I can say is I now have one.

Some of the observers are more than fanatics, you should see the equipment. Big Dobsonians are very popular and high tech equipment seemed to abound. CCD are obviously gaining popularity. One particular piece of equipment one chap had was based around image intensifiers such as that used in night scopes. Using a 55m lens he could just wave this about the sky and clearly show the Milky Way and general nebulosity. Connected to a telescope such things as globulars and nebulas real stood out. This is not really a general observing tool but is a great show and tell instrument.

David Malin gave a talk on some of his photographic methods. Extremely interesting and some of the detail he can tease from a

negative is truly amazing. It shows my photographic endeavours could be better.

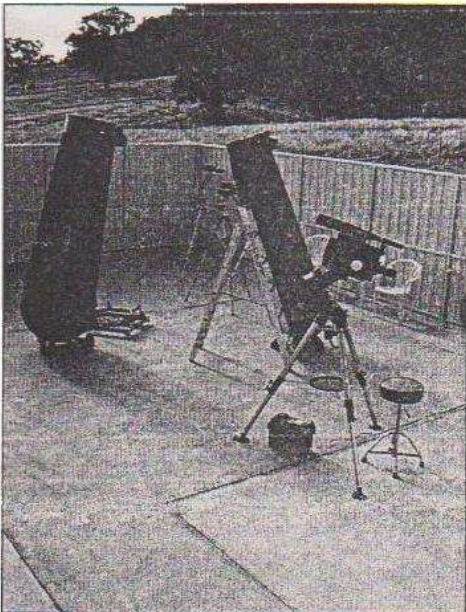
Last year I wasn't completely sold on the South Pacific Star Party but after this year's showing I think I'm hooked. If you do decide to go, you must remember at this time of the year there is a good chance you'll have to brave dew, frost and possible rain but the other activities can more than make up for this.

I'm sure this was not our last one. Well done A.S.N.S.W.

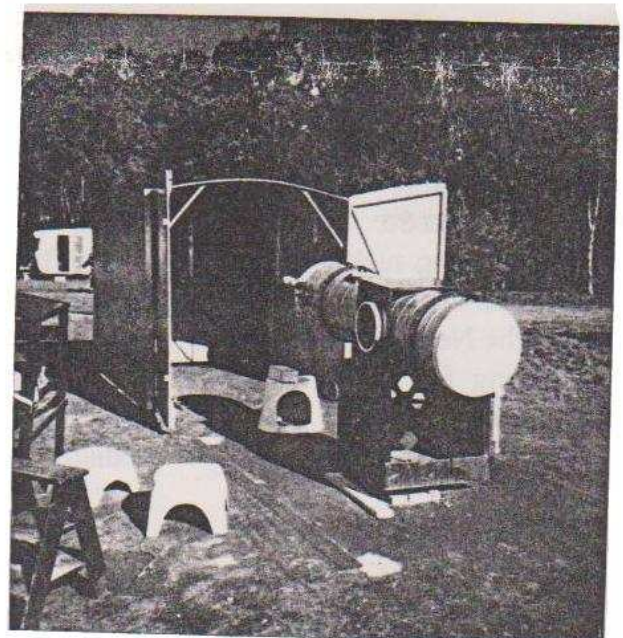


DARBY'S FALLS OBSERVATORY

is 20 minutes from Cowra at Darby's Falls. Enjoy an evening gazing at the stars through the 20" telescope, while Mark and Marie Monk answer all your questions. Ph: 018 63 9940 or (063) 45 1900.



Darby's Falls Observatory



The Skywatch Observatory, Coonabarabran (above)

One of the radio antenna at The Australia Telescope Narrabri (centre)

A 400mm Dobsonian with roll off roof observatory at The South Pacific Star Party (below)