

MACARTHUR ASTRONOMICAL SOCIETY Inc.

Journal



PRIME FOCUS

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President's Report

Welcome to the new millennium. I hope everyone had a great Christmas and the break has been exciting. Not only have I done more observing and been doing some drawings of my observations, some hopefully in the March issue of Prime Focus, but I have also been writing astronomical articles for local papers. (Most not yet been accepted by our local papers, but in other newsletters from other non astronomically related societies).

As most of you know I am a nutcase on Mars and I was hoping to see Mars Polar Lander do its stuff of the Martian surface—more in article later. But what many people don't realise is that I am also very interested in Radio Astronomy and SETI which is not only radio but

visual as well. (SETI Article next issue of Journal.)

My pipedream is to have a large radio dish at the top of my house and linked with my PC plus a 12" telescope which is controlled by my computer. Whilst this may never come to pass, I can search for ET via my PC through SETI via a small program which analyses data when you are on the Internet and not typing up or looking up information. Currently I am up to 80 % search, Daniel is 120%. In this way I feel in my small way I am aiding the scientists and may also get that lucky signal. Failing that, it makes a great screen saver for my computer.

I would like to thank Noel, 60 Minutes and all the guest and local speakers for 1999 for contributing and making each and every meeting interesting. While on thanking I must thank Noel for his hard work all year, Bob for Prime Focus,

Daniel for organising rooms, John Rombi and Noel for Star Nights. Also all the members for making 1999 a very enjoyable final year for me as President.

Speakers

If anyone knows of anyone willing to speak, or yourself talk for 10-15 mins to us, please let us now so we can fill up the 2000 calendar quickly. I am hoping to have Paul Butler this year, and some other high profile guest speakers such as professional astronomers from major observatories in NSW. Can't wait for 2000 to get up and start moving.

MacDob:

I must admit since having MacDob, my observing nights have increased ten fold. Of course the weather has not been overly kind, but it shows

with crystal clarity Jupiter, Saturn, many Messiers in dark skies, and the stars just jump out at you. It is a must for any member into semi-serious observing and wants to feel the magic of a 6 inch Dobsonian to borrow this amazing piece of astronomical equipment from me. Just phone me at the above number and it can be yours for 1 month, (Or see me at meetings, star nights).

Library

The year 2000 promises to be a lot better in terms of the Library. I have been slack in keeping it up and bringing along materials to be borrowed. Soon I won't be El Presidente and can hopefully devote more time to this valuable asset of our Society. More about Library in a latter issue of the Journal, with also some highlights of the available materials which can be borrowed for 1 month.

Mars, A History of its Spacecraft Visits

Mars is a tiny world, similar in many ways but also drastically different to our own Mother Earth.

Firstly Mars has only $\frac{1}{2}$ the diameter of Earth and thus its gravity is only $\frac{3}{8}$ ths. So if you weighed 100 kilograms on Earth, you would only weigh a little under 45 kilograms approx on Mars (great way to reduce weight).

A day on Mars is very close to that of our own. Earth has 13hrs 56 mins. Mars has 24 hrs 30 mins approx. It has seasons just like on Earth, just only twice as long as it orbits the Sun twice as far away. Image a winter even on the equator of -150°C at night and -70°C during the day. In summer it improves to a cool -130°C at night and a warm 10°C during the middle of the day. The hottest temperature ever recorded was a hot 27°C . However, you couldn't sunbake on Mars as the radiation would kill you, and if not that the 95% carbon dioxide (CO_2) would. The atmosphere is very thin and is almost of vacuum status, only $1/10^{\text{th}}$ as thick as on Earth.



Throughout history Mars has inflamed the interest of writers and scientists, in fact all of mankind. Since H.G. Wells scared the daylights out of the American public with a play of a Martian Invasion-- to Edgar Rice Burroughs with beautiful princesses and heroes-- to the most recent books by Ben Bova simply titled Mars (good read) and Kim Stanley Robinson's

trilogy Red, Green and Blue Mars (great reads). Soon to be a miniseries on TV directed by James Cameron.

I digress. These writers and others have put Mars on the Map and created a huge public and scientific interest in Mars.

These questions beg answers. Does, or did Mars harbour life now or in the past? The Antarctic rocks (meteorites have indicated fossilised bacteria once were on Mars.) However, until a manned mission actually takes samples we will never be certain.

Many photographs from visiting spacecraft have shown areas on Mars which indicate possible past civilisations, The Face, Cydonia region etc. However, recently more advanced photographs have failed to confirm the pyramids or enhancing the view of past life on Mars.

Mankind does not want to be alone in the cosmos, and would love to find even microbial life on a neighbouring world. With the Moon totally sterile, and Mars looking less and less likely, mankind is hoping to hear from ET via SETI.

Back onto Mars. Many spacecraft have explored this amazing world of canyons and mountainous terrain. The Russians kicked off the space program toward Mars with the

space probes Mars 1-7, with many of them failing to take even 1 photograph. However, their Mars 3 probe landed and took 15 seconds of a picture before the probe lost contact with Earth. A huge dust storm was being observed by the large telescopes on Earth at the time and is believed to be responsible for the spacecraft's demise. The Russians failed on many other attempts, including Mars 4-7 and Phobos 1 & 2. Phobos 2 was about to take the first ever shots of the tiny Moon Phobos (15 kms in size) but fell unfortunately silent just on snapping the shot.

Many people believe with all these failures that Martians were taking pot shots at our Earthly craft.

...scientists and all of us still had hopes and dreams of a Mars with some life...

America also had some luck, but also a lot of mishaps. Starting with Mariner probes, first Mariner 4 taking 22 photos, and very successful first ever orbital shots of Mars for a quick fly-by. The surface looked very Moon-like with most of Mars' southern region being photographed. This disappointed many as they didn't see the vegetation or any flat beautiful green plains they had read about or had dreamed about. Mars was all cratered. However on March 1964 Mariner 9 showed a far greater aspect of our

neighbour and took 3 months of very rewarding shots of Mars after a storm raged all over the planet for the first 1-2 months. Mars was seen as cratered in the south but smooth flat plains in the north. Winds howled at over 200 kms/hr. huge mountains and enormous valleys were seen all over the planet. Scientists and all of us still had hopes and dreams of a Mars with some life.

The greatest success story was Viking Landers 1 & 2 which took samples and inconclusive evidence of life on this little red world. The spacecraft operated for approximately 7-9 months with the orbiter taking breathtaking photographs of the rugged surface. Interestingly, Mars showed a feature which resembled a face and a geometrically strange area known as Cydonia. The area looks to be scattered with pyramids. The Orbiter also showed the largest volcano in the solar system Olympus Mons, and the largest canyon Mariner Valley. The Mountain is a whopping 25 miles high with the canyon just fitting between Perth and Sydney. Make the American Grand Canyon look like a small ditch.

America had its fair share of failures, Mars Global Surveyor, Mars Climate Orbiter (last Sept) and most recently Mars Polar Lander. However a major success was The Pathfinder Lander which had a rover which cruised the

surface for just over 90 days. It mainly indicated that Mars may have had a wet past, but mainly is littered with igneous, volcanic material.

If Mars did have a warmer, wetter climate and once managed to breed some form of life, then a sample return mission or manned mission MUST take place and soon. If Mars shows it has water and life, should we infect it with our presence (as it's only a few microbes) or colonise this neighbouring world and make Mars a second Earth for Mankind.

Phil Ainsworth.

Latest News

Mars Climate Orbiter made a huge impact on Mars, and Polar Lander also possibly made another small crater on the surface of Mars, also failing to give off a signal. Mars Climate Orbiter was given wrong signals and was designed to take imperial units, but was sent metric values and hence came a little too close to the surface and is believed to either burn up in the atmosphere or simply crash onto the surface. It is unknown as to what caused the demise of Polar Lander.

The scientists have tried making contact with the probe, but after several unsuccessful attempts it is believed to be either a major computer failure or the spacecraft landed a little too hard onto the surface.

Galileo:

This amazing little spacecraft continues to defy the odds. Obviously there are no pesky Martians near Jupiter to inhibit its operations.

On Jan. 3rd Galileo continues to take photographs of some of Jupiter's smaller moons, Almathea, Thebe and Metis, then took further pictures of volcanic Io.

The spacecraft has taken twice the amount of radiation that was supposed to have stopped it working months ago.

Shuttle

The Hubble repair last month was a major success. It seems NASA can get that right and long serving spacecraft, but anything about Mars falls apart. Makes you wonder doesn't it? Anyway this news is about the success of the Hubble repair.

It took 3 space walks, each just over 8 hours in duration, to fix all the problems and update some of the equipment.

Space Walk 1- repaired 6 gyros which were 6 years old. They also installed voltage temperature improvement kits with wiring between The Hubble's solar array and its 6 batteries. The kits should improve charging the batteries.

Space Walk - 2 performed brain surgery replacing its

outdated computer with a new model. It now works 20 times faster with 6 times more memory to store information.

Space Walk-3 on Christmas Eve, the astronauts installed a new s-band transmitter and replaced the old data recorder with a solid state new model. They also replaced insulation on the telescopes two equipment bay doors.

...the Hubble repair last month was a major success...

On Christmas Day the shuttle successfully had completed its mission and pulled away from the telescope and headed for home.

The astronauts spent the longest recorded time in space with their EVA, an overall 24 hrs 33 mins. The most difficult situations encountered were wrong size of bolts for the tools or the bolts proved really tough to undo and having no gravity it would have made the problem even more difficult. (I know, I have been trying to unscrew some screws under the water in my pool, and every time I turn the screw or try to I also turn. Water is like working in zero gravity and I feel for the astronauts on their arduous tasks while in EVA mode.)

Y2K

The dreaded bug did not cause any major problems for spacecraft or satellites except

one, which stored its information until the problem was rectified.

MIR

Once again, the debate. Are the Russians with new Prime Minister running the country keeping MIR operational? 1/3 of its space funds have been allocated to restoring the aging space station. A mission for two months is planned for April and one later in the year. That's if the 1/3 funds can also cover all the needed repairs and upkeep of the station and the remaining 2/3 is spent on launches and keeping up with the building of the International Space Station and all its launches. We will just have to wait and see. Russia spends a huge amount of money on its military and weapons. Shame it and the United States cannot spend this money on feeding its population and some on space.

A current theory

Florida scientists are experimenting with the idea that any dust disks not seemingly created in the centre of a neighbouring solar system may be evidence of Earth like planets. There theory is too involved and I cannot grasp it in this short news article.

UFO's ???

In a Northern country town of NSW, a small black object

was seen streaking through the sky and then suddenly left a huge crater as it plummeted into a local dam. It is believed to be a meteorite. However further privately funded investigations will be taking place in the near future to exactly determine what the object may have been. UFO groups are believed to be interested in investigating this strange black object.

Galileo Update

On January 10th, scientists say that the latest data received on the magnetic field of Europa suggests further evidence of an ocean underneath the thick layers of ice. The internal heat source of this small world would be ideal says the Florida scientists for organic life to be alive and thriving.

ADVERTISEMENT

One Tasco 114mm telescope, well looked after, for sale \$395.00 ONO. It has various eye pieces, sturdy equatorial mount. Will have on display this meeting for all to see. (See Phil Ainsworth if interested).

MARS POLAR LANDER

Scientists at NASA have finally given up any hope of recovery for the spacecraft which is now assumed crashed into the Martian south pole and beyond repair or able to receive any aid from Earth.

Phil Ainsworth

Vice President's Report (Noel Sharpe)

What a surprise last month's meeting was. Our unofficial meeting was attended by 30 members and guests. I must thank Daniel Ross and Dick Everett for displaying their handiwork, also thanks to Daniel for a sneak preview of the observatories. What a good start to the year!

We had on the January meeting three new members plus some old ones rejoining, and maybe would have had a fourth except I ran out of membership forms. Our total membership stands at 70, the highest yet ! But as per experience of past years, we will have some non-renewals , but should pick up and maintain our best number of core group members come March/April (despite the possible price hike).

The Cobbitty site has proved its worth by allowing a regular observing place. The December and January nights were effected by poor weather as have much of the summer, but we did manage to get some observations in.

I believe that we must strive to maintain a clear direction for the Society. We are growing larger and with the observatory coming on line this year coupled with our web site (which looks really neat), the year ahead is sure to be a rewarding one.

What's To See This Month (21st Feb – 19th March)

The Planets

Mercury: From 22nd Feb to about 6th March, Mercury is not viewable due to its close proximity to the Sun. However, from then on until about the end of April, Mercury is in a very favourable morning viewing position.

In particular, there will be a very attractive conjunction of Mercury and Venus (only 2° apart) on the morning of 16th March, about 5am Daylight Saving Time (i.e. about 1 hour before sunrise).

Mercury will be at mag 1.1 and Venus at mag -3.9.

Photo Opportunity

Venus is also a morning object, rising from 4.30am (22nd Feb) to 5.15am (19th March) at mag -3.9.

On 22nd & 23rd February, Venus can be seen less than 1° from the mag. 8.0 Neptune.

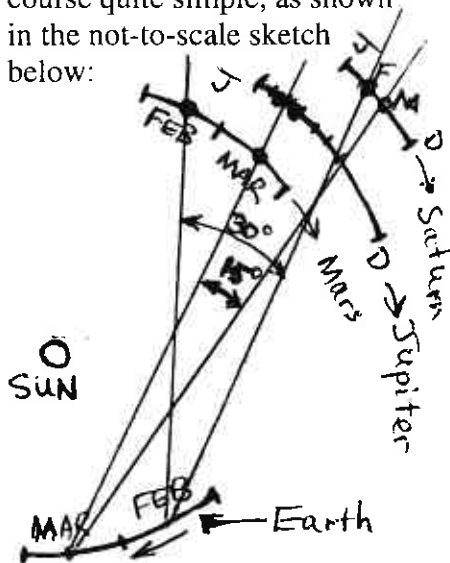
Not to be outdone, Uranus (mag 5.9) has a close encounter with Venus (only 0.3° away) and an anorexic moon (2° away) on 4th March (also about 1 hour before sunrise.)

Photo Opportunity

Mars is still visible at mag 1.2, but only just. It is very low on the horizon towards the end of evening twilight. After March it will be effectively non-viewable.

The interesting feature to watch for over this month's period is how the angular distance between Mars in the west and Jupiter and Saturn to the north-west dramatically closes up. On 22nd Feb, they will form a line with Mars and Saturn at opposite ends about 30° apart. But within one month (by 19th March) they will have closed up to about 15° apart. This is an indication of the big 'overtake' up ahead in future months.

The explanation for this is of course quite simple, as shown in the not-to-scale sketch below:



Mars is a long way away at present. e.g. On 15th March it has an angular diameter of 4.18". Using our shorthand formula $d = D \cdot 2.063 \cdot 10^5 / \theta$ and Mars' diameter of 6,794km, gives us a distance of 335 million km.

Jupiter is mag -2.1 for this month, with an angular diameter of 34.7" on 15th March. (This gives a distance of 850 million km.) Jupiter is still fully visible all evening but obviously setting earlier. As mentioned before, note

that Jupiter and Saturn are slowly coming closer together. They 'overtake' at the end of May but this will only be visible in morning twilight.

Dates for the 'Dance of the Moons' this month are 26th & 28th Feb and 11th March.

Saturn, at mag 0.3, is creeping closer to Jupiter this month, ending up only 7° apart.

There is a nice conjunction with a thin crescent Moon on 10th March. Saturn and the Moon will only be 2.8° apart.

Photo Opportunity

Constellations:

This is a great time of the year to view 'the other half of the sky.' There are some great constellations up there for binoculars and telescopes, small and large.

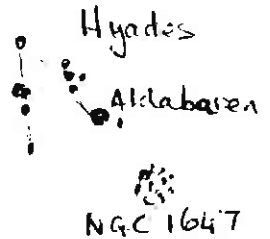
Taurus is setting earlier so this month is your last chance. The Pleiades and Hyades are wonderful naked eye and binocular objects. The bright red 'eye' of the Bull In Hyades is the red Giant star Aldebaran.

The Hyades cluster is of particular astronomical interest as it is the nearest star cluster to us, and this allows it to be used as the first step in the process of scaling the size of our Universe.

There is a faint cluster of about 25 stars (NGC 1647),

just beyond naked eye visibility

At mag 6.5, below the broad base of the Hyades 'V' about one 'V' length below Aldebaran.



Can you find this with your binoculars or low powered scope? They look like a delicate dusting of faint stars against the dark sky.

...the Pleiades and Hyades are wonderful naked eye and binocular objects...

Orion is standing high in the NNW sky. At this time of the year it is magnificent, with the red supergiant Betelgeuse, the white supergiant Rigel and, of course, the Orion Nebula M42 in the 'dagger'.

I discovered something new (at least to me) the other day. It's called (by us Down Under) the Summer Hexagon. The six points of the hexagon comprise the bright stars Sirius (in Canis Major), Procyon (in Canis Minor), Pollux and castor (in Gemini, counted as 'one star'), Capella (in Auriga, just near the northern horizon), Aldebaran (in Taurus), Rigel (in Orion), then back to Sirius. It is a useful 'skymark' for finding your way around the sky. It is quite large, covering an area

of about 65° by 45° .
Betelgeuse finds itself in the heart of the hexagon.

The False Cross (and its nearby cluster NGC2516) is almost directly overhead. Those who know the history of NGC2516 and our Noel Sharpe will understand when I suggest we rename it the 'Toyota Hi-Ace' Cluster. Ask Noel why.

Just south of 'overhead' is the Large Magellanic Cloud (LMC), about as high as it gets in our skies. Take the opportunity to check out this satellite galaxy only 170,000 light years away, the location of the most recent naked eye supernova (1987). Also, check out the beautiful Tarantula nebula attached to it.

Bob Bee



The Tarantula Nebula in the Large Magellanic Cloud.
(Photo by D Malin
-- used by permission)

Spiders & Tooth Fairies

The event was professionally organised, the stage was set and the venue was the St. Helen's Park Public School Campbelltown. This was a joint effort between the Wollongong Amateur club and ourselves, and was held on Friday night on the 19th November last year.

The combination delivered over a dozen telescopes and astronomers, all at the ready to bedazzle the troops, but I must bestow some kindly advice. Never, never, never, set up your equipment under automatic pop-up lawn sprinklers as its possible the system might activate..... and this one did in bucket fulls ! I've never seen so many astronomers move so quickly, literally throwing telescopes into cars. I have said previously that great care is needed when washing mirrors and lawn sprinklers are not the way to go. There was however quite a strong flow of water and several astronomers were seen standing on the pop-up heads of the sprinkler system, even garbage can lids were used as a type of shield. This was the funniest thing I have seen in ages, and I really needed a good laugh. After the entertainment finished: i.e. someone turned the tap off - the serious business of star gazing took place. All scopes which were now dried, were eagerly awaiting excited young observers.

Inside, Joe from the Wollongong club held court with slides and pictures which was enjoyed by all.

Afterwards, the school children made their way to the telescopes and observed some fine Lunar features, Saturn and Jupiter. I thought I would try Canopus, it's very bright and still dazzles in the field of view.

I wanted to try and present something a little different, so I defocussed the star which made diffraction rings, this brought a swift response with some of the younger children excitedly calling it a "Spiders Web" which is what it looks like. Some even identified it as the "Tooth Fairy Star" I didn't even know that the tooth fairy possessed a star, but, it made sense. (anyway to a 9 year old).

The school children then passed on their impressions to all and sundry and requests were made to the other astronomers to show them the "Tooth Fairy Star" much to their bewilderment.

...several astronomers were seen standing on the pop-up heads of the sprinkler system...

I know you might think that I am not providing serious astronomy, but I believe young children live with fire in their imagination, and first impressions are everything. I left the serious work to the

others, and I know by asking, that observations made were spectacular; rings of Saturn, Moons of Jupiter, craters and mountain ranges should definitely leave an impression.

I stayed on Canopus all night, focusing and defocusing and playing games, but with the older children they would question what they were seeing. Opportunities then existed for explanations and I was more than willing to oblige.

The night was a fantastic success and my thanks go to the following MAS members: Lloyd, with his really big 10" telescope, Lou, Jon, Daniel and Sarah, and Ian Cook. Well done guys.

As the night came to a close we gathered in the school lunch room for coffee and a chat. It was a fun night, the collection of "Telescopes on Parade." was impressive, and I know everyone will agree this joint venture was a great success.

I wish to also thank all the "Good Fellows" from the Wollongong Amateur Astronomical Club for their invitation to assist. Who knows our paths may cross again.

Noel Sharpe ■

Highlights of 2000

This is a thumbnail summary of 'significant' planetary conjunctions for the Year 2000 (it excludes January). More details of each of these events will be included in relevant future issues of Prime Focus. However, this list may be useful to keep on your fridge or kitchen notice board as a quick reference.

22nd & 23rd February (am): Venus less than 1° from Neptune.

4th March (am): Venus 0.3° from Uranus.

16th March (am): Venus and Mercury 2° apart.

22nd March (pm): Mars, Jupiter & Saturn in perfect line, each 7.5° apart.

6th April (pm twilight): Mars & Jupiter (1°).

16th & 17th April (pm twilight): Mars & Saturn (2.4°)

29th April (am twilight): Mercury & Venus (0.3°).

5th May: The so called "Grand Alignment" of the 5 naked eye planets, when the combined gravitation and tidal forces will bring doom, gloom to Earth and untold wealth to sensationalist quasi-science authors. Expect to read a lot more about this phony science event in the coming months.

9th May: (Unobservable). All 5 naked-eye planets fit into a 23° circle.

18th May: (Unobservable). Venus, Jupiter & Saturn fit into a 1.7° circle.

19th May: Mercury & Mars (1.1° apart).

...the combined gravitation and tidal forces will bring doom, gloom to Earth...

1st June (am twilight): Saturn and Jupiter's closest approach for the next 20 years (1.2°). Saturn will now lead Jupiter in the sky.

11th August: (Unobservable in morning twilight). Mars and Mercury (0.5°).

12th December (pm): Venus and Neptune (2.5°).

24th December (pm): Venus and Uranus (1.2°).

Bob Bee ■

Hot Hot Hot

One of the hottest stars known lies in a shroud of gas 4,000 light years from Earth in the direction of the constellation Puppis. The dying star radiates with a temperature of about 200,000°C and is surrounded by a pinkish nebula NGC2440. (*Astronomy*, January 2000)

Year 2000 Predictions.

2000 being such a significant year, it is fitting that special and significant astronomical events occur to mark it. I have consulted some learned gurus and plumbed the depths of ancient tomes, and in so doing have developed the following startling predictions:

➤ **α Orionis (Betelgeuse)** will go supernova. At only 420 light years, this will prove quite spectacular from Earth and during its peak brightness at mag. -10, will rival the Moon and be starkly visible during daylight.

Having a mass of 20 Suns, Betelgeuse will leave a black hole and a beautiful supernova remnant nebula.

Rupert Murdoch will acquire all television and photographic image rights and have the nebula officially named M1 (for Murdoch). When told there is already an M1, he will buy out the rights to the Messier Catalogue and renumber Crab Nebula as M102, leaving M1 blank (matching the faces of all the world's astronomers.)

➤ NASA will finally achieve an intact landing of a probe on Mars (after being forced to admit that its earlier Polar Lander probe *had* discovered water but in Guyra dam.)

The probe's burrowing robots will discover sublayers of ice, tupperware, spent uranium rods and disposable nappies, proving conclusively that life on Earth **did** originate on Mars.

➤ A spectacular comet will be discovered by two MAS members and named Comet Bee-Sharpe. Orbit projections will indicate a precariously close pass by Earth. When media interviewers ask co-discoverer Sharpe if it is likely to collide with Earth, he will scratch his beard knowledgeably and utter the immortal words "Buggered if I know".

(NOTE: More musically minded members of MAS will know that the existence of this comet is highly unlikely.)

➤ In May, all five naked-eye planets will line up. Although the doomsayers predictions of volcanoes, earthquakes and tsunamis don't eventuate, it does have an even more devastating result when their combined tidal forces cause a bail to fall from the stumps during the final delivery of the Australia vs South Africa World Series Final. This causes Australia to lose and Steve Waugh is heard to say "bugger" on stump-cam, thus totally offending the sensitive Australian nation who demand and get his immediate resignation as captain.

➤ Bill Gates will donate \$500 million to Macarthur Astronomical Society to build its own 8 metre active-optics telescope and dome, for personal use by members. MAS Committee evaluates the cost of the project as \$500,010,000, is unable to raise the extra \$10,000 needed so regretfully declines Gates's offer. Instead, they spend

\$1,500 on an 8" upgrade of MacDob.

Let the Year begin!

Nostrabobus ■

SECTION LEADERS

The following members have offered themselves as leaders (or coordinators) of those members with special interests in particular fields

DEEP SKY:

Pete & Bobbie Elston

Phone 02 46474491

e-mail:

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ASTRO COMPUTING:

Daniel Ross (02 9790 5838)

AMATEUR TELESCOPE

MAKING: Dick Everett

Phone 02 96051564

COBBITTY OBSERVING

SITE: Noel Sharpe

Mobile 0410 445 041 for checking field conditions.

TELESCOPES :

NOVICE/INTERMEDIATE

Noel Sharpe

ADVANCED: Peter Druery.

ASTROPHOTOGRAPHY:

NOVICE: Noel Sharpe

ADVANCED: Peter Druery

We know the speed of light is 300,000 km/s. But what is the speed of dark?

The Red Planet

In the late months of 1984, Robert Score from the US National Science Foundation was in Antarctica collecting fragments of meteorites from its barren, icy surface. He collected an unusual specimen (ALH84001) and immediately shipped it to the Johnson Space Centre for further observations. There it was ignored for more than eight years until a group of NASA scientists took interest and studied its contents and origin.

The researchers had discovered its *chemical signature*, the so-called SNC (Shergotty, Nakhla and Chassigny, the names of the three individuals who first discovered the first three such meteorites) class meteorite that, apparently, originates from Mars. The well-known single cell organism in ALH84001 was shortly after discovered. It was kept under wraps until 1996 when it was announced to the general public, only later being ridiculed by other scientists as a mistake in identity.

Obviously the theory *of life on Mars* sounds like something out of an old science fiction novel, however it may require a closer observation by the sceptics, from a different point of view.

How could life possibly survive in such a desolate environment? To answer this question, we must look at our own environment. In the most

remote and harsh geological environments, life has found a way to survive.

British scientists, in the mid 90s, found thriving subterranean creatures after drilling more than 4 kms below the Atlantic ocean, where pressures reaching 400 times greater than sea level. These bacteria proved possible for life to survive under the most intense conditions.

...the theory of life on Mars sounds like something out of an old science fiction novel...

Other scientists have ventured 3 kms below sea level near the mouths of active volcanoes and discovered another form of bacteria that thrive in mineral rich plumes rising from the active crust. Such other creatures are called *autotrophs*, which have been found in benzene, toluene and acid and in depths at 11 kms below sea level where no sun light could possibly filter through (Marianas Trench).

In the most coldest parts of the world, where temperatures reach over 100 degrees Centigrade, green photosynthetic organisms had been found living in the outer layers, within various rock samples.

One other example worth while mentioning is the mission of Apollo 12 in 1969, which was to retrieve

Surveyor 3 that had landed on the lunar surface more than two years prior. During the mission, the camera on the surveyor was removed and dismantled. Inside dry speckles were found where someone had sneezed onto the circuits during assembly. Upon returning to earth, scientists experimented with these speckles and under certain circumstances, revived the bacteria hibernating inside.

There are countless other examples where *life had found a way* that would be impossible to enumerate in a single article. Mars has a cold and bitter environment. It lacks earth-like supportive gases such as nitrogen and oxygen, not to mention a low atmospheric pressure. The ice on its South Pole is completely carbon dioxide, however the north cap does contain a large portion of pure ice water.

Taking into consideration some of the above examples, would it be possible, that under the thick layer of permafrost, maybe not carbon based but some other form of life has found a way?

(To be continued.)

Attila Kaldy

Heavenly Bodies That We Don't Want Here

by John Casey

It is that time of the year again! Nothing worth looking at on TV! Time for a few good books. Well, I have just read to that made me think and wonder. These were "The Search for Our Beginning" by Robert Hutchison, and "Cosmic Catastrophes" by Clark Chapman and David Morrison. Both dealt with celestial visitors to our home planet- but in somewhat different ways. We owe our existence to these mechanisms that built the Earth itself, but, must live in fear of even the smallest of such fragments that arrive late. We may owe our present dominant position as a species to a recent fragment that wiped out the dinosaurs and left the field open to us, but with our knowledge, must now live in fear that we may well be next to go.

I had known already that we ourselves are made of "star stuff". Evolution of stars like the Sun converted hydrogen and helium- [the overwhelming proportion of all matter brought into existence in the "Big Bang"] into heavier elements up to iron by nuclear fusion reactions. The fusion reactions proceed because the mass of

the product elements is always less than that of the reacting elements, and the missing mass provides the energy by the $E = MC^2$ equation to heat the core to maintain the balancing forces of thermal agitation and radiation pressure that counter the crushing inward pull of gravity. Elements heavier than iron require the provision of energy, and massive densities and temperatures in order for them to be formed. Only in stars > 5 Solar masses is gravity sufficient to overcome this stopping of synthesis of the elements at the most stable of all of them - iron. Within a supernova a nuclear soup of neutrons at incredible densities and temperatures forms the elements heavier than iron, and blasts these and other material outward into space.

...must live in fear of even the smallest of such fragments...

Until I had read "The Search for Our Beginning", I had not thought much on what would happen from this point on. I had vaguely thought of massive hunks of iron and other material blasting outwards, and that asteroids and similar visitors might be some of these debris entering

the Solar System at some time in the past. But it is unlikely that much, if any, lumps would emerge from the incredibly hot fireball of a supernova at billions of degrees Kelvin [in comparison iron would vaporise at 2000°K]. There would be a rapidly expanding ball of super hot gas and plasma that would obey the gas laws and cool rapidly from the lowering pressure and increasing volume. Plasma would pick up oppositely charged particles and combine, chemical reactions would take place appropriate to the conditions of the moment, and then the temperatures and pressures would eventually drop sufficiently for the first solids to seed from this gaseous soup. Metal oxides would be the first to condense [eg Al_2O_3 at 1600°K , then iron/nickel alloy at 1300°K , then silicate minerals from 1200°K . Iron oxides would condense from below 1000°K . The initial solids formed would be fine dust, but further growth of these seeds would occur by sublimative condensing of gas directly to solid, as the pressures in outer space would be too low for liquid to form. The cosmic abundance of the elements, gleaned from spectra of star light, can be expressed as number of atoms per million hydrogen atoms, and in order of increasing atomic number, the abundances are as follows:

Element		Atomic Number	ppm(#)
H	Hydrogen	1	1,000,000
He	Helium	2	68,000
C	Carbon	6	420
N	Nitrogen	7	87
O	Oxygen	8	690
Ne	Neon	10	98
Na	Sodium	11	2
Mg	Magnesium	12	40
Al	Aluminium	13	3
Si	Silicon	14	38
S	Sulphur	16	19
Ar	Argon	18	4
Ca	Calcium	20	2
Fe	Iron	26	34
Ni	Nickel	28	2

(# = Abundance relative to H)

Further expansion would lower the temperature still further, and ices of water [around 250° K], ammonia [150° K], methane [100° K] and other compounds could condense out. This is likely to occur over an existing dust particle, as the energy needed to form the initial first solid particle is much higher than needed to condense onto an existing surface. Thus, at a sufficient distance from the supernova, an expanding sphere of fine particles would condense out of the gas cloud, but still travelling outward with the inertia of the same mass of gas. A large amount of this material would have sufficient velocity to overcome the gravitational effects of the supernova remnant, and continue radiating out into the universe to mix and collide with the gas and solid residues of more distant supernovae, or be caught in the gravitational field of other stars and galaxies. Most of the matter likely to be encountered on the way would be hydrogen and helium as gas or hot plasma, as shown in the table at left. >

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Local compression of the gas cloud [eg. by collision of two gas clouds] would cause dust particles to coalesce into large particles, and the particle size would grow over time, as thermodynamic effects cause groups of small particles to grow into larger particles in order to minimise their surface energy density. This then starts the local gravitational centres that gradually attract more particles, and begin to compress those nearest the centre of mass. Conservation of angular momentum then requires that outer particles spiralling into this mass should impart a spin to the mass, and the first seeds of a new star system has been

formed. Hydrogen and helium, as gases would resist compression on their own, but as masses of solid agglomerated, the gravitational effects would then pull even at these gases, and an increasing pressure of an atmosphere would form around the solid core as it developed.

"The Search for Our Beginning" looked at the chemical composition of meteorites, and why they are different from surface composition of the Earth. We all know by now that iridium was the marker element in the thin rock layer that was the boundary above which no further dinosaur fossils were

found in layers of rock throughout the Earth. A thin layer of darker rock about 2-3mm thick, containing carbon and > 20 times the normal Earth surface rock concentrations of iridium could be found in rock over most of the Earth, and marked this period of severe mass extinctions at the end of the Late Cretaceous Period, 65 million years ago. Iridium is scarce in the surface rocks, because it is an iron loving element. During the Earth's early history, impacts, natural radioactivity and extreme volcanism caused the Earth to partially melt, and molten iron, being dense, sank to form the magnetic core, taking with it those elements

that would dissolve in the iron melt,- such as nickel and iridium. This left the lighter silicate rocks at the surface depleted in such elements.

"Cosmic Catastrophes" looked back over the changes in scientific attitude to catastrophic events as instruments for evolution of the Earth, the Moon, and the planets. Before the Moon landings, most scientists considered that the Moon craters were volcanic in origin. Ralph Baldwin, of the Oliver Machinery Company, in Michigan was single handedly responsible for demonstrating that lunar craters were due to high speed meteor impacts. He was educated as an astrophysicist, and, in 1941, whilst giving lectures at Chicago's Adler Planetarium, his interest was aroused by large photographs of the Moon on the wall. The idea that high velocity impacts should be explosive was an unfamiliar concept to scientists at that time, but second nature to Baldwin due to his war time research on proximity fuses for bombs. A meteor travelling at only the escape velocity from Earth, of 10 km/second, would have a kinetic energy of 100 million joules/ kg, or 25X as much energy as released by the same mass of TNT explosive. Most meteors travel at over 16 km/second. Baldwin recognised that no matter in

which direction the meteor struck the surface, a circular crater would result, with the crater diameter being 10-20 times the diameter of the incoming meteor. Other scientists did not catch up to Baldwin's views until after Mariner 10 arrived at Mercury and found it to be very similar to the Moon. Baldwin had recognised the implication of the Moon's cratering to the Earth, where the scars of such catastrophes had largely been obliterated by tectonic and erosive forces. He had reached the conclusion that we could infer Earth impact distribution from the preserved distribution patterns on the Moon.

...most meteors travel at over 16 km/second...

Known meteor impact craters on Earth were fairly rare. Meteor Crater, in Arizona is the best known, and is one of the most recent impact crater. It is nearly 1.6 km in diameter, and formed 50,000 years ago, when a nickel/ iron alloy meteorite about 60 m diameter hit with a force of 15 megatons of TNT. Other impact craters have been found more recently. The Odessa Crater, found near Odessa Texas in the 1920's, is 60 m diameter and 10,000 years old. In 1938, a well formed 160 m diameter crater was found near the Boxhole

Sheep Station in Australia, with fragments of meteoric iron found on the site. Then, in 1947, during an aerial survey, the Wolf Creek Crater in W.A. was found- it was 1000 m diameter. With satellites and aerial photography, much older, and more weathered impact craters- called "astroblames"- [more than 100 of them!] have been located,- with diameters up to 80 km, and most larger than Meteor Crater. The best documented of these is the Ries Crater in Bavaria, which is 15 million years old, in the southern plains of Bavaria. It was formed by a rock asteroid 1.6 km in diameter, with a mass > 1 billion tons, [but still an Earth approaching asteroid equivalent only to the smallest such object discoverable by present day astronomers.] The impact had an energy of several million megaton of TNT. Evidence is still present, with huge boulders littering the landscape up to 56 km away from the crater, which originally was 5 km deep. The cavity resulted from the removal of more than a trillion tons of rock and earth in the explosive blast. Something this big hitting the atmosphere just pushes it aside, leaving a vacuum in it's wake. Incoming material is stopped within 0.01 seconds, and ejecta can be blown out into space through this vacuum corridor. Most will return after solidifying in space, then remelt on the outside as they re-enter the atmosphere at "tektites"-

strange teardrop shaped lumps of glass up to 1 inch in diameter. Such tektites are scattered over Central Europe, and at least a dozen other tektites fields are now known.

William Hartmann was the first of the modern cratering catastrophists. As a scientist/author/ artist, he projected Earth based photographs of the Moon onto a sphere, then measured the size distribution of the impact craters. He then applied a new technique, suggested by Gene Shoemaker, to attempt to measure the age of the Mare basins on the Moon. He showed that lava flooding of the giant lunar impact basins, which had created the maria, occurred after 19/20th the time that the Lunar highland craters were made. If the bombardment rate had been constant over time, then the Maria would be only 225 million years old [since the Moon formed about 4.5 billion years ago]. He concluded that the bombardment rate was not constant, and most occurred very early in the Moon's history, and that the Maria was actually about 3.5 billion years old. His conclusions were confirmed when Moon rock was returned to Earth and radioisotope dated. The more recent bombardment rate has been low.

This was good news for we on Earth at the moment, but the

risk has decreased, not vanished. There are currently over 1100 known Earth orbit crossing asteroids > 1 km in diameter, and only amateur astronomers specifically keeping watch for these unwelcome heavenly bodies.

...if you can see them coming, then we are all doomed...

On June 30, 1908, an ice and rock meteor or asteroid broke up in an aerial explosion over the Tunguska River in Siberia. Little of the fragments actually hit the ground, but even so, this 100m diameter mass gave an aerial blast equivalent to 10 megatonnes of TNT and flattened the forests below. A man was knocked off his chair 100 km away. It is sobering to think that such an object would not be observable by Earth based telescopes even today.

Soldiers in the war used to say that you never hear that one that got you. Well, unwelcome heavenly bodies are worse still – if you can see them coming, then we are all doomed – and if you don't, then only those nearby will die with you! They say that cockroaches would survive a nuclear war. I wonder if they are the next to inherit the Earth?

From the Editor

This is the start of the fifth year of Prime Focus. It is hard to believe that there are 40 issues of Prime Focus behind us. Hard, that is until I look at my folder of issues and see it bulging at the seams. This year I start a new folder.

If anyone is interested in catching up with old issues of Prime Focus, they are all at the Campbelltown Library, under Local Studies LS 520.5 MAS. They can be read there but not taken away.

As Editor, I am always looking for interesting articles to include in Prime Focus. The charm of our Journal is that it is mostly generated by members, from all levels of experience in amateur astronomy. So if you wish to write a short, medium or long article on any subject to do with Astronomy, please do so. Also if you have any photographs (astronomical objects or candid 'people' photos), I'd like to see them too.

I prefer articles to be types on Word or WordPerfect and supplied to me on floppy or attached to an e-mail. Otherwise, handwritten articles can be given or mailed to Phil Ainsworth who will type them up for me.

So please, start writing. The next issue awaits.

Bob Bee

STARS IN THE WEST

The cold night air echoed with a raging bellow from the dark trees on the horizon; points of light sparkled overhead and I felt strangely warmed in my feet as I moved closer to the arrangement of poles and boxes on the large concrete slab.

The bellow was the sound of hippos doing their thing in the Western Plains Zoo next door to Dubbo Observatory, a large tin shed containing a reception/shop, a meeting area for wet weather activities, and displays and a large concrete slab in the open air. Peter Nielsen owns and runs 3 Meade LX200 30 cm computer controlled telescopes and various large aperture binoculars in boxes and on poles set in the large concrete slab, and promises to show people 'large chunks of the Universe' in a short time. I visited there last year and along with several families and teenagers that night was excited at being able to seemingly float above the surface of the moon with the aid of a video CCD cam, but the cold was really biting in August.

I had come with my own list of objects to line up on, and after the paying public had gone home, I was offered the opportunity to swing around the sky to see the colours of Albireo in the Swan, M9 a tiny globular in Ophiuchus, and then the awesome sight of the planet Uranus. There was something really eerie and

exciting to see the ghostly green disk of this distant world and to consider that I was seeing it in real time across the vast distance. A few moments later the vivid blue of Neptune swung into the eyepiece as well. These planets were the highlight for me that night as I remembered the many times I had strained my eyes from my backyard or at our own star nights to differentiate these planets as more than points of light from the starry background. The memory still lingers

Oh! 'that strange warming of the feet', that comes from hot air blowers plugged into the electrically wired poles and set at waist and foot height. There were no 'tough guys' there that night who didn't sneak up for a warm at some point.

Ian Cook

Borrowing MacDob

The Society's own telescope, a 6" Dobsonian, is available for loan for members. It is easy to transport, set up and use. If you would like to borrow MacDob for a month, speak to Phil Ainsworth who has taken over the its custodianship. Though there is no hiring fee, members are invited to make a donation which will go towards the upkeep and upgrade of MacDob

Membership Fees

The Society has entered a new era whereby *Prime Focus*, cannot be produced as cheaply (i.e **\$1 per member per year**) as it has in the past. We now have to have it produced commercially and, although the cost is very cheap by commercial standards, it will cost an average of **\$10 per member per year** to produce.

Regrettably, the only way the Society can cover this is by an increase in membership fees. Rather than pass the whole \$9 on, the Committee proposes to increase annual membership by \$5 and absorb the \$4. The Committee is confident that members, both existing and new, will see that the benefits of our Society and the Journal are worth this modest increase (our first in four years).

The following is **Notice of a Motion** to be put to the **March General Meeting**:

"That due to the increased cost of *Prime Focus* coupled with the GST, membership fees be increased as follows:

- i) the cost of Full Membership be increased by \$5 from \$20 to \$25;
- ii) the cost of Family Membership be increased by \$5 from \$40 to \$45;
- iii) the cost of Student and Pensioner Membership be increased by \$5 from \$10 to \$15; and
- iv) the cost of the Joining Fee shall remain at \$10.

Table for Calculation of Distance to Planets from Earth

This Table can be used as a Ready Reckoner for finding the distance to a particular planet from the Angular Diameter given for that particular date.													

NOTE 1: The range of Angular Diameter (θ) for some planets is not continuous. This is to allow the maximum and Minimum to fit in.NOTE 2: For the inner planets, the Maximum and Minimum θ will not be visible due to alignment with the Sun (inferior & superior conjunction)NOTE 3: For the outer planets, the Minimum θ will not be visible due to alignment with the Sun (i.e. conjunction)