MACARTHUR ASTRONOMICAL SOCIETY Inc.

Journal

PRIME FOCUS

Volume 1 Issue 8 August 1996

PRESIDENT	VICE PRESIDENT	SECRETARY	TREASURER	EDITOR
PHIL AINSWORTH	NOEL SHARPE	DAVID MCBEAN	ROBBIE CHARLTON	BOB BEE
(02) 605 6174	(046) 253 051	(046) 559725	(047) 749 331	(046) 251623

PRESIDENT'S REPORT

Welcome to all our members and guests. I hope you are all enjoying the society with its star nights and great lectures by our guest speakers.
The talent continues over the next few months as we are hearing from;
* Peter Druery on Star Maps and Wheels (19th August.)
* Noel Sharpe (VP) on Comets and Doomsday (16th September)
* Rolando Demichiel on the controversial topic of Cosmology and the Big Bang Theory (21st October). He is visiting us from Sutherland so let's make him feel welcome.
* Steve Manos -- new member from the Australian School of Astronomy will talk to us about the Anglo Australian Telescope (Nov.18th)

Our **open night at Bringelly** may have to be postponed until next month as we have not had any reply on becoming a charity and thus may not be able to sell food. Lets hope we can have one soon.

Our **Christmas Picnic** is going to be on the first Sunday of December (1st) at Pembroke Park (on Pembroke Rd, Leumeah) so we can all have a BYO BBQ and the kids can play on some swings. Commencing 1pm to...?

CAMP CONSTELLATION - 9th/10th November.

Kangaroo Valley seems the likely place for our camp and weekend of viewing the stars and the sights of the beautiful Fitzroy Falls. There are great facilities for camping at Kangaroo Valley and the sky should be great. Please let me know of your interest and place your name on the list on the notice board .Thank you.

A big thanks must go to Bob Bee for his very interesting and informative talk on 'The Distances to the Stars'. After listening and then reading the information booklet that accompanied it, I now feel more comfortable on the subject.

MEMBERSHIP

It has been voted and agreed by the committee that a joining fee of $10 will commence from September 1st this year. This is because membership after this date will be eligable for membership until March 1998.

We are trying to have all fees due by May 1997 as it is far easier to keep the books for one membership date for all members. All fees payed from March-May 1997 will allow membership till 1998.

All current members need not worry about this joining fee as they have already joined and are members of the society. Please feel free to see Robbie, David, myself (Phil) or any other committee member for an application form.

It has been decided by the committee to ask all visitors for a $2.00 visitors' donation after the first visit unless they wish to join the society on that night. Also due to production costs, our Journal will remain free for members, however guests will be requested to donate $1.00 for a copy. Tea and Coffee remain 30c. Thankyou for understanding.

LIBRARIAN'S REPORT.

I would like to thank all the members who have donated items toward the library. Chris Barnett must receive special mention for his the books on physics.

The library is open to all members to borrow. Videos, magazines and some books are available for a one month loan. Some items may still be in Reference as they are large valuable books or the most recent magazine. Dr.Bhathal's book is on reserve for six months. This will give everyone a chance to peruse the material in it and decide whether to borrow from the library or purchase the book from the National Library of Australia for $24.95. See me for details.

I am pleased to announce that people who have donated items have their name inscribed on a small sticker inside the book. Any further donations greatfully accepted. Also I have made 'date due' slips and purchased a date due stamp (no more excuses for late items).

(Phil Ainsworth - President/Librarian)

A home-made Dobsonian Telescope

THE MARTIAN FRONTIER

Ever since the dawn of time new frontiers have been man's goal. Humans have continued to strive for better living standards, other mineral resources and to expand mankind all over the globe.

Throughout history men and women have explored the entire Earth. What the Pacific Ocean was to Cook is now the gulf of space between Earth and Mars.

Why Mars ? Why not live under the great oceans of Earth where great untapped resources lie or the remote regions of the Antarctic ? Or further still the Moon ? After all, we have been there and know what to expect. Surely it would be easier.

All these places for settlement are all possible and would be much closer than inhospitable Mars. However, neither of the previous destinations are far enough away or help the situation on Earth, as they rely too much on still using Earth's finite resources.

The Moon is definitely of closer proximity to Earth than Mars and it does contain oxygen in the rocks and the rare element Helium 3 which could be used as a fuel and limitless supply of solar energy. But this still is not enough as it lacks water and elements such as hydrogen, silicon, iron and many others found on Mars.

Finding oxygen and water on the Moon would be like trying to find gold in the oceans on Earth (it is that rare and hard to extract). However, Mars has a plentiful supply of hydrogen for fuel, water in the atmosphere or in the sub-surface -- Permafrost.

Landing on Mars would have to be approached differently than the almost airless Moon, as Mars does have a rather thin tenuous atmosphere - 1/100th of Earth's - but needless to say still enough to make landing on the Red planet a little more difficult. Space craft when they re-enter on Earth have to glide through the atmosphere and Mars is no different. This process is know as aerobraking, using the atmosphere to slow a spacecraft down and then use parachutes.

Colonising the Moon would lead to many of the colonists permanently relying on Earth to supply them with resources. The people could never be totally self sufficient as a colony on Mars. Growing food and water supplies would constantly be a struggle even if possible on an airless body such as the Moon. The Moon would need specially developed greenhouses with lighting to let the plants know an approximately 24hrs day and night.

Mars, despite a greater distance would be a much greater prospect for colonisation as it has all the ingredients to make it survive. A group of scientists could grow food in greenhouses and not worry about endless nights. Mars has a 24hr 37min day/night, air which could be filtered into oxygen to breathe and there is ample carbon dioxide for the plants to photosynthesise. The seasons are similar to Earth, only twice as long. Plants could survive much more readily than on the Moon.

Mars is ideal as the next place for humans to live as it is far enough away to be free from Earth's cultural and political domination. After 20-30 years Mars could become independent.

Living off Mars would not be easy for the early colonists, they would still be required to suit up when they walked outside their shelter. Habitats would need to be insulated from cosmic and especially Solar rays, but not to the extent as on the Moon because it has a slight ozone layer due to its thin carbon dioxide atmosphere.

Mars, as I mentioned before, has all the ingredients for humans to live off the land. It contains many necessary minerals that Earth could use as well as the people staying on the planet. Some other minerals Mars has are silicon, phosphorous, inert gases and raw materials needed for building domes and habitats.

The United States with collaboration from other space faring nations (and I include Australia) have the technology today. If technologies and a living off the land approach were implemented, man could be walking and living on Mars within the decade.

Once humans reach Mars and an infrastructure is in place, I see no reason why at least 100 intrepid individuals could not migrate to our neighbour. Trade within 50 years would be established with Mars becoming completely self dependent.

The reason why mankind needs to go to Mars is that humans are ever increasing in population, resources are running low, so unless we find a rich source of minerals to mine, Earth will eventually starve itself and use up all its reserves. Also with the increasing pollution levels, Earth will eventually suffocate and cause untold damage with global warming. Mars could use a bit of global warming and so why not relocate industries to the Red Planet and thicken the air so that it will have more ozone, warmer climate, and possibly genetically made plants could start to grow and thrive over the surface.

Mars is not the ultimate answer, but it is a beginning. Population won't be solved by 100 eager colonists per year, but if it can be shown than humans can live away from their home, then possibly further colonies can be started on the Moons of Jupiter, Saturn or a Earth-like planet around another star in reasonably close proximity. All this is futuristic speculation but if we start soon, maybe some of earths problems can be reduced.

We as human beings are destined to explore the cosmos, learn new technologies, and I feel Mars is the first step toward leaving our cradle Mother Earth.

Finally, where would all of our Earthly civilisation be if Captain Philip or Christopher Columbus decided to never stray from their shores. Times are very similar today as that of early Europe, we have a necessity to explore because of the demand for more food and resources. These men had a vision to explore and improve the life style of all of us, let us continue in the shoes of these great pioneers.

(Phil Ainsworth)

****

'PRIME FOCUS'

Hopefully you will have noticed that our newsletter is a newsletter no more. It is now a Journal.

Also, you will have noticed a new name - Prime Focus. Why Prime Focus?

Well, the committee wanted a snappy, dignified, individual, astronomy relevant name that would distinguish our Journal from others, but also one that carried a message of the society's philosophy and vision.

Definition: 'Prime Focus' is the "first' focus of a telescope, before the light has passed through secondary reflectors or lenses. (That is, it's the 'real thing'.) In an optical reflector, it is situated at the top of the telescope tube, or in the bucket of a giant telescope; in a refractor, it is at the eye end of the telescope.

This is a basic, well recognised term in astronomy and it will serve us well in the amateur astronomical community. But more than that, the name of our Journal will remind us that astronomy is about light, telescopes, observing the stars and planets. Despite all the talks, books and discussions, let us never forget that the PRIME FOCUS of our society is to encourage our members to get outside and LOOK.

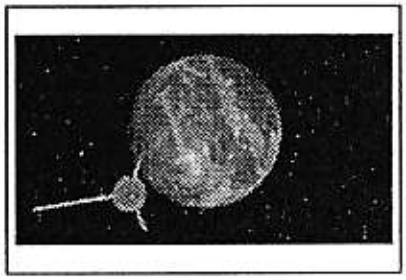
We hope you like the new name.

(Bob Bee - Editor)

****

LATEST NEWS FROM GALILEO

Space probe Galileo recently passed the large Jovian Moon known as Ganymede. This is the largest satellite in the Solar System. The probe took pictures of an amazing quality which far surpassed Voyager's. Many ridges, craters and lots of smooth regions were visible. On June 27 the small spacecraft passed only 7,448 kms away. The smallest feature which can be seen is 74 metres across. The lines are in parallel sets and the ridges and grooves indicate a pulling apart and shear horizontal sliding which both shape the icy landscape.



-------- **GANYMEDE**

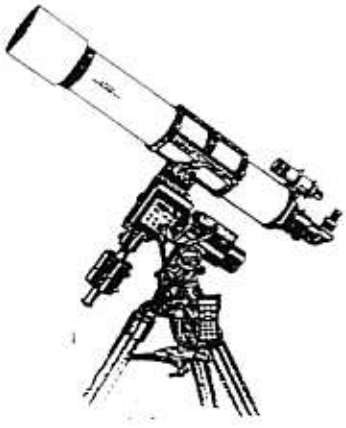
Io was seen also on June 25th from a distance of 2.2 million km. It revealed features 22 km across. Dramatic changes seem to have taken place since Voyager. In the region of Masubi volcano located on Io's southern hemisphere. This region is apparently covered with new deposits of sulphur and sulphur dioxide frost put there by a fairly recent volcanic eruption.

Galileo's next close encounter is on September 6th once again with the moon Ganymede, more information will be forthcoming in later issues.

We honour Viking as it is 20 years since this fantastic little craft landed and performed many experiments. A special article commemorating the probes and landers will appear in the next issue of the journal.

Stay tuned for news on the spacecraft setting off for Mars this year and to land on the red planet at various stages throughout 1997. A schedule of the projects planned and for the near future also appears in the next issue.

(Phillip Ainsworth)



Refractor Telescope

RECOMMENDED BOOKS

The following books are available from Campbelltown Library. I have referred to them in preparing my talk on Measuring Distances to the Stars but also found they provided fascinating information on other general astronomy subjects. I recommend them to you for general or specialty reading. (Bob Bee)

1. **'The Hidden Universe' by Michael Disney** (1984). [523.1 DIS]
This book gives a comprehensive coverage of the issue of the 'missing mass' of the universe. This missing mass comprises at least 90% of the universe but its nature is the subject of great debate. In the process of examining this subject, the author takes us on a tour of discovery of other relevant topics such as : interstellar distances, mechanics of stars, measuring the masses of stars, our galaxy, galaxy clusters, gravitation, the expanding universe, weighing the universe, weighing galaxies, quasars and intergalactic gas, theories of the missing mass, unravelling the mystery. It is well indexed for quick reference and a surprisingly easy read from cover to cover.

2. **'Black Holes, Quasars, and The Universe' by Harry L. Shipman** (1980). [523.1 SHI]
This is another comprehensive coverage of the large questions of the universe. It is very similar to Disney's book but does not have an emphasis on the missing matter. It is comfortably divided into well presented chapters such as: Basic Astronomical Terminology; The Violent Universe; ; Black Holes; Supernovae, Neutron Stars and Pulsars; Galaxies and Quasars; Active Galaxies; Life Cycle of the Universe; Relics of the Big Bang; the Future of the Universe.

As you can see, the subject matter is huge. As a broad reference for cosmology, it is a good read. There's something for everybody in it (except maybe you planetologists).

3. **'The Constellations' by Lloyd Motz and Carol Nathanson**
(1991).[523.8 MOT]
Now for something completely different. The authors bring in tales of ancient history and mythology, blend them with tales of modern science and provide a charming narrative map of the sky. Along the way, the book gives detailed, star by star descriptions of the better known (and some not so well known) constellations. Sprinkled between the constellations are easy to read descriptions of some of the basic concepts of astronomy.
It is beautifully presented, with a comprehensive index, stacks of diagrams and some great B&W photographs. If you have a telescope, this provides a great reference to what to look at and where. On a slightly negative note, it is primarily aimed at the Northern Hemisphere constellations, though there is a Southern Hemisphere section. Despite that, I found it a great read and fascinating background (and detailed) information about the major stars in each constellation.
It would be difficult to read this book and not achieve a quantum increase in your general knowledge of astronomy.

(Bob Bee)

****

ANSWERS TO MAS QUIZ NO. 2

1.c, 2.b, 3.a, 4.b, 5.a, 6.d, 7. b, 8.a, 9. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Pluto, Neptune. 10.c, 11.c, 12.a, 13. b.

****

LATEST MARS NEWS

NASA scientists in conjunction with 2-3 affiliated universities in the United States have recently discovered a Mars rock which appears to have fossilised organic material. The rock, hit by a meteorite and flung off into space many millions of years ago, finally reached Earth only 13,000 years ago. The Martian rock landed in the Antarctic and 12 years ago was found. It is the first rock of 12 that have been located mostly in the Antarctic region and the first to show any possible signs of life. Newly developed laser technology has allowed scientists to probe deep into the structure of the rock and finding shapes resembling organic compounds. One such is PAH (Polycyclic Aromatic Hydrocarbons). These could not have seeped into the rock since its landing on Terra Firma, however, PAHs have been found to exist on other meteorites.

Another piece of compelling evidence that the rock shows past life from Mars is that it has the same mineralogical composition as those rocks found and analysed by the Viking spacecraft back in 1976. The most compelling evidence is that carbonates have similar enhancement which can be interpreted as biological activity. The scientists have also noted there were minute crystals of iron and sulfur although these may have formed through inorganic processes.

Every 1-2 million years, meteorites crash into a planet and take a chunk out of it, though these collisions happened more frequently in the earlier formation of the sola system. It is believed that Mars and Earth have cross bred over many millions of years and spores from Earth have also landed and scattered over Mars's surface.

Throughout the ages, Mars and Earth had similar beginnings, including Volcanism and warm wet climates. However, since Mars has a weaker gravity and is further away from the Sun, it began to lose its atmosphere and freeze over, so that today Mars is no more than a large frozen desert, with an atmosphere 1/00th as thin as our home planet's.

The meteorite in which the Mars rock came to Earth is called AH840001. AH are the initials of the scientist who found the rock, 84 the year, and 0001 being the first.

One major point of contention amongst scientists over the authenticity of fossilised remains is whether the organic compounds found are a result of bacteria or have been formed by non-living forces that existed on Mars 15 million years ago. At best, the evidence is circumstantial, and one must wonder in this year that NASA is sending two probes to the Red Planet, that the cash strapped agency is not just seeking publicity and more funds. Plus it is also a good time to go public so President Clinton in an election year can appear good and supportive towards space travel and exploration. If he could do a JFK, what a great morale boost for his election campaign and the space industry.

AH840001 found by Alan Hills is clearly still a mystery needing further investigation. Other meteorites found also are known to contain similar properties but these have not been singled out for past life, nor should this sample until further evidence can be forthcoming.

Finally, Mars does have the best chance of having had life in the past and possibly some still active many metres under the soil. Let us not discount that this rock having come from Mars did indeed contain live organic bacteria in the past. However, this question cannot be fully answered until more probes are sent to test the surface. Maybe evidence of life will only show up in the year 2005 when NASA has a 'sample return' mission and scientists get a look at a first hand piece of Martian

rock, or it may take a human mission to Mars. Plans are being drawn up for a landing and possible 30 day stay on the Red Planet by 2018. However, I believe the mission can and should be implemented on an international scale and thus allowing man to expand his horizons and answer the question once and for all , 'Does Mars have Life, or Ever had Life?'

(Phil Ainsworth)

****

THE MOON, STARS AND NURSERY RHYMES

A long time ago, in a galaxy far far away, a very young child sat upon his father's knee, and they both gazed skywards towards the heavens on dark crystal clear nights. And great words of wisdom were handed down from one generation to the next.

It's with fondness that I can reflect upon my childhood years and the early training I received in matters astronomical. Many hours passed by in our backyard and my father took great pride in delivering my professional training which went upon the following lines:

"Hey diddle diddle, the cat and the fiddle
The cow jumped over the Moon
The little dog laughed to see such fun
And the dish ran away with the spoon."

Being only 4 years old, I found the above to be highly illogical to believe farmyard animals could gain the necessary escape velocity to take off and orbit our nearest heavenly body. Get real! And what's this crap about the Parks Radio Telescope eloping with a piece of cutlery while some height challenged canine found it amusing that a cat could play a musical instrument ... I mean really!

My father's attempts at educating me in things astronomical were seen as a great failure, especially by my mother who insisted that my boundaries should be expanded and that she be given the responsibilities of my tuition.

Hard at work night after night, my mother formulated her ideas and at last the time arrived when I knew I was in for some serious learning.

It was a dark clear night. A small ensemble of relatives gathered around, my father sulking in the background. My mother approached, beckoning me to sit with her on a soft blanket placed delicately on the ground.

We both looked upwards, my anticipation was killing me. "Speak, mother, speak" I screamed and then those fateful words were spoken.

"Twinkle twinkle little star
How I wonder what you are
Up above the world so high
Like a diamond in the sky."

Even now, after all these years, I can still hear the sound of my dad's laughter.

Looking back through the years, I felt a wonderful contentment searching the heavens looking for cows and diamonds, the Moon, stars and of course ... nursery rhymes.

Regards,
Noel Sharpe

P.S. Next issue..."My first telescope."

A Little Light History (Part 2)

by Peter Druery

In the early part of this century, Max Planck proposed his quantum theory. It had been known for thousands of years that objects gave off light when heated and that the colour changed as the objects became hotter. A piece of iron, for example, becomes first red, then orange, then white. If it is made even hotter, no further changes can be seen with the eye but they can be detected with scientific instruments. If a white hot piece of iron is heated still further, it will begin to emit substantial amounts of ultraviolet radiation. The term for this phenomenon is known as ***black body radiation***.

Planck discovered that light was emitted in little bundles of energy which he called quanta. To Planck, this result was rather disturbing. It was the kind of result one would expect if light was made of particles. Yet all the evidence indicated that light as composed of waves.

In 1905, when Einstein showed that light was indeed made up of particles, that is was emitted as quanta, that it travelled through space as quanta, and that it was absorbed by matter as quanta, Planck refused to believe it. He actually spent years trying to undo his own work.

In 1921, Einstein published his famous third paper (his first dealing with Brownian movement and his second Relativity) which dealt with quanta and something called the ***photoelectric effect***. This is a fairly simple process - the ejection of electrons from metals exposed to light - but no one had been able to come up with a good theoretical explanation. Einstein made the simple, but revolutionary assumption that the photoelectric effect was caused by the collision of light particles with electrons.

Einstein was making the outlandish suggestion that light could be made up of both waves and particles at the same time (a wavicle?). He was essentially saying that although in many situations, light acted as though it were made up of waves, sometimes it behaved as though it were composed of particles instead.

Today scientists no longer speak of quanta of light. The contemporary name for a light particle is a ***photon*** (in analogy with ***electron***). At this point in time we think that all forms of matter and energy come in these discreet packages quanta (by 'discrete' is meant that you cannot have half a quantum).

The idea that energy had a quantum nature married neatly enough with the view that light was a wave motion, but at the same time it set people thinking in terms of particles once more. The size of a quantum of light is inversely proportional to the wavelength of the light: the longer the wavelength, the smaller the quantum and the lower the energy of the light.

In the early 1920's the UK physicist Arthur Compton was performing experiments to see what happened when matter was bombarded with X-rays. The beam of X-rays was of course scattered by the collision, but Compton discovered that the wavelengths of some of the scattered X-rays had increased - they had lost energy. How could this be?

Compton proposed that the quantum of light could act as though it were a particle, and he christened this the photon. Photons were colliding with the electrons of the atoms of the matter; the recoil of each electron 'stole' a little energy from the relevant photon - just as the white ball in

A Little Light History (Pt 2) - Cont'd.

pool loses energy when it bounces off another ball, and therefore slows down.

But photons are extremely odd particles indeed. For one thing, a photon at rest (if you could get one to rest!) has a mass of zero. At light-speed, however, their very velocity gives them the ability to exert pressure. Not very much pressure, to be sure - otherwise all of us would be flattened when we stepped out on a sunny day - but pressure nonetheless.

We can give descriptions of a photon in terms of the way it behaves, but it is very hard for us to imagine what a photon actually ***is***. Here we encounter a mystery that is common to all aspects of any discussion of energy or matter at the quantum level. The mathematics works, the evidence can be gathered from experiments, and so forth, but in the end we find ourselves unable in any coherent way to explain the true nature of light at the quantum level.

So today our present understanding is essentially that light is emitted by atoms in the form of quanta, or photons. Light, however, is neither a particle nor a wave; it has characteristics common to both.

*

Peter Druery is a teacher of Ophthalmic Optics at Sydney Institute of Technology - Ultimo. Peter has been an amateur astronomer since approximately 12 years of age and enjoys almost aspect of the hobby. His main interests are deep sky observing and astrophotogaphy - where he tries his best to capture a few of those elusive photons forever!

****

MAS PUZZLE NO. 1

(Courtesy of *The Observatory* of July 1934)

In the village of Nova Brunsviga, there is a flourishing astronomical society consisting of eight members - Mr Mercury, Mr Mars, Mr Jupiter, Mr Saturn, Mr Uranus, Mr Neptune, Mr Pluto and Miss Venus. Each planet of the solar system is observed by one and one member only: no member observes the planet bearing his name. We have discovered the following facts:

1. Mercury's observer sends his sightings to the Nova Brunsviga Echo, and Mars's observer sends his to the editor of The Observatory.

2. Mr Neptune observes four satellites belonging to his planet.

3. The heavenly namesakes of the observers of Venus and Neptune are neighbours in the solar system.

4. Jupiter is outside his observer's heavenly namesake's orbit.

5. Mr Saturn has no interest in Neptune; five years ago he mistook Venus for his planet; since then he has given up observing in disgust.

6. Miss Venus and Mr Jupiter observe neighbouring planets.

7. Mr Pluto is building a telescope and hopes it will be ready for the next opposition of his planet.

8. Miss Venus consults Sir William Herschel's observations of her planet.

How are the eight planets distributed among the eight observers?