

PRIME FOCUS

Volume 2 Issue 9

October 1997

PRESIDENT
PHIL AINSWORTH

VICE PRESIDENT
NOEL SHARPE

SECRETARY
DAVID MCBEAN

TREASURER
ERIC BROWN

EDITOR
BOB BEE

MAS : Postal Address PO Box 17 MINTO 2566 Phone (02) 9605 6174

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Presidents Report

The end of year 1997 is almost upon us, with warmer weather fast approaching. At present most of the planets are visible in the night sky, so there is no reason for not venturing out and stargazing. Most of my observations of late have been studying Jupiter and its four major satellites.

Latest News

September 12th saw Global Surveyor enter into Mars orbit. Over the next 4-6 months it is aerobraking to give it a closer look at our neighbour. In March 1998 it will take pictures that will be roughly the size of a car, with far greater quality than the Viking orbiters back in 1976.

Mars Pathfinder appears to have run out of juice, for three days no communications have been heard from the rover or the lander.

Shuttle Atlantis has successfully docked with the MIR space station. An historic space walk from the space shuttle took place for 5 hours (Oct 2nd), with a Russian and American together just outside the shuttle.

October sees America launch Lunar Prospector which for two years will map more than 70% of the uncharted Moon. It will also solve the riddle of ice on the polar cap.

Coming Events

Oct 23rd - Thursday at 7.30 pm.

Dr. Rachel Webster, a professional astronomer from Melbourne University will lecture us about the "Fate of The Universe." This event is free. I encourage you all to attend.

Nov. 8th - Camp Constellation 6 at Carol's place. Warmer weather will mean more pleasant observing and camping conditions.

Nov. 17th - Amateur Astronomer and Ph.D. student Andrew Reid will speak to us about Galaxies and Radio Astronomy. He is a gifted lecturer and has spoken at many astronomical events.

Dec 7th -- Christmas picnic at either Mount Annan or Pembroke Park. Last year we had a great time playing cricket and enjoying warm friends while having a BBQ. The final location is to be confirmed.

April 10th -- 18th convention for Amateur astronomers - See Brett McMillan or myself for details. Registration forms are available at the front.

APOLLO 10

Only one more Apollo flight till the first landing of man's first steps onto another world. Apollo 10 blasted off in May of 1969 on a Saturn V rocket. The Command Module (CM) was nicknamed Charlie Brown, with the Lunar Module (LM) being called Snoopy.

Three brave astronauts Thomas Stafford, John Young and Eugene Ceran were the dress rehearsal for the memorable next mission. This was the first time the LM undocked and orbited the Moon in its gravitational field and redocked almost without a problem. The LM reached within

14,400 metres and could have landed, but was advised by NASA officials to redock with the CM. On ascension the LM started spinning out of control, until Ceran piloted it on manual control and successfully docked with the CM. It was later found that a technician had set one of the controls in the wrong position.

After 192 hours in flight Apollo 10 orbited Earth, then flew toward the Moon, orbited it 31 times then travelled back to Earth safely on May 26th.

Phil Ainsworth



Contributions in the form of Articles, News Notes, Personal observations, astro photographs, letters to the Editor etc are warmly welcomed. Yea, eagerly sought.

They should be sent to the Editor at 27 Old Kent Rd, RUSE no later than 3 Saturdays before the Monthly Meeting. For information, ring (02) 46251623.

Articles typed and on disc in Word or WordPerfect format are preferred. Handwritten is acceptable if not too long. Discs will be returned.

Cosmology Models: From Deities to the Big Bang, or Plasma Continuum – Part 1.

By John Casey

Theories on how the universe began have preoccupied man since ancient times, where astronomy was intertwined with religion, and the information on the heavenly bodies was jealously kept secret amongst priests- for the ability to predict eclipses and seasons kept them in positions of power and influence. Theories oscillated between observational, theoretical and ideological versions, depending upon the era, and the climate for change.

Early versions of creation of the universe from Mesopotamia and Egypt were of magical-biological reproduction, with the gods emerging from a primeval ocean and mating with one another to produce additional deities-the earth, the heaven and the oceans. Ancient Greece came up with two versions. Pythagorus taught that the heavens were realms of pure mathematics, where objects move in perfect unchanging circles, and Plato's student, Eudoxus created a system of moving spheres, with the Earth as their centre, which had the planets, the Sun and the Moon all in perfect motion around the Earth. This was popularised by Aristotle. Later, when the actual movements of these objects did not meet the indicated motions, Ptolemy added epicycles [small circles] and offset the spheres to better match observations. Aristarchus of Samos, using Euclid's new geometry, estimated that the Sun was 5 million miles away, and six times as big as the earth. He believed that it made no sense for a large Sun to orbit a small Earth, and proposed that the Earth and other planets orbited the Sun, and that the Earth was spinning on its axis. About AD 400, Augustine, a Bishop of Hippo, a city in North Africa, devised

an elaborate cosmology that was strangely similar to the Big Bang. The universe had begun at a certain moment in time, out of nothing, and at some time in the future it would suddenly end, returning to nothing. This Christian ideology based creation ex nihilo was done by a divine creator, and therefore the details of how this occurred were beyond comprehension, and therefore did not need to be pursued.

When Copernicus proposed an infinite universe, with the Earth spinning on its axis, and orbiting the Sun in an elliptical orbit, he was aware of the threat to the ideology and social hierarchy implications and did not publish it for nearly 30 years, until 1543. It was published in the Protestant stronghold of Wittenberg, after the Reformation had begun. In England, Henry VIII had split with the Catholic Church, and all of Germany was embroiled in wars between Protestant princes and those aligned with the papacy and Catholicism. A former monk, Giordano Bruno, travelled in England at the time and taking in the Copernican theory, proposed an infinite universe, both in space and time- without beginning or end, and therefore contrary to the Creation dogma of the church. He was arrested on return to Catholic territory in 1592. He was imprisoned for 7 years, and was burnt at the stake in 1600 when he refused to recant his theory.

In 1609 Kepler made precise planetary observations, and, by trial and error methods, discovered that the planetary orbits were elliptical, with the speed changing so that the planets swept out equal area segments over time-

speeding up when closer to the Sun, and slowing when furthest away. That same year, Hans Lippershey patented the telescope in Holland, and within a year, Galileo in Italy and other astronomers elsewhere used it to observe the heavens. Galileo discovered the existence of the moons of Jupiter, the phases of Venus, and mountains on the Moon. He saw by observation that the Copernican theory was correct and attempted to convince the Catholic hierarchy. He was warned by Cardinal Bellarmine not to continue and when he did, Copernicus's work was added to the index of prohibited works and officially condemned. Galileo continued his efforts, and in 1632 published his defence of Copernicus, in the "Dialogue on Two World Systems". He was placed under house arrest, and with the example of Bruno before him, forced to recant. The new theory was forbidden in Catholic countries for over a century.

In 1755, the philosopher Immanuel Kant proposed the idea of an infinite universe, and that in the past this was a nearly homogeneous infinite gas, but developed, by random fluctuations and gravity, to form stars, and by random motions and attraction, formed spinning agglomerates of matter. Within these huge vortices, galaxies, stars and planets were born.

In England, James Hutton, an amateur scientist, made geological observations and developed a theory for the evolution of the Earth itself. In his 1795 work, "Theories of the Earth", Hutton concluded that mountains, rivers, oceans, sedimentary and igneous rocks were formed over millions of years- and thus rejected the supernatural origins of the Earth. Although condemned by the church, by the 1840's the new geology and

cosmology were widely accepted by scientists and the public.

In 1877, Ludwig Boltzmann attempted to derive the second law of thermodynamics [discovered by Rudolf Clausius in 1850], from the newly emerging atomic theory of matter. He proposed that the new concept had cosmic implications, and the universe as a whole must, like any closed system, tend towards an equilibrium state of entropy. The universe would suffer a heat death, becoming increasingly colder, and all sparks of higher energy would eventually die- like a clock, with its spring initially wound up, then running down at a constant rate until, with almost all the spring energy gone, the clock ticks slower, until all movement stops forever.

Albert Einstein first formulated his concept of a static, finite universe in 1917, two years after developing his General Theory of Relativity. He soon saw that it was flawed. A static closed universe could not remain static, as its own gravitation would cause it to collapse. Rotation could be used to counter this collapse, but this was ruled out, as it implied a central axis, with a distinct direction in space. He introduced a new term into his equations of gravity to counter the gravitational effect, but acting equally and in all directions so that it would not destroy the symmetry of the universe. However, in 1924, a young Belgian priest and physicist, George - Henri Lemaitre showed that Einstein's proposed solution was unstable- and was only one of an infinite possible cosmologies- with some expanding, and some contracting.

In 1916 Slipher and Pease had succeeded in obtaining spectra for numerous galaxies, and found large

differences in lines of elements compared to the lines found in the laboratory. In 1919, Harlow Sharpley noticed that most of the spectral shifts were to the red, and proposed that this was a Doppler effect. Edwin Hubble in the 1920's, whilst using the new Mount Wilson 100 inch telescope then showed that the dimmer a galaxy is, the more the red shift. On the assumption that the apparent brightness of a galaxy is proportional to its distance away, Hubble then showed that the apparent speed of the galaxies away from us was proportional to the distance from us. He realised that we were not the centre of the universe, and that this same effect would occur if the whole universe was expanding. He defined the rate of recession, and calculated the Hubble Constant, the expansion rate as 530 kilometres per second per megaparsec. His estimates of distances were out, and current estimates of H_0 are much less than this. Recent Hubble telescope data gives the value as 85 ± 15 .

In 1929 Lemaitre proposed the first version of the modern Big Bang theory... (to be continued).

John Casey ■

References

1. "The Big Bang Never Happened" Eric J. Lerner
2. New Scientist, 6 Sept. 1997, pp24-29. "Into the Abyss".
3. Cambridge Atlas of Astronomy. First Edition
4. "Blinded by the Light" - John Gribbin

John has written an extensive article about Cosmology Models. This is the first instalment of at least four. Stay tuned for more.

ASTRONOMER'S PROFILE

Dr. Ragbir Bhathal

A physicist at UWS Macarthur, Dr Bhathal teaches the SETI Physics strand which is part of the science degree at the university. He is also the author of several books, and many papers relating to Astronomy. Some of his most recent works include 'Astronomy For The HSC', 'Searching For ET' and 'Australian Astronomers'. He has been awarded the 1996 Nancy Kessing Fellowship by the State Library due to his outstanding work on Astronomer John Tebbutt.

Among his many other achievements Dr. Bhathal is currently Chairman/Director of the SETI Institute of Australia, and is researching for his next book on the topic 'women scientists in astronomy in Australia'.

During the last few years Ragbir has not only been fascinated by Aboriginal Astronomy but has completed nine paintings which he hopes one day will be in an exhibition for Aboriginal Astronomy.

His major research includes topics about galaxies and dark matter, SETI, and Australian scientists mainly involved in astronomy. He believes ET is out there, and one day we will hear a message. How and if we respond is a matter of much debate, but it is clear that ET will already know of our existence due to the TV and Radio broadcasts constantly being sent out into space.

Ragbir is a member of the Macarthur Astronomical Society, and has donated his book 'Australian Astronomers' for a prize later this year for the society.

Phil Ainsworth ■

On A Wing And A Prayer

On the 17th December 1903, Orville Wright successfully became airborne. The length of the flight at Kitty Hawk was just 36 metres on his first attempt.

On the 3rd September 1997 on a 747 Jumbo jet somewhere over the Pacific Ocean, I arose from my seat and proceeded to the toilet, a distance of 40 metres. While occupied, I briefly conceptualised these two events, then flushed the toilet and returned to my seat.

This was the start to the best holiday I've ever had. I saw and did so many wonderful things. However, I have chosen 3 events to write about briefly. Certainly, the 3rd event was "awe inspiring".

1. Visit to the Corning Glass factory, New York State. At first this place sounded as interesting as a Tupperware party. The first displays were of some interest, consisting of beautiful glasses, plates and ornaments. These were centuries old and very valuable. Then, to my surprise, a large technology section presented itself and things were looking up.

The fibre optics display was fascinating, as well as the hands-on displays and the tensile strength of various glass composites.

Another surprise was the large display on space travel as the Corning Factory supplies exclusively to NASA for all their glass and ceramic requirements. These range from the windows on the Gemini spacecraft to the heat tiles on the shuttle.

The videos playing were very interesting and informative. The Gift Shop even sold telescopes! Also, the

mirror blank for the 200" Palomar telescope was on display, and a video explained its construction at the Corning Factory. A visit to Corning is a must for anyone interested in space travel.

My verdict: This was no Tupperware Party.

2. The Air & Space Museum, Smithsonian Institute Washington.

This was the biggest display on aviation I've ever seen. Jets, planes and space craft suspended mid-air, movies and videos. The aircraft were real. However, many of the spacecraft were from the props used for the television series "Space". A bit hard to display the original Lunar Module!

The museum, on two floors, is huge, about the size of the Powerhouse Museum x10! Lots of things to see and do with countless hands-on displays. If there was anything on aircraft or space you needed to know, this place would have the answer. I personally liked the walk-through tour of the full scale model of "Sky Lab".

My Verdict: So good, I bought a T-Shirt!

2. Night Time Launch of the Space Shuttle Atlantis.

The Preliminaries: I was very fortunate indeed to witness a night time launch of the space shuttle. The formula was 10% effort, 90% sheer luck, and being in the right place at the right time. This was a once in a life time event.

Some people on our tour hired a car. We were headed towards a place called Coco Beach, which we were told was a good vantage point. However, while on route, we passed over a bridge and the

On A Wing And a Prayer (Cont'd)

whole car shouted "We can see it!" Well, seeing is believing, so we turned and parked under the bridge. An excellent location. We had a clear line of site to the shuttle which was highlighted by powerful spotlights.

Thunderstorms were noticed but were still some distance from us. The sky above was clear and I observed for the first time on the tour Jupiter, Scorpius and Sagittarius, looking rather different than I'm used to.

The sky above was abuzz with planes, police helicopters and jets. I assume they were doing the rounds and maintaining security. Several times a police boat would intercept the yachts on the bay. Other moving lights were helicopters were obviously filming the event. This was a really big production number with a cast of thousands.

...the fireball gave way to a majestic white glow, as bright as a million Jupiters...

The crowd started to build. For some, it was their first night launch, for others it was routine. One observer told me we were in the best position and what to expect.

I couldn't believe the festive occasion that was developing and I laughed when a pick up truck stopped nearby. The family unpacked and started to BBQ hamburgers, make hot dogs and even brew coffee.

The Action: The three hour wait was killing me. I was so... well, I don't like this word, but it's very accurate... "pumped!" I had video recorder, binoculars and camera, and my eyes.

A hush fell over the crowd – you could cut the air with a knife. Someone

turned up the radio and I heard 10, 9, 8, 7 – my heartbeat was jumping through my chest. Then... NO!!! It's exploded. For a few seconds, a huge fireball blazed. It remained stationary at first, then I noticed the fireball gaining elevation in a controlled fashion. The whole bay was aglow and the sound had now reached us.

What to do first? I got very confused. Watch it, magnify it, tape it or photograph it? I did all at once and almost fell into the water.

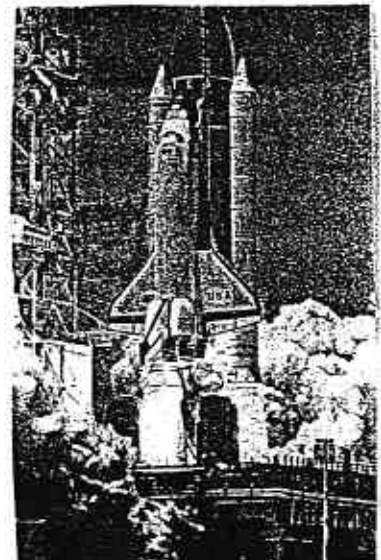
I observed the shuttle 'roll over' and it was now travelling very quickly. Using my binoculars, I saw the two solid rocket motors separate, right there before me. I was so excited I almost wet my pants! After the separation, the fireball gave way to a majestic white glow, as bright as a million Jupiters, yet as big as a full moon. And... soft.

The shuttle was on view for about 15 minutes. I thought it would ascend straight up, however, it disappeared over the horizon. It literally set.

After the astronauts were safely on their way, the crowd cheered and clapped and our prayers were answered. Safe Journeys and Bob Voyage.

My Verdict: Having a great time... wish you were here!

Noel Sharpe



From The Editor's Desk

It's been a funny month. What with Global surveyor, a partial solar eclipse (spoilt by cloud!), 'Men in Black' (Phil – your secret is safe with me), and Venus shining like a 747 coming in to land at Holsworthy Airport, it's not been short on variety.

And the views of Scorpius and Sagittarius high in the sky. What great opportunities! I hope you were able to make the most of them. October is an equally exciting month and the nights are warming up. So no excuses – right?

I'm looking forward to hearing the adventures of our globe trotting Vice President. I'm sure Noel has a bucketful of anecdotes to pass on. And did the Lone Stargazer have many opportunities to study the northern sky? If so, no doubt we will hear all about it. Stay tune for some exciting (or hilarious) articles from Noel. (You will see his first offering in this issue).

The next issue of Prime Focus (No. 10, November) will be the last until February 1998. I'd like to make it a bumper issue. However, for this to happen, I'll need articles contributed. (See the notice elsewhere in this issue). So come on. Use your imagination. There must be something you'd like to write about, express an opinion about, show some photos etc. Let's send Prime Focus out on a high for 1997.

Had an eerie experience while driving down the South Coast on 3rd October. It was about 9pm as Marion and I drove south from Nowra (though it was probably more south-west). Venus was directly ahead of us, like a beacon, and as the road veered more to the south, lined on either side by the rows of trees, there on the horizon, directly ahead and pointing down to

the road, was the Southern Cross. It looked like an arrow head (it was upside down) and seemed to point at the far distant end of the straight road, saying "This is the way."

Do de do do ... do de do do.

Recently, some donations of prizes were made to the Society's guessing competition, to help raise money for our telescope. I would like to acknowledge the generosity of the kind donors of these prizes.

Mac's Liquor

106 Lindsey St, Campbelltown.
Donation of two bottles of Starwine.

'Sky & Space' and
'Southern Astronomy' magazines
for subscriptions to each.

Dr Ragbir Bhathal for a copy of
his book 'Australian Astronomers'.

The Pistol Star has just hit the headlines. It's only 1 to 3 million years old (ie a baby) but its diameter is as big as Antares (a dying red supergiant) – about 400 million ~~km~~ **km**. **Big!!!!!!!**
Hopefully more about it next issue.

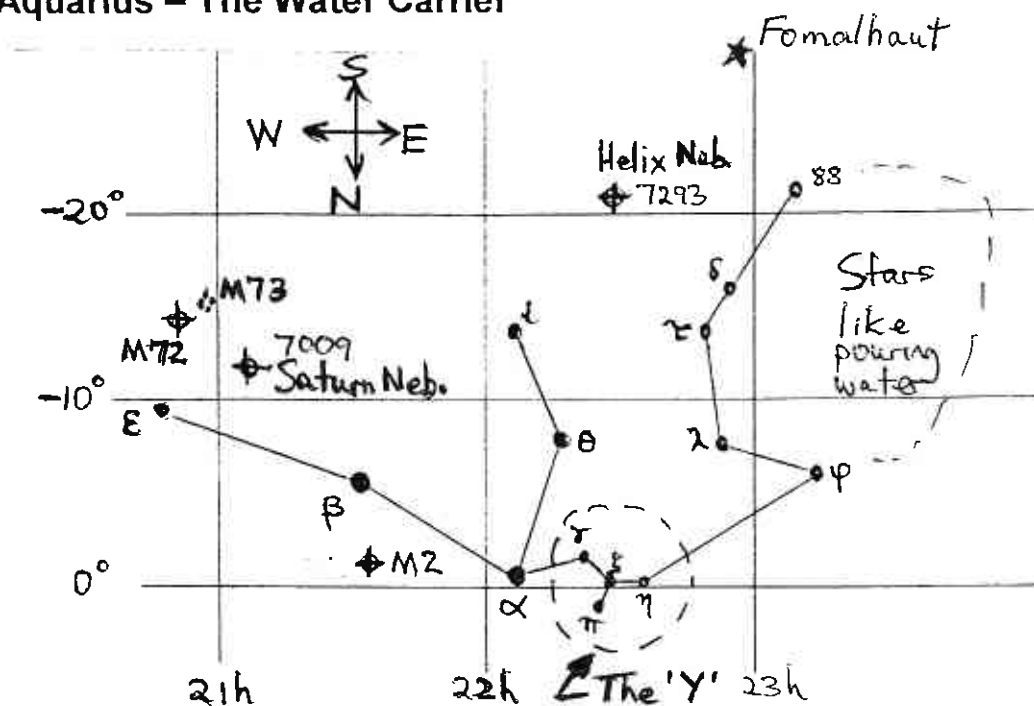
Good Seeing.

Bob Bee



Ragbir Bhathal

Aquarius – The Water Carrier



As one of the oldest constellations and as the focus for 'The Age of Aquarius' of 'Hair' and astrology fame, this constellation has earned our respect (Sorry about that! – Ed.).

It's not easy to locate, despite its size, about 3hrs (45°)x20° as it has only three 3rd mag stars, with the rest fainter. However, it does contain some interesting stars, three Messier objects and two particularly interesting nebulae.

How to find it? Use a Star Wheel of course! But, as a general rule, for this time of the year (at 9pm):

- Find Scorpius (low in the West).
- Follow Scorpius through Sagittarius (Tea Pot). See July 97 Prime Focus.
- At the end of Sagittarius, move up (North) about 10°. Then for the next 45° to the East in that line, until level with the bright star Fomalhaut, is the constellation Aquarius. It is generally in the North half of the sky.

I told you it wasn't easy. It's much easier with a Star Wheel. If you don't have one, it will make a great Christmas gift hint).

Different references connect the stars in different patterns. However you do it, it doesn't look like a guy carrying an urn (hence the awful pun) to me – especially upside down. (It's sometimes called the 'Water Pourer', explaining some of the star names).

For what it's worth, the urn/jar/bucket is represented by the stars Gamma (γ), Zeta (ξ), Eta (η) and Pi (π). In fact, this jar is usually the easiest to find because of its distinctive 'Y' shape. You can star hop to the rest of Aquarius from there.

(Again, the references disagree significantly on the distances to these stars and objects. For the purposes of this article, I have used the distances noted in 'Collins Pocket Guide to Stars and Planets' 2nd Edition).

Here are some of its interesting features:

α (Alpha) Aquarii (22h 6m, 0.5°) represents the Water carrier's right shoulder and is called 'Sadalmelik'. Mag 2.9, it's a yellow supergiant, about 550 l.y. away. Its diameter is 80 times the Sun's and luminosity about 6,000 times the Sun's.

β (Beta) Aquarii (21h 29m, -5.8°) is Sadalsuud, also a yellow supergiant, about 680 l.y. away, mag 2.9, with a luminosity about 5,800 times that of the Sun.

γ (Gamma) Aquarii (22h 22m, -1°) is called Sadachbia and is a 3.8 mag white star 180 l.y. away. γ forms the most southern of the two western tips of the 'Y'. It is also supposed to mark the Water carrier's right elbow. (So the line between α and γ is his humerus bone?). On a historical note, in 1643, the Capuchi friar De Rheita of Cologne, thought he'd discovered five new Jupiter moons when that planet entered Gamma's field. However, they turned out to be several faint stars just south of the jar. Can you spot them?

δ (Delta) Aquarii (22h 55m, -16°) is called Skat, 'The Shin Bone' which it depicts. Mag 3.3, Skat is a Sirius type white main sequence star 68 l.y. away. A naked eye companion directly south is not gravitationally related.

ϵ (Epsilon) Aquarii (20h 48m, -9.45°) is Albali, a mag 3.8 Sirius type white main sequence star about 110 l.y. away. It supposedly marks the towel held in the Water Carrier's hand.

ξ (Zeta) Aquarii (22h 29m, 0°) is at the centre of the 'Y', mag 3.7. This star is a good test of your telescope's resolution. ξ is a binary, about 98 l.y.

away, with twin white stars, mag 4.4 and 4.6 separated by 1.7 sec of arc (about 100 astronomical units). A 75mm aperture with high magnification should resolve them. Though not visible, there is a red dwarf companion to the second white star, orbiting at the amazingly small distance of 9 AU (about the distance from our Sun to Saturn).

λ (Lambda) Aquarii (22h 50m, -7°) mag 3.8 lies at the head of a stream of stars that appear to be streaming from the water jar into the mouth of a fish.

Messier Objects:

M2 (NGC7089) (21h 34m, -1°) is a bright globular cluster, suitable for binoculars and small telescopes. Medium telescopes show its compressed centre with outlying stars like rays, while larger scopes (200mm) will resolve its individual stars. M2 is about 37,000 l.y. away.

M72 (NGC6981) (20h 54m, -13°) is a globular cluster 56,000 l.y. away as is not as impressive as M2, though its stars are resolved easily.

M73 (NGC6994) (20h 58m, -12.5°) is a curiosity only. Not a nebula nor cluster as Messier thought, but a collection of four very ordinary and unrelated stars of 10th magnitude. Worth a peek though to increase your collection of Messier scalps.

Planetary Nebulae:

NGC7009 (21h 4m, -11°) is called the **Saturn Nebula**. It is 3,000 l.y. away. Larger telescopes show rays curving around both sides of the main nebula disc, resembling the ringed planet, Saturn. Smaller telescopes show what appears to be a bluey-green 'planet'.



The 8th mag nebula has an intensely hot (55,000° K) central 11th mag star.

NGC7293 (22h 30m, -21°) – the famous **Helix Nebula**.



Photo by D Malin
(Used by permission)

This is thought to be the closest of the planetary nebulae, about 300 l.y. away. Its dimensions are about a ¼° of the sky - half the apparent size of the moon. It is easily shown in binoculars (particularly those with 10x or more) and small telescopes on low power, which show it as a misty circular patch. At its centre is a 13th mag star (a white dwarf) from which lines of radiation can be seen in the nebula, indicating the envelope's expansion from the star's initial mass shedding. This is the final stage of star evolution. Our Sun, a main sequence G2 star, will end up like this – in 5 billion years.

Bob Bee



What's To See This Month

October is a great month for the planets, and also the early part of November. With the exception of Mercury (lost in the Sun's glare), they are all up and viewable – some most spectacularly. The following notes cover the period generally from mid-October to mid-November.

VENUS

Exceptionally bright at mag -4.2. It stays high in the west quite late (it sets progressively from 10.00pm on 20th October to 10.30pm on 18th November. Plenty of time for viewing.

During that period, it has some interesting viewing combinations with other objects. Early in October (now past, of course) Mars, Antares and Venus performed a doe-see-doe forming triangles in the sky. On 15th October, Mars, Antares and Venus are within 4° of each other, and on Oct 17 Venus is only 1.7° north of Antares. (I've been watching these formations over the past few days and it is fascinating.)

...Mars, Antares and Venus performed a doe-see-doe forming triangles in the sky.

This square (or triangle) dancing continues with different alignments of the three. It would be fun to keep a nightly track (with charts) of their relationships.

On 24th, 25th and 28th of October, Venus will be within 0.5°, 0.4° and 0.2° from glob. clusters M19(NGC6273), NGC6293 and NGC6355 respectively.

On 2nd November, Venus will have become mag -4.5 and moved into Sagittarius which will be its home for

What's To See This Month (Cont'd)

the rest of the month. Theoretically, on a dark site with no other illumination, Venus should cast a shadow.

MARS

Mag 1.1 during this period. It's easy to see why Antares is named 'Like Mars'. If I didn't know where Antares was in Scorpius, I'd be hard pushed to tell it from Mars, which in the early part of October conducts an audacious flirtation with its namesake. On 12th October, they were within 3°.

Mars has its 'bumps' with globular clusters in Ophiuchus NGC6284 (0.9°) and NGC6325 (0.5°) on 23rd and 27th October respectively.

Like Venus, Mars will move into Sagittarius in early November, where it will have close encounters with even more globular clusters. On 11th, 16th and 20th Nov, it will kiss NGC6544 (0.3°), M28 (0.3°) and M22 (a ripper) (0.6°) respectively.

Mars sets about 10.15pm to 9.45pm from 18th Oct to 18th Nov. So there will be plenty of viewing opportunities.

JUPITER

Jupiter dims from -2.5 to -2.3 over this period. Even though outshone (in spades) by Venus, it is still a beautiful sight with its four major moons. It sets from 2am to 12.15am from 18th Oct to 18th Nov, so it will be mostly in the low west for late evening viewing. Be quick!

An interesting viewing point is that on 12th and 13th Nov, Jupiter will appear to have five major moons. This is because a 6th mag star (HR8083) will be in its vicinity in the same plane as the moons. It will be a test of your observational powers to pick the fake. The chart on page 106 of Astronomy 1997 will come in handy.

SATURN

This planet is conveniently visible for the whole evening as it rises just before twilight. It will be at mag 0.1, its brightest. It was in opposition on 10th Oct, with an equatorial diameter of 20 arc-sec. Around 9 to 10pm, it will be high in the sky for easy viewing.

URANUS

Sets from 1.30am to 11.30pm from 18th Oct to 18th Nov. So view early in the evening to catch it high. At mag 5.8 it is eminently viewable. On 25th October and 15th Nov, its position will be 20h 29m 17s, -19°40'03", and 20h 30m 49s, -19°34'04" respect.

NEPTUNE

Sets half an hour before Uranus. At mag 7.9 it is visible but a challenge. On 25th Oct and 15th Nov, its position will be 19h 57m 03s, -20°19'29" and 19h 58' 21", -20° 16' 21" respect.

PLUTO

For those who like a challenge. Pluto sets early from 8.50pm to 8pm between 18th and 31st October. (Sets too early in November). At mag 13.8, it is obviously hard to find. However, on 25th October, its position will be 16h 17m 56s, -09° 12' 24". Good luck!

CONSTELLATIONS:

Scorpius and Sagittarius are setting earlier these days, but as a consolation. Orion is making its appearance late in the evening. I was walking eastward home at 11pm the other night and was struck with the view of Orion looming over the horizon. Hullo Betelgeuse!

Go Get'em.

Bob Bee

