MACARTHUR ASTRONOMICAL SOCIETY Inc.

Journal

PRIME FOCUS

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President's Report

Most Recently.

Welcome to our last meeting of the year. When casting an eye over the last 11 months I can confidently say that it has been the most active and productive year since we started, a rather bold statement that goes somewhat on a limb. Take for example the number of Public Education presentations. This has been nothing short of "astronomical". I would like to express the gratitude of not only myself, but of the entire society in saying "a job well done".

From various reports coming back to me it seems that showing the night sky to all those who wonder is a rewarding and enriching experience. At our meetings the variety of topics that have been discussed has been amazingly diverse and the talent of our membership never ceases to amaze. Further to that we have been visited by some great "Guest Speakers" and this should continue early next year.

It was just last month, for example, we had three excellent speakers. My thanks go to Ian Cook for the quiz - were the questions really that hard?, I think it's time to learn some astronomy. Thank you to Bob Bee for the Kuiper Belt objects. Please Bob, don't take away my Pluto as I like it just the way it is, and finally to the Lloyd and Noel photographic display. It would make David Malin quite envious I'm sure!

It's upcoming

The annual Xmas party is on again, same venue as last time which is "The Courtyard" in building 21 at the University, on **14th December**, say from 6.00pm or thereabouts. As this is the last time we will be together this year it would be great to see as many members and their families come along as possible. Unfortunately we will not be providing a full catering service so please bring absolutely everything, this includes something to cook your food on, although I'm sure there will be a spare hot plate or two.

On the 11th of December we will need all hands on deck at the "Seimens Science Experience", a night of hands on astronomy at the Observatory, It's a Wednesday night from 8.00pm, about 80 to 100 science students from all over the state will be in attendance so we need as much help as possible. There has been some excellent advertising for this event recently in the local papers. Also the media has been in helping us by promoting our first telescope workshop at the Narellan

Library, see Ian Cook for details.

Our last Belanglo Forest night will be on the 7th December. Please note that there is NO general meeting in December. We will restart on January the 20th. We are returning to the Oaks airfield for member viewing nights on January 4 and will look at increasing our visits there over next year. Please find listed below a quick guide to our events.

07/12/02	Belanglo Forest
14/12/02	Xmas Party
04/01/03	The Oaks
11/01/03	The Forest
20/01/03	General Meeting

Important Announcement!

The extremely dry weather has taken its toll on the water tanks down at the cabin. i.e. they are empty, so you must bring all your own water. Also, all events of the society as advertised will proceed even if conditions look poor. Obviously some common sense has to prevail, so please contact me on my mobile (0410 445 041) or liaise with John or Lloyd and I will keep in close contact with them late on the day of our events. We have communications open with the forest ranger for weather conditions. Our visit on Nov 2 still went ahead as I had the keys, I apologise for my late arrival on the night but this could not be avoided. For those who missed out, a pleasant night was spent with good company, a cosy fire and a touch of fine sherry!
May I take this opportunity to wish everyone safe and happy times over the festive period and I look forward to seeing you all again next year, if not sooner.

Kind regards
Noel Sharpe.

MacDob

The Society's own 6" Dob telescope is available for a MAS member to use.

This would be an ideal chance for a new (or old) member who does not have a scope to try out a good telescope (while 'only' 6" aperture, MacDob had great optics) to get both the thrill of viewing and also experience in telescope handling.

It costs nothing to borrow MacDob, though a small donation towards its maintenance would be appreciated.)

If you'd like to borrow MacDob over the Christmas break, discuss with me at the November meeting or call me on 4647 4335. (NOTE: This is a new phone number.)

Life Out There?

by John Casey

[This is the 2nd and concluding part of John's fascinating article.]

Life Something Like Us

It is extremely likely that life, if it exists elsewhere, will require the very same chemical elements to that found in life on Earth - and thus will be based on carbon, oxygen and hydrogen, with small but critical quantities of heavier elements. This is because the properties of all compounds are determined by those of the elements with which they were made, and these in turn are mainly due to the combined effects of the electrons orbiting the nucleus, rather than the nucleus itself.

So the chemistry is governed by the electron orbital patterns, with different isotopes of the same element having slightly different physical properties, but nearly identical chemical properties. [Isotopes of each element have differing numbers of neutrons, but the same number of protons for that particular element.] **There will be no alien elements on these alien worlds**, except for the fleeting presence of some radioactive isotopes of already known elements that decay away with their own individual short half-lives.

This is because the same fusion and fission processes

have been going on in all stars in all locations in the cosmos. However, over the aeons, the proportion of heavier elements has slowly increased from the ashes of past supernova.

Carbon has unique chemical abilities to combine with itself, that make it almost certain that if there is life out there, then it will be based on carbon, and not other bonding elements, such as silicon. There are more "organic" chemical compounds – i.e. those based on carbon-carbon bonds, than there are for all other elements combined. Therefore, the naming of carbon chemicals as "organic" is relevant, because all "organic life" on Earth is based only on carbon, and the bonding of carbon to mainly oxygen, nitrogen and hydrogen, with important, but small amounts of other elements such as sulphur, phosphorus, calcium, etc.

Ashes to ashes, dust to dust - we do not leave much behind, for all our weight, when the time comes to go and fire breaks up the "organics" into a small urn of ashes, and a lot of CO_2 and H_2O!

Supernova and Carbon Dating

Supernova explosions blast out not only heavy elements - hydrogen and helium particles are blown off at large fractions of the speed of light. This can cause some unusual effects. If such particles collide with atmospheric nitrogen, the particles hit with such force that carbon 14 is formed from the fragments in spaulding type atomic collisions. This carbon 14 forms carbon dioxide in the atmosphere, and plant life, breathing in the CO_2, and breathing out oxygen, build this carbon 14 into the cellular structure of the plant. But this carbon 14 is radioactive, with a half-life of 5,730 years.

The carbon dating of wood relies on the fact that, whilst alive, the tree or plant life constantly exchanges the carbon within itself with that present in the air, and preserves the same ratio of C_{14}/C_{12} as in the CO_2 in the air whilst it lives. After it dies, the ratio slowly decreases as the C_{14} decays. The carbon 14 dating of wood relies on there being a nearly constant level of bombardment of the atmosphere with high energy particles from distant supernova [and none being nearby in the recent past, at least on time scales of multiples of 5,000 years!]

The Beginning of Life - Measured or Caused by Supernova Events?

If life required the presence of at least trace levels of heavier elements, as it does on Earth, then it was unlikely to have formed in the first stages of the initial epoch of star formation. Life would have to wait until supernova spread the heavier element fertilisers needed for life widely throughout space – so that sufficient was present in "safe" regions for life to spark.

Were There Many False Starts for Life Elsewhere?

In the early epoch of galactic evolution, regions with planets that have been seeded with the necessary elements for life would be attached to stars within nearby spirals of the same galaxies as exploded supernova stars. The reason for this is that this is where the dust clouds would be most prevalent and concentrated, and the shock waves from the supernova cause compression of dust clouds that then seed star formation nearby. But the supernova events, as givers of life in the form of the heavier elements, can also be death stars as well - and can incinerate or sterilise life in regions too close, from X rays, blast and high energy particles.

It may have taken many thousands of generations of supernova to spread the heavier elements widely enough into space to allow a safe haven for initial life to prosper relatively undisturbed by such energetic cosmic events nearby. There may even have been many regions with spontaneous development of life, but with this snuffed out from nearby supernova - as well as other disasters such as impacts and perturbations in orbit of the host planet into inhospitable zones unsuitable for life.

Thus, there were many factors in addition to nearby supernova events that could snuff out life once it had begun, and depending upon such factors, the duration of all life on such islands might have been initially relatively short - at least compared to the 10-15 billion years since the Big Bang.

Death Stars

Death Stars [as the cause of mass extinction on Earth] have received scientific backing from recent studies. The Sun and Solar System occupies a position 3/4 of the way out in one of the spirals of our galaxy- the Milky Way, [about 30,000 light years from the hub, which we orbit about once in 200 million years]. But as well as revolving with that spiral arm, we also oscillate from above the galactic plane to below it and back in a cyclic motion.

Examination of the position of the Sun relative to the galactic plane over time has shown a very strong correlation of past mass extinctions of life on Earth with passage through the densest star fields close to the galactic plane. From these studies it appears that the probability of a mass extinction on Earth from each passage through the galactic plane is about 50%. Thus this region of high star density, and higher likelihood of a nearby supernova really is "in harm's way"! But depending upon your point of view, these mass extinctions are a rebirth, in that new species rapidly fill the void left after the original dominant species became extinct, and for instance allowed mammals [including humans] to develop after the dinosaur became extinct.

"Suitable Conditions" in the Nursery of Life

- The Right Amount and Kind of Sun Light

The Earth receives energy from the Sun at a rate of 1.4 kWm^{-3}. This is called the Solar Constant. This is a high rate of energy delivery, equivalent to burning one litre of petrol per minute for every square meter exposed to the Sun [measured at right angles to the Sun]. Of all this energy delivered to the Earth's atmosphere and surface, 98% of the energy is at wavelengths between 0.25 and 5 micron [between UV and near infrared]. On the ground surface at Sydney [latitude 34° South], the total incoming Solar radiation is 0.96 kW/m^3, because of the angle that the light reaches the surface. During the day, the ground absorbs energy, and at night there is a net loss as heat is radiated away into space. Carbon dioxide [and water vapour] in the atmosphere absorbs some of this infrared energy, and can keep the heat from escaping; - so CO_2 is a "green house" gas because of this effect is strong, even though there is only 0.03% CO_2 in air.

Luckily for life on Earth, a large proportion of the harmful UV light is absorbed by ozone produced from oxygen in the upper atmosphere. Enough still reaches the Earth's surface today to be lethal to earthworms by a few minutes exposure to full sunlight. Loss of this atmospheric ozone layer from volcanic events and vapours from man made chemicals could cause mass extinctions of primitive life on land and sea surfaces, and from loss of food sources, eventually, even of man himself.

The temperature on the surface of Earth would be extreme if all this Solar energy was absorbed. Luckily, the Earth re-radiates a large amount of this energy from the atmosphere and the surface. The back-radiation spectrum is centred on 10 micron, in the heat [infrared] region of the spectrum.

Life on Earth has been fortunate, with a number of properties that suit that life, such as-

1) A Sun that is of the right mass and age to emit energy with the right blend of radiation frequencies, so that not too much lethal UV is produced. A hotter sun gives more UV relative to visible light.

2) The right distance away, so the total energy received allows liquid water to exist on the surface.

3) The Earth's orbit is not so eccentric that it passes out of

the habitable zone during each orbit, or over longer periods from influences of other nearby stars.
4) The Earth is tilted on its axis, so that seasons are present to spread the hot and cold zones more widely, and to keep a larger percentage of the planet hospitable to life.
5) The Sun is far enough away from other suns in the spiral arms of the galaxy, and it maintains large mass outer planets in orbit to scavenge most incoming comets so that cataclysmic interactions and collisions of large bodies with the Earth are rare.
6) The Earth is large enough to retain most of its atmosphere.
7) The Earth has a magnetic iron core, such that its magnetic field is strong enough to deflects most of the energetic particles from the Solar wind that could kill life.

-Temperature and Pressure

All life on Earth operate with internal temperatures in the range -5°C to +125°C, with larger animals maintaining their core temperatures in spite of even more hostile external temperatures by insulation of fat and fur. This internal temperature range is determined by conditions that allow the most critical component for life - water- to remain in the liquid state within their cells. At the Earth's surface, under atmospheric pressure, water is liquid between 0 and 100°C.

But life has pushed the boundaries at both ends of this temperature range, and has been found from high in the upper atmosphere down to the deepest ocean trenches, and even in solid rock deep down, under enormous pressures. At low temperatures, some cells make effective antifreeze of sugars and glycerol type compounds to stop the liquid water within their cells from freezing solid.

At the high temperature end, some simple cells survive in water under pressure sufficient to prevent the water from boiling, such as near volcanic vents on the ocean bottom and by deep burial underground. If the pressure was lowered, then these cells' walls would rupture and they would die as the water within the cells boiled.

The temperature operating range of each cell is determined by the enzymes that it uses to regulate the biological processes it needs to survive. The specific enzymes that each cell uses **denature**, or degrade, over very narrow temperature ranges. So, for instance, simple Antarctic organisms would coagulate their protein, and fry like an egg below 20° C, - our "room temperature"- because of the enzymes that they utilise to match their operating environment [through evolution] cannot stand this "high" temperature.

-Salty Seas

Some simple life survives quite well in brine solutions that could raise the boiling point up to about 105°C- but they have devised ways of overcoming large osmotic pressure differences and are rare because they cannot compete under more favourable conditions. Most cells remain in osmotic equilibrium with their environment - that is, they maintain total salts concentrations within their cells near to that present outside the cell [such as in sea water.] Differences between WITHIN and WITHOUT concentrations cause the cell walls to leak water to dilute the stronger concentration, upsetting the functioning of the cells.

This is why salting of beef is effective in preserving meat for long periods - the bacteria which spoil the meat come in contact with the preserving salt and have their cells ruptured by the high osmotic pressure of the salt liquor outside their cells. This shrinks the cells and causes them to die.

-Acidic and Alkaline Environments

Another critical parameter for life is the acidity/alkalinity of the aqueous system in which they live. Most operate in waters with pH ranges of between 4 and 9, but some hardy life can be found in volcanic pools of weak sulphuric acid at pH <1. Within the life itself,

specialist cells routinely adapt to such extremes of acidity and alkalinity to process food. e.g.- The digestive enzyme pepsin found in animal stomachs exhibits its optimum activity at pH 2 in the hydrochloric acid produced there, whilst trypsin is most active in the intestines at pH 8.

Life is Frugal

Most cells operate best where their enzymes are most active at the pH of their immediate surroundings. As shown above, higher animals have utilised clusters of adapted cells to undertake useful tasks within their own isolated environments that then benefit the whole animal. An example is the digestion of foods in an enclosed stomach to process food that would otherwise not be usable.

In this way life does not have to make all the organic components them self - they break down already formed compounds just sufficiently to be able to utilise these recycled components from previous generations and from other species. Life has had to be economical on where the effort was put in, and not create everything from scratch.

Adapt or Die

In each environment on Earth with life present there is a spectrum of life more or less adapted to the current conditions. As these conditions change, the organism that best fits that niche amongst those present will shift, and the population distribution of these organisms will move to reflect this changing survival probability, opening opportunities for new species that arrive at the right place and time and those who adapt quickly. When change occurs too rapidly, mass extinctions will occur, as none can adapt fast enough to survive.

Seeding by Comets?

It may be that the first microscopic life was not even formed on planets at all - but in comet like debris that condensed or swept up the necessary starting materials, and received just the right combination of radiation to warm and nurture these seeds to a point where they could then remain dormant to await good times. In falling of such material onto existing planets could then conceivably sprouted life in many star systems with the same life or near relatives. Pushing the location for development of life into some distant, unknown region of the cosmos has done nothing to change the difficulty of initiation of life - it just transposes the location and the epoch in which it developed.

Viruses as Aliens?

Hoyle and others have proposed that life may have arrived on Earth as viruses from comets. Viruses are unlike all other life forms on Earth, and are unrelated to the other simple living species. They appear to dwell in a twilight zone between the living and the non-living and are very robust. Viruses are stripped down packages of hereditary information, either DNA or RNA within a protein coat. Viruses are parasitic predators and need host cells to replicate and live. Viruses cannot live except within a living cell because they rely on the nutrients and mechanisms of that host cell to replicate.

They do this by misdirecting the host cell's mechanisms, and probably arose originally from parasitic cells that then lost much of their own structures and functions, with the exception of those needed to infect and reproduce. This cutting back on their own requirements would have been a winning strategy under intense competition, in this early evolution and quest for survival. However, a virus, without also a host already present or introduced at the same time, would not have been able to replicate [by itself].

So life could not have started with viruses from elsewhere in the universe, unless they brought along suitable host cells with them. If the host cells were already here or hitched a ride too - then who needed the viruses as the source of life? Viruses might indeed commute throughout the cosmos - if other cellular

life forms are abundant out there as well, - so if we do find viruses in comets, then this would imply life is commonplace in the cosmos as well.

The Big Question-Sustaining Life- the Leap From One to Symbiotic Many

The big question, no matter where it originally occurred, is how life went from one species to many interacting species that could maintain a stable population. Even if a single life form came into existence by chance, it would replicate and consume all that it needed to survive until one of the critical components for its sustenance was exhausted - and then the population would collapse to extinction.

Only when mutations enabled some portion of that population to consume still available alternatives and then survive, and to mutate enough to eventually consume the wastes of the original species, would there be any chance of continuing survival of any of the species in the chain. Migration to other areas or other planets would postpone this exhaustion of vital nutrients, but in each area of such growth there would be this crisis. Only rapid death and decay of that single species, [or cannibal tendencies] would prevent an extinction if other species were not formed.

So it appears that a fast rate of mutation might actually be an initial requirement for life to proceed - at least until there was sufficient diversity of life to ensure that all available resources were being utilised and recycled.

Up the Tree to Greater Complexity, and to Us

Higher life needed to build upon the community of simple life to develop. This rise in complexity would have been driven by survival of the fittest, with there being advantages for cells that fused together with others. Cells clumped together into communities, and became more specialised. Symbiotic relationships developed, where cells worked together for their common survival - by out-competing other cells. This set in motion an arms race of grouping trying to outdo their neighbours- where only the fittest survived. This pushed the drive towards more complexity, and to systems that became more removed from thermodynamic equilibrium with their environment.

One definition of life is that of a system that consistently [whilst it is alive] is far from thermodynamic equilibrium with the local environment. Life must burn food and be hotter than the environment to live. Small means small temperature differences and less energy available to live. The cell units had minimum volumes necessary to perform their functions and are generally similar in size, so association of cells into clustered units is one way to limit the heat losses into the environment. Complexity then begot complexity and eventually resulted in animals like us.

We live by burning our food in oxygen, the waste product of huge numbers of simple photosynthesis cells. We obtain much more energy from this efficient process than those simple cells could get from their photosynthesis of CO_2 into O_2, but without those cells we are doomed. For our waste is their food, and visa versa. We are higher up the evolutional ladder, but much more dependent on the lower members than they are of us. This is likely true also for our alien friends as long as chemistry and physics are universal and uniform.

So if there is life out there, it is likely to be predominantly simple, and cellular. For every trillion or so of these that we find, there might be a few as complex as worms, and perhaps a self-destructing "higher" species, something like us!

The Recent Search for Life

NASA has approached the search for life within the Solar system and especially on Mars visually and chemically. They initially looked down from space for signs of life, then with after touch down of landers, looked in wide-angle views, then scooped soil and chemically

tested for indicator reactions of life. They saw no Martians, large or small, and the chemical testing gave peculiar results, probably due to exotic oxidants formed by UV light on the soil surface.

SETI has followed a top down approach, and is actively looking for signals from distant life forms with intelligence enough to transmit messages via high powered electromagnetic transmissions. This is a long shot approach, but as most people want to know if there is intelligent life out there, rather than just the most primitive forms of life. This approach might be the most economical way of answering the question [assuming that THEY are smart enough to be able to communicate with us, but dumb enough to want to communicate with us].

But if there really is intelligent life out there a bit like us, I wonder if they would transmit free to air - or would we have to send our credit details, and sign up first. Looking at our record of wars and extinction of species, they may think we are a bad risk in more ways than one.

But you never know, they may come by, and take us out for dinner. But who will eat whom? There is no such thing as a free lunch in this galaxy. In the end, on a cosmic scale, perhaps we will be swallowed by a supernova prone star, and recycled yet again! So the question might change from "Is there life out there?" to "Is life still here?" and " For how much longer?"

John Casey

The Camera Club

Well, I blew it at the last monthly meeting. I showed some of my photos and put down some rather strange results to the quality of the film. Part of the fun is to look at your results and find out what went wrong. In my case it was so obvious that I missed it completely.

The reddish staining on the film was obviously light intrusion as conveyed by John Koster. It all came back to me later when I realised that the camera body needed a good click back into place before I took those lovely daytime shots. My recollections now confirm that just before taking those shots of the country side that the camera back was a tiny bit loose. I snapped it back in place and thought no more of it...what a dunderhead. Oh well, back to the drawing board !

We left off last time at taking some star trail shots. Has anyone got results to report? If so, please write about it in future Prime Focus editions. I have previously spoken about the reward in taking some great photos. In consultations with other members the upcoming Saturn and Jupiter appearances will be worthy of a few snaps. I only have the one shot of Saturn and many failed attempts at trying to take a better one. Maybe next year will be more fruitful.

With Focal or F ratios the message here is that for deep sky photography the lower the F number the better. A long focal length telescope at say F12, would not be beneficial for wide field vistas of faint objects, however would be great for planetary and lunar photography where the exposure time is just a few seconds and relies on a strong image.

The term fast or slow speed relates back to the F numbers and how the incoming light is impacted on the film plane, slow for F12 and fast for say F5 as examples. When using an eyepiece for your photography the F ratio increases dramatically making the system work very slowly. This is called eyepiece projection as opposed to Prime focus photography where no eyepiece is used, just the mirror or lens.

For photos of the Moon or Planets use an eyepiece for a few seconds, results will show even if tracking is a bit off. For photos of clusters and nebulae ,ono eyepiece is needed as again this will make the system work far to slowly to capture the very faint light. Exposure time from a few minutes to an hour, generally speaking, is needed for the above mentioned faint stuff.

I am sorry this article is a bit short on exposure, but I'll try to play catch in the new year. Please submit any articles on photography to the Camera Club so we all may benefit and learn together.

Good hunting

Noel

What IC This Month

Nov. 19 – January 20 2002

Quick Sky Tour

Zodiac constellations in November start with Sagittarius sinking in the western evening sky and stretch across to Gemini in the eastern morning by January.

Bright stars in the north will be Altair (Aquila), Deneb (Cygnus), Aldebaran (Taurus) and Orion

Bright stars in the south include Fomalhaut (Piscis Austrinus), Achernar (Eridanus), Canopus (Carina), Sirius (Canis Major), Gamma Velorum (Vela), the Pointers and the Cross.

Venus / Mars cuddle on 30/11
Eclipse of Sun (SA only) 4/12
Saturn and the Crab 5/01

The Moon Diary

Full M. 20 Nov; 20 Dec; 17 Jan
Last Quarter 28 Nov; 27 Dec
New (Dark) M. 4 Dec; 3 Jan
First Quarter 12 Dec; 10 Jan

Evening Sky Planets

Mercury rises in the evening in December but will not be far from the horizon until the second week. On 5/12 it will be above a thin crescent Moon before setting, but will rise to its greatest distance from the Sun on Boxing Day evening. During January it will descend to hide in the Sun once more.

Neptune & Uranus are both overhead in Capricornus during December in the early evening. With good eyesight they can be spotted with binoculars, but most of us will need at least a small telescope. These slow moving planets will be in conjunction with the Sun early 2003, so it will be some time before we see them again

Saturn rises about 9 pm in the evening on the border with Orion and Taurus. On 22/11 it will be just 4° above a full Moon. Retrograde motion will bring it back into Taurus for opposition when it will be visible and at its brightest all night on 18/12. The end of December and early January will see it within half a degree of M1 which will appear to be closer to the planet than its moon Titan on 5/1.

Jupiter rises in the early morning about 1.30 am in Leo. On 27/11 it will be above a waning Moon. During December it will rise earlier and return to reside in Cancer. During December to March it will be at opposition and we will have the best views all night.

Morning Sky

Venus appears as the Morning Star in Virgo all November. Late in the month and again in December, it will form various triangles with Mars and the Moon brushing close about 4 am.

Mars stays in the morning sky close to Venus and Spica in Virgo. On 6/12 it will be within 1.5° of Venus at 4 am and will form a triangle with the late crescent Moon and Venus 2 days before New Years Day. At the end of January 2003, Mars, Venus and Mercury will be in line in the eastern morning sky before sunrise.

Comets

P/1992 Q1 (Brewington) will brighten from 11 to 10 magnitude and can be spotted late November near Neptune in Capricornus. Middle of December it will be 3° from Uranus before moving near to Theta Aquarius for January. Good skies in the evening should give you a chance at this in 2003.

Meteors

Late November look for the **Taurids** originating from between Pleiades and Orion. Although not many per hour they are said to be slow and bright. Then between 7-17th December the **Geminids** can produce up to 100 per hour of bright medium speed meteors. After midnight is the time to

look even though Gemini will be below the horizon

Good seeing IC

Portraits in The Sky

Being summer holiday time we are going camping by the river for our constellations this month.

ERIDANUS – The River

Is connected with a case of dangerous driving under the influence of testosterone and female persuasion. Phaeton, the son of Helios the Sun god, wanting to impress the girls, pestered his father to let him drive the chariot that carried the Sun across the sky. Alas Dad caved in under the constant yammering, and off he went. Now the horses that drew this vehicle were fiery creatures and difficult to control at the best of times. First they shot off too high and the Earth grew cold, then swooped too low and crops got scorched and Phaeton could not pull them up. Finally an exasperated Zeus (Jupiter), hurled a handy thunderbolt knocking him into the river. Unfortunately Phaeton was killed and for egging him on the girls were turned into poplar trees lining the river bank. Sounds like today's newspaper doesn't it. "Fatal high speed chase!"

Stretching from Orion's foot, originally the river ended with **θ Eridani** called Acamar, because the Greeks couldn't see further south. Now its end is at Achernar, near Hydrus. Both Acamar and Achernar mean 'end of the river'.

There is some doubt about whether the constellation refers to a real river or not. If real it could be the Tigris, the Euphrates, or even the Po in Italy, but my choice is the Nile in Egypt because that river's unknown source was eventually found deep in the southern hemisphere.

Another name for Eridanus is *'The Ostrich'* and if you turn a map of the constellation upside down to view it as seen from the northern hemisphere, there is some resemblance to an Ostrich.

Starting near Orion with β called Cursa, meaning foot stool for Orion, the figure swings around in a wide circle east towards Cetus, around Fornax before snaking off to **α Achernar** in the south. In the north east corner of this bend in the river are the 4-5 mag. stars **ζ, ρ, σ, η** making up the Ostrich Nest.

There are many fine double stars in the constellation including **ρ Eri** a clear to see orange and yellow, and **o Eri**. the 'Ostrich Eggs' about 15° to the right of Rigel. **o2** is actually a multi system with a yellow primary and a white dwarf showing as a wide double in a telescope. The fainter of these two is a pair of white and red dwarfs considered the easiest dwarfs visible to amateurs. "I'd like to see that!'

Along the border with Fornax we find **τ 1-9** faint 4.0 mag. stars spread over 17° leading back to the west. This brings us to **υ 1-7** Beemim and Theemim before heading south. Tucked underneath Fornax is a white pair **θ Eri**, (Acamar) and 20° away further south, the blazing blue-white of the 9th brightest star in the sky mag. 0.4 **Achernar.**

The classic barred spiral galaxy **NGC1300** is visible as a faint oval haze in 150mm and is located 4° north of **τ4**. Photographs show the spiral arms. About 8° west of Acamar **θ** and a little to the south is **NGC1291** a bright oval galaxy which looks like a globular in 150mm. Lastly for you nebula hunters 4° west of **γ Eri** called Zaurak is **NGC 1535** a 10th mag planetary nebula. Then **IC 2118** the 'Witch Head' reflection nebula is just 1° south of Cursa drifting down to Rigel. More for the larger apertures I think.

FORNAX - "The Furnace"

Fornax is a constellation created by Nicolas Louis de Lacaille from several fairly bright stars in the bend of the river Eridanus. Impressed by the development of chemistry in the mid-eighteenth century; he called it *Fornax Chemica.*

This uninspiring but surprisingly large asterism, connects the three brightest

stars, which are fourth and fifth magnitude. ***Alpha Fornacis*** passes overhead on 9 November and is an easy visual binary, however most interest is on the Fornax Galaxy Cluster located in one corner between Chi Fornacis and Nu Eridanus

Double stars:

Alpha Fornacis is a visual binary magnitude 4.0, 7.0; separation 5.1". with an orbit of 314 years.
Gamma^{1A} and gamma^{1B} Fornacis form a faint triple system: AB: 6.0, 12; 12", C: 11; 41", and ***Omega For*** is a binary: 5.0, 7.7; 10.8".

Deep Sky Objects:

"The Fornax Galaxy Cluster" in the south-eastern corner on the border with Eridanus is a group of 18 galaxies gathered between Chi Fornax and Nu Eri. However most are 12th mag or fainter. The brightest is ***NGC 1316***, 8.9 magnitude (also *Fornax A*), 1-2° SW of chi^3 For, with ***1317***, a 12 mag. galaxy right next to it.

NGC 1365, is about midway between Chi Fornacis and Nu Eri, or 1.5° ESE of chi^3; at 9.5 mag. a splendid barred spiral seen face on with open spiral arms. ***NGC 1399*** is nearly as bright at 9.9, and is 2° E of chi^3 Fornacis.

Turning our eyes to the South we can enjoy some fishing with:

DORADO - The Swordfish

Dorado was introduced by Johann Bayer in 1603 in his famous star atlas Uranometria, and is also known as "The Gold Fish", a well known large sea-going game fish.

Alpha Dor is on about the same latitude as Canopus and will be directly overhead on 29th November. While the main stars are not very bright, there are several objects of interest in the constellation, especially the Large Magellanic Cloud and the Tarantula Nebula.

The **Double stars** are either too closely placed or too dim to be of interest to our scopes

Deep Sky Objects:

The Large Magellanic Cloud is a miniature galaxy about 200,000 light years away, a satellite of the Milky Way. It has perhaps a tenth of the mass of our own Milky Way Galaxy, with roughly 10,000 million stars.

I must admit that mostly I have been content to just observe the starry cloud and not probe too deep. However if you get some real eyepiece power onto this area, wonderful things pop out!

An obvious starting point for the new observer is the largest glowing gas cloud ***NGC 2070, the Tarantula Nebula,*** This is so bright it has a star name *30 Doradus*. Dozens of supergiant stars are clustered at its centre, giving the nebula's light . With a diameter of about 1,000 light years, if the Tarantula Nebula were moved to the Orion Nebula, it would fill the whole constellation of Orion.

Tarantula Nebula Area

Just on the left hand edge of 2070 is **2100**; a clearly visible knot of stars. Boost up the power and see the blue-white young stars.

Further to the left (about the same distance as the width of 2070) is **2164** within the same field of view of a 20mm eyepiece are three star clusters forming a triangle.

The LMC is full of different coloured stars indicating their age. Remember this is a galaxy and like the Milky Way, the stars have different ages. There are many yellow and orange mid-life stars, but also blue and white relatively young new ones.

Older stars have supernova-ed and density pressure waves crashing into gas clouds are still triggering star birth. A good computer star program will give some detail of objects to be found here.

During January while you are waiting for our first star night of 2003, give it a go!

Ian Cook

A Year's End

And so we end another MAS year – number 7.

It's hard to believe that Macarthur Astronomical Society has only been in existence for 7 years. Hard to believe because when you look around at our meetings and see the folk there, comfortable with each other, 'old' friends, the depth of knowledge contained across the membership, the extent of public talks and sky shows each year, you can't imagine all this coming together in only seven years.
And yet it has! I have proof. A folder containing all 70 editions of Prime Focus going back to January 1996.

There are many names contained in the by-lines of the articles that fill those issues. Some are no longer with us, some have appeared in nearly every issue, others are new and hopefully will continue their contributions.

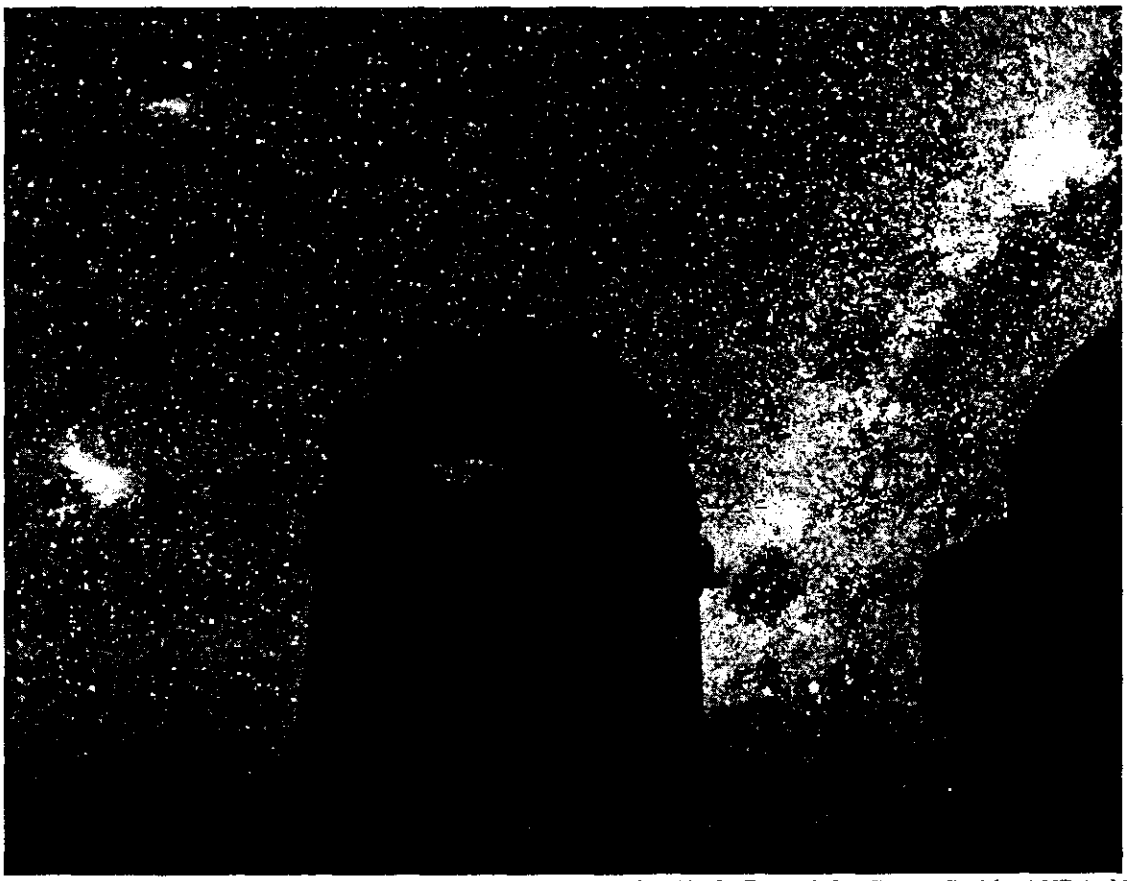
But the main feature is the unique approach of all the authors, exhibiting their personal approach to our common passion - astronomy.

So as we approach 2003, could I urge all members of MAS to give serious consideration to penning something of their thoughts, observations or simple anecdotes to keep our Journal, and indirectly, our Society, so vibrant and unique. Get them to me in the new year, so you too can be a part of MAS history.

My best Wishes for a safe and Happy Christmas and New Year

Bob Bee (Editor)

High atop a Chilean mountain lies one of the premier observatories of the southern sky: the Cerro Tololo Inter-American Observatory (CTIO). Pictured below is the dome surrounding one of the site's best known instruments, the 4-meter Blanco Telescope. Far behind the dome are thousands of individual stars and diffuse light from three galaxies: the Small Magellanic Cloud (upper left), the Large Magellanic Cloud (lower left), and our Milky Way Galaxy (right). Visible just to Blanco's right is the famous superposition of four bright stars known as the Southern Cross. A single 20 second exposure, this digital image was recorded with a sensitive detector intended for astronomical imaging. The observatory structures are lit solely by starlight.



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