SCORPIO

Journal of the Astronomical Society of Frankston Inc

Vol 1, No. 3 | P.O.Box 596, Frankston Victoria 3199 | MAY/JUNE 1992

FUTURE EVENT

GENERAL MEETING

18 May 1992

Technical Session

Session Leader: Peter Lowe

Subject: Life in Space (Continued)

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15 June 1992

Speaker: To be Advised

Subject:

VIEWING NIGHTS

Deep Sky Section :- 2nd May

6th June

Held at David Murray's Home

COMMITTEE MEETING

The committee will be held at the Brown's residence on:-

28 May 1992

25 June 1992

23 July 1992

The Astronomical Society of Frankston was founded in 1969 with the aim of fostering the study of astronomy by amateurs and promoting the hobby of amateur astronomy to the general public. The society holds a General Meeting each month for the exchange of ideas and information.Regular observing nights, both private and public are arranged to observe currently available celestial objects. In addition the Society provides the services of its members for educational presentations or observing nights for schools and local community groups.

N.A.C.A.A 1992

This Easter weekend saw the fifthteenth National Australian Convention of Amateur Astronomers in Adelaide. (pronounced nay-sir) ASF was representated by:- Steve Malone, Peter Norman, Peter and Ros Skilton and Bruce Tregaskis.

In his keynote address, Professor.A.Rodgers of Mt Stromlo, outlined plans to bid for a 14 metre optical telescope to be sited in central Australia. After this presentations ranged from observations of Jupiters moons to a theoretical paper by our own Peter Norman on the elemental abundances in the universe. The highlight of the day was an invited and sobering talk by Duncan Steel of the Anglo-Australian Observatory on the Search for Earth threatening asteroids and how amateur societies such as ours can contribute significantly.

The conference dinner then followed providing a relaxed atmosphere for renewal of old friendships and making new ones.

The convention culminated in a bus trip to see what a small group of dedicated amateurs can produce in 2 years. Two large domed obsevatories stood majestically houseing the ASSA's 20" Cassegrain and a private 30" Newtonian. Have you ever looked through one that big? Everyone stood back awed by their achievement.

Congratulations to Joe Grida and his team. Well Done.

Ros & Peter Skilton

EDITORS MESSAGE

Don't forget if you have any comments about the magazine, its layout or its contents - please send comments to the Vice President

Meeting Venue:

The Peninsula School

Wooralla Drive, Mt Eliza

(Melways Map 105, F5)

Room F6 at 8.00pm on the third Wednesday of each Month except December/January

Visitors are always welcome

Annual Membership Fees

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

Membership Fees due 1st July each year

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SOCIETY NEWS

COMMITTEE NOTES

The committee meet on the 26 March. Given the vote at the last general meeting not to change the Society name (6 For to 13 Against) it was agreed to proceed with the Society Lapel badges. A most economic run lot is now being explored.

We are still waiting for news from the Frankston Council about the award and from the Mornington Council about the use of the Briars as an observatory site.

The Post Office display associated with the Astronomy Stamps release went very well.

Arrangements for the Environment Week display are being finalised.

The Scorpio newletter is going very well and a number of favourable comments have been received.

The Technical Session at the last meeting went very well although it was felt that a less formal structure still would be better. The discussions at the end of the session were still going strongly and it was felt that the next Technical Session will carry on with the same subject.

The special interest groups have made a tentative start and it was agreed that some form of activity programme

Bimonthly Scorpio

Some members have expressed concern they are not receiving a Scorpio each month.

Scorpio is issued every two months. This allows us to produce a better quality magazine and does not increase our overall costs.

If you have any suggests on how we can improve the magazine please see me at the general meetings.

Remember I could always use some contributions.

Peter Lowe.

WELCOME TO NEW MEMBERS

It is with great pleasure we welcome the following people as new members of the society:

Rene Skilton

Terry Hancock

QUESTIONS & ANSWERS

The following questions were submitted at Monthly General Meetings:-

How was the speed of light ascertained?

Prior to the 18th century, light was considered to move through a celestial ether much as sound moves through air. If you had asked this question at that time you would have gotten a vague answer that basically meant "We don't know but it's fast". The first reliable measurement of the speed of light was obtained by the astronomer Romer in 1675. Romer noted from his observations on eclipses of Jupiter's moons that they did not always occur at the predicted times. He found that the measured timing of an eclipse was 986 seconds later when the Earth was at its greatest distance from Jupiter than when at its closest. This distance was of course the effective diameter of the Earth's orbit around the Sun. Thus as the Earth orbited the Sun, light from the eclipsing moon of Jupiter had to travel more or less distance depending upon where the Earth was in the orbit. From this he deduced a speed of 200,000,000 (or 2×10^8) metres/sec. This figure was slowly refined with more observations to 3×10^8 m/sec. In 1849 H.L.Fizeau made the first non-astronomical determination using a five mile long light beam and measuring the time of flight of pulses of light along the beam using a toothed wheel to generate and time the returning pulses of light. He obtained the value 3.13×10^8 m/sec. The French physicist Foucault greatly improved the accuracy using rotating mirrors. The method was extended further by A.Michelson until in 1932 the accepted value was 2.99774×10^8 m/sec. Since that time a number of independent determinations have been made using various radio and microwave methods.

What is the latest thinking on any planets beyond Pluto?

The triumphant predictions of celestial mechanics that allowed the calculation of the position of Neptune and its subsequent discovery has encouraged many astronomer over the years to repeat the deed. Pluto was discovered by an extensive photographic search by Clyde Tombaugh after it was claimed that the orbital deviations of Uranus and Neptune meant there was another planet out there. Pluto however is too small to account for the deviations so some still believe there could be other planets beyond Pluto. Small differences between the measurement and computed positions of the three planets (called residuals) are still encouraging some astronomers to continue searching for Planet X. The search these days is more by computer than with telescope because it is proving exceedingly difficult to come up with an hypothetical planet that has believable characteristics. Either the planet X must be very big (upto 5 times the Earth's mass) and have a distant and highly eccentric orbit or very small but moving in an orbit closer to Neptune. In both cases there are fundamental problems with explaining how these objects would have attained these orbits or why they have not been seen in previous surveys.

The general consensus is that there is no planet X. The residuals while apparently present are comparable with the error of measurement and are probably the result of limited measurements. After all, Neptune hasn't had time yet to complete one orbit since its discovery. One vital piece of data that seems to sound the death knell for Planet X is the paths of the Voyager 2 spacecraft currently leaving the solar system. When Voyager 2 was being flight planned, it was very important that any effect from a possible Planet X be understood or the spacecraft could be pulled off course. They had to compute the spacecrafts trajectory past Saturn with enough precision to send it on skimming past Neptune and its moon Triton which it did with great accuracy. The astrodynamicists found they could compute the path of the craft more than accurately enough if they ignored all astrometric observations of both Uranus and Neptune prior to 1910. Systematic errors in the early observations would more than account for the residuals seen.

It does not appear necessary to invent another planet just yet but wouldn't it be fun to find one.

WHAT'S NEWS IN ASTRONOMY

Soviet Cosmonant Returns

Cosmonaut 3rd Class Sergei Krikalev has returned to Earth after 10 months in space. Sergei had been stuck in the Mir space station waiting for someone to decide to bring him back after the demise of the USSR space programme. Russia which was strapped for money to launch a supply mission could not afford the massive fees charges by Kazakhstan who now own the launch facilities. Russia however worked a deal to send the first Kazakh into space in return for access to the Biakonur Cosmodrome.

Doomsday Rocks

The UK Schmidt telescope at the Anglo-Australian Observatory is current engaged in a cataloging programme of possible Earth colliding asteroids known as "Doomsday Rocks. The international project objective is to detect Earth crossing asteroids and help predict their future orbital paths.

The formation of the planets is based on mass accumulation by collisions. The really heavy collisions finished in the early part of the solar systems history and there is plenty of evidence to attest to its destructive power. The formation of our own moon is thought to have been the result of a collision between our Earth and a Mars sized object. As recently as 65 million years ago it seems likely that the demise of the dinosaurs and most other life on Earth was the result of a cosmic collision.

British astronomers believe we must re-evaluate the possibilities for collisions from asteroids. An asteroid bigger than 10 kilometres could hit the Earth every 150 million years but this has been revised to every few hundred thousand years because of the estimated large number of undiscovered objects.

Believe it or not, NASA is considering a project to detect collision course asteroids and divert them using thruster rockets or nuclear bombs. They require about three weeks warning to mount a suitable mission if the rockets were on standby. Given that current technology only detects these objects when they are very close to the Earth and thus only visible for a few hours or days it does seem like a waste of money. Lets at least hope some good science can come from it.

Isaac Asimov 1920 - 1992

A lone candle burns in our home tonight marking the death of probably this centuries greatest science fiction writer: Isaac Asimov.

Since astronomy and spacetravel form part of the sci-fi backbone, it seems appropriate to mention Asimov's work

Russian born in 1920, he was brought to the USA in 1923. He became interested in writing and had his first story published at the age of 18 (*Marooned Off Vesta*). This started a series of stories and books covering almost 500 titles on a wide variety of topics. In total he won five Hugo Awards and three Nebula Awards, an amazing feat.

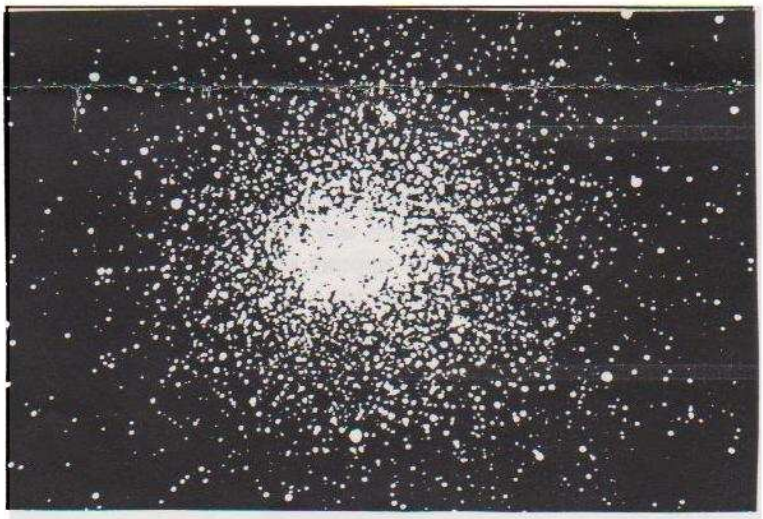
Arguably his greatest story the *Foundation Trilogy* was voted the Best All Time Science Fiction Series and given a Hugo award by his fellow writers. The Foundation series is a story covering a thousand years in the development of a future galactic empire that failed through internal corruption but was destined to rise again through the forces of democratic science.

With his death we will never know if the second empire ever made it.

P.J.Lowe

Pulsars in Globular Cluster

Astronomers using the Parkes radio telescope in NSW have discovered more than 10 short period pulsars in the globular cluster 47 Tucanae. The short period pulsars have periods ranging from 1.78 - 5.76 milliseconds. (562 - 174 rpm). Millisecond pulsars are believed to be members of binary star systems where one of the stars is a "recycled" pulsar that has been spun-up by the transfer of matter from the other companion star. The transfered matter adds angular momentum to the pulsar causing it to spin-up and start pulsing again.



The discovery doubles the number of known pulsars with period of only a few thousandths of a second. This globular cluster is tightly packed with a bright central core and the presence of so many millisecond pulsars may provide clues to the orgin of these objects. Interestingly no slower pulsars with period in the order of seconds have been found and current research is trying to explain why only millisecond pulsars are present.

Searches for pulsars in other globular clusters are of course also underway.

Ulysses Rounds Jupiter

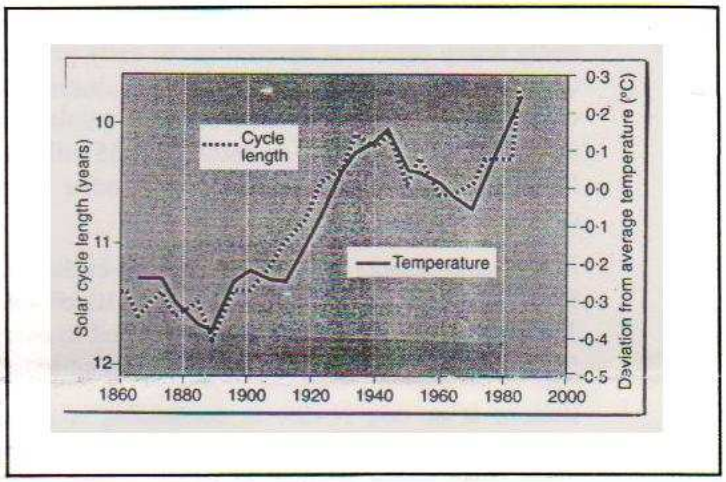
The European space probe Ulysses has swung over the north pole of Jupiter and started its voyage under the Sun's south pole. It is expected to pass over the Sun's south pole in 1994 and loop over its north pole in 1995. This will allow astronomers to measure the solar environment outside the plane of the ecliptic. The probe survived the passage through Jupiters massive ionized magnetosphere without damage. During the transit it provided the first north-south transit of the magnetosphere. The last measurements were made by the Voyager spacecraft in the 1970's and these were along the planet's equator.

The magnetosphere is a magnetic bubble of ionized gas surrounding the planet. In the Earth's magnetosphere the ionized gas comes from the solar wind while at Jupiter the moon "Io" injects volcanic sulphur and oxygen which inconjuntion with the solar wind creates a vast flattened structure. The flattened shape of the magnetosphere is explained by an enormous electrical current flowing through these tenuous gases. The sheet of ionized material could be carrying as must as a billion amps of current and generating a magnetic field strong enough to flatten the magnetosphere. By comparison the Earths magnetosphere is spherical. Jupiter's magnetic field is some 20,000 times that of Earth of which about 10% is generated by this vast electric current around Io's orbit.

The Ulysses probe is now steadily moving out of the ecliptic plane and sending back a map of the solar properties in this unexplored region of the solar system.

Solar Influence on Climate

Researcher have long sought a connection between the Earth's climate and solar activity. Early research was aimed at predicting crop yields but more recent research is trying to better understand the risks , if any, involved with such things as the greenhouse effect. In some cases the apparent link between crop yields and solar activity was tantalizingly close but no positive connection was ever made. Researchers in Denmark have now found the first convincing evidence of a direct connection between solar variations and world climate. The principal indicator to solar activity is the 11 year sunspot cycle during which the number of sunspots visible on the solar surface varies cyclical. Every eleven years there is a reversal in the magnetic orientation of sunspot groups thus the 11 year cycle should more accurately be called a 22 year cycle. This cycle is not exact however and can vary from 16 to 28 years. Records of the sunspot counts suggest the cycle length stretches and shrinks over about an 80-90 year period. The Denmark researchers have found that the length of each cycle correlates strongly with variations in the Earths mean global temperature. Ice cores have been used to determine the variations in the Northern hemisphere temperature and these seem to also vary in about 80 year cycles. A plot of the mean temperature and the cycle length since the mid 19th century shows a good correspondence between the two. In fact the statistics are so good there is less than a 5% chance that the correlation is a freak. To achieve this level of effect, calculations have shown the Sun's output would only have to change by ± 0.5% which is comparable with satellite measurements. The solar output seems high for short cycles and low for longer cycles. It remains to be seen if an enhanced greenhouse effect due to human activity will overtake this solar connection.



1992 EXTRA LONG YEAR

In addition to being a leap year, 1992 will be made one second longer. Keepers of atomic clocks worldwide will add a "leap second" simultaneously on 1 July at 9.59 am and 59 seconds Melbourne time because of variations in the Earths rotation

Wrong Way Galaxy

An American astronomer has found a galaxy NGC4622 which seems to have spiral arms going in two directions. Spiral galaxy arms usually trail the galaxy as it rotates. In the case of NGC4622 the outer two arms trail the galaxy as expected however the inner arm wraps around the galaxy in the wrong direction and appears as a "leading" arm nearly forming a ring around the core.

At this stage gravitational interaction with a nearby galaxy or some close invisible mass are being suggested as possible causes for the about-face arm. Time will tell?

New Gamma Ray Pulsar

Observations from the Compton Gamma Ray Observatory launched last year have revealed the third known gamma ray pulsar. Gamma rays are electromagnetic radition at the shortest wavelengths and as such are at extremely high energies.

The new object known as The Circinus Pulsar emits one pulse every rotation. This is different from the other known pulsars which emit two per rotation.

Theorists are trying to explain how these high energy photons are generated and why only one and not two pulses are seen.

SPECIAL ACTIVITY GROUPS

DEEP SKY OBSERVING

The observing night on the 8th March was very successful. Sky conditions were very good and a large number of objects were sighted. Although the intention was to concentrate on the constellation of Centaurus, a number of other constellations were covered. Objects sighted were:-

NGC5139 Famous globular cluster Omega Centaurus

NGC5128 Bright galaxy with dark dust lanes

NGC5286 very rich globular cluster

NGC4945 Spiral galaxy seen nearly edge on

NGC4976 Galaxy with a bright centre

NGC5102 Galaxy with tighly bound spiral and bright centre

NGC4696 Centaurus Galaxy cluster. This cluster is the main area of interest for the next few months and is the site of a vast galaxy cluster.

Other objects viewed were The Large Magellanic Cloud in Dorado, NGC2023 in Orion, the globular cluster NGC4372 in Musca, NGC3372 the Eta Carina nebula, The Sombrero Galaxy M104 in Corvos, a large but faint galaxy M83 in Hydra and the 10th magnitude planetary nebula IC4406 in Lupus.

Sky conditions were excellent and we look forward to continuing the viewing sessions in this region of the sky.

April 4th was fairly successful. It was intended to continue the work from March however cloudy conditions force us to move around the sky generally. Conditions cleared later in the night when most people had gone home however those who stayed were able to positively identify five members of the Centuarus Galaxy Cluster. More could have been seen if condition had been better.

Now we are heading into the winter months, we will be concentrating on the constellations of Scorpius and Sagittarius. I have been asked to have a better plan for our deep sky nights and it is intended to give members one or two constellations and ask them to research what objects can be found. Researching the objects can be half the fun and then go an find them on the night.

If you would like to give it a try please contact me.

Dark Skies To Everyone

David Murray

SOLAR SYSTEM

A field trip to Baxter Park was carried out on the 21st March to observe the asteroid 229 Adelinda occult the star PPM97322 in Gemini. No fluctuation in the light level was observed with our site probably being too far south relative the path of the asteroid shadow. Similar observations of the asteroids 251 Sophia and 409 Aspasia were thwarted a few days later by Melbournes weather., though the latter asteroid was believed to have been sighted the night before.

It is intended the Solar System group will meet in the field (literally) once per month depending upon events with preference giving to Friday/Saturdays

TELESCOPE MAKING

With Steve Malone off on his around Australia holiday for the rest of this year, I'm not sure what's happenning with the telescope making group. The intention is to develop a telescope making instruction bookiet and possible video. Various members are at different stages in making instruments but the group has not yet started to get together.

I will prepare a list of instruments known to be underway and get something going for the next meeting.

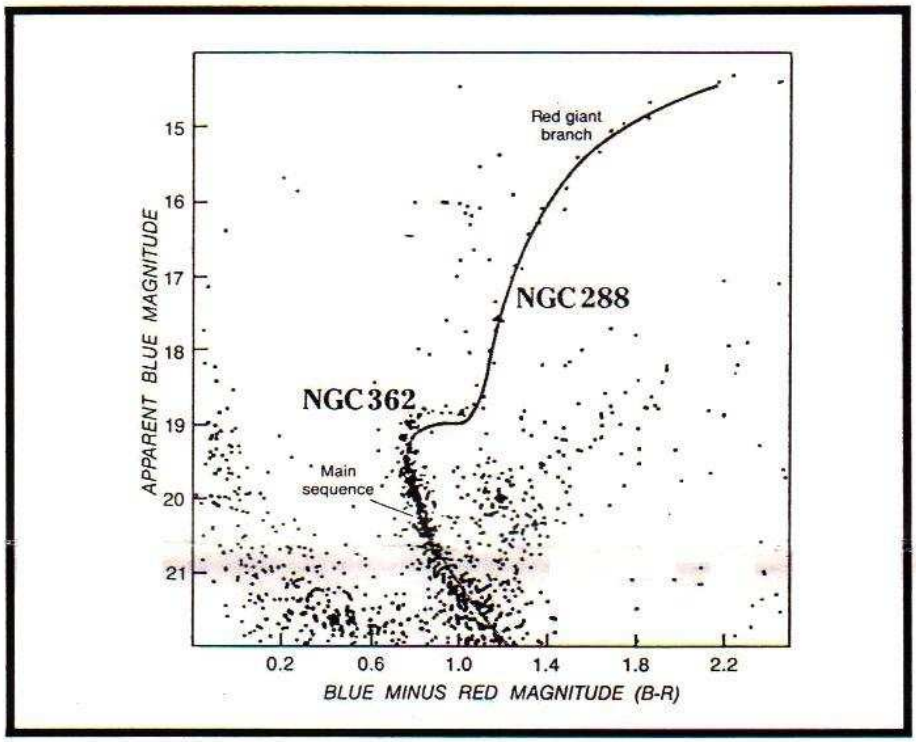
P.J.Lowe.

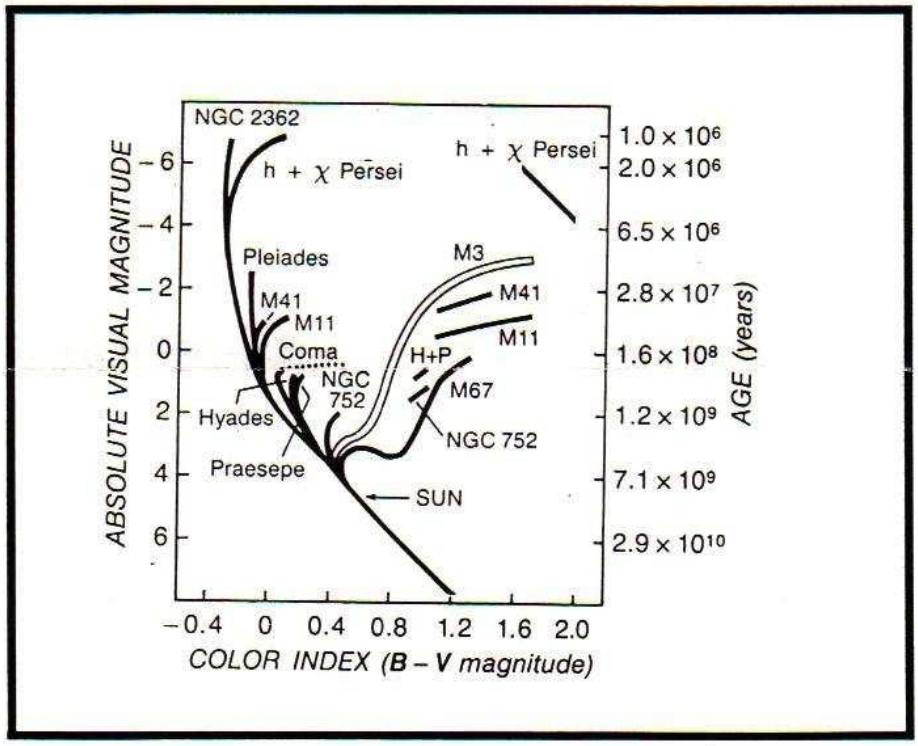
DISCUSSIONS - GLOBULAR CLUSTERS

The approach of the winter months brings the famous globular cluster Omega Centura into view. This cluster is a favourite object for all observers and it seems that an article on globular clusters would be appropriate for the winter issue of Scorpio. Globular clusters are some of the most beautiful and intrinsically appealing objects visible in the sky. Their smooth, symmetrical appearance is immediately pleasing to the eye and cannot fail to invoke some "ooh's and aah's" at the telescope. They are not just pretty faces however but represent a view of star formation at the earliest stages in the evolution of the Milky Way galaxy. Currently it is thought these clusters formed when the Milky Way galaxy was still a large gas cloud many hundreds of thousands of lightyears across. Star formation at this time was controlled more by the slow collapse of parts of the cloud at random locations than at the specific locations seen today such a H_2 complexes. As the cloud collapsed and stars formed, they came together in a roughly spherical star cluster. The Milky Way galaxy continued to form by contracting and spinning up to become a spiral galaxy. This contraction left the globular clusters spread more or less uniformly about the galaxy as a sort of halo delineating the size of the original gas cloud. Star cluster are still forming today in the galaxy but no longer like the globulars. Some obvious questions come to mind, if the globulars are so old why are they still there and not broken up like the open cluster we see today and why do they have a distinctive spherical shape? The answers to both these questions are closely linked. When a cluster forms each star end up with some level of momentum either from its own speed moving about the cluster or some angular momentum about the cluster centre of gravity. All the stars in the cluster are interacting gravitationally and thus are constantly exchanging energy which changes their speed. Occasionally a star will obtain sufficient speed to be able to leave the cluster forever and will fly off. The cluster thus losses a star member and the overall energy of the remaining cluster has been reduced by the amount the escaping star has taken with it. This process is call "evaporation" and like evaporation of liquids the hot vapour flies off and the liquid cools. The equivalent cooling of the cluster means the average energy of the remaining stars is lower and thus gravitational interactions will be less energetic. Most small clusters have enough total energy that eventually all the stars will evaporate away and the cluster breaks up. The Pleides cluster is a good example of this. A very young cluster that is already starting to evaporate into space. There is another possible outcome. As stars evaporate away from the cluster the energy available to speed up more stars reduces until eventually the chance of stars interacting sufficiently to accelerate one star to escape velocity become negligible. The endpoint is a vast number of stars slowly orbiting the cluster centre of gravity. Over the eons of time, the original shape of the star cluster is lost and the cluster becomes more uniform and assumes the distinctive spherical ball of stars. Stars in a globular are packed a lot closer together than they are in our part of space. Through a telescope, some more stars can be resolved but generally they appear so close together that the stars appear to blur together. The chance of a collision is in fact very low. Near the centre of a cluster, the average distance between stars is a few lightmonths more than enough space for stars to orbit about without chance of collision. This is about 250 times more distant than Pluto. The night sky would not show a Milky Way but a rather uniform spread of bright stars. If fact nighttime on a cluster planet would be about the same as our full moon light level. With all that light amateur astronomy in a globular cluster would have to be hell! I much prefer being on the outskirts of the galaxy.

From the astronomer's point of view star clusters are very inportant objects. They represent the only places where a large number of stars have formed at the same time, same place and from the same materials. It is thus possible to make direct comparisons between stars. If they all formed at the same time and from the same materials then any differences between one star and the next would be due to different aging processes. Since they are all at the same place then they are at the same distance more or less from Earth and thus any difference seen in star brightness is real. Globulars offer a perfect opportunity to study the life stages of stars and have been very important to our understanding of star populations and stellar evolution. In the early studies of globulars it was noticed that the brightest stars were old and red while the solar neighborhood stars were blue. It was realised that there were two types of star populations, the older Type II population of the globular clusters and the younger Type I population found in the galaxy itself. Further studies showed that the galaxy was surrounded by a halo of population II stars including some 125 globular clusters. This halo delineated the size of the galaxy. Further studies on the distribution of the globular clusters in space showed they were concentrated toward the brightes part of the Milky Way in Sagittarius and it was realised that they were spread uniformly about the galaxy centre which put the Earth out toward the edge of the Milky Way galaxy. It is now thought the Sun is about 7000 parsecs out from the galaxy centre. The radius of the galactic disk is considered to be about 15,000 parsecs. In the early part of the century, E.Hertzsprung and H.Russell independently proposed the usefulness of plotting the luminosity of stars against their spectra type or colour. This plot called the H-R diagramme is fundamental to our understanding

of stellar evolution because stars change their luminosity and colour as they age. The way that any particular star changes throughout its life time depends like human being upon its starting conditions, in the case of stars, the initial mass and type of materials composing the star. High mass stars will use their nuclear fuel quickly and will move along their particular path on the H-R diagramme quickly while less massive stars will move more slowly. Since in globular clusters all the stars formed at the same time and from the same material, the distribution of stars on the H-R diagramme will show the typical evolutionary path for that cluster. A typical diagramme for 47 Tucanae is shown below. When stars form and start nuclear burning of their hydrogen they move into an area on the diagramme called the main sequence. As the stars evolve and slowly burn up their nuclear fuel they become brighter and bluer. Our own Sun is in this stage of its life now. Eventually the composition of the stars core becomes more polluted with the helium waste product from the hydrogen burning and the star is unable to maintain the hydrogen burning. The star turns off the main sequence and starts to swell up into the red-giant phase. It cannot remain in the red giant phase very long because the star no longer has the fuel to burn. It eventually starts to die and evolves away from the red-giant branch toward the lower right area of the H-R diagramme to become a white dwarf and cool off. If the star had a large mass to being with it may end its life in a supernova leaving behind a neutron star or black hole. As mentioned on page 3 pulsars have been found concentrated in globular clusters. A study of the distribution of stars on the H-R diagramme for any particular cluster allows us to estimate the clusters age. The older the cluster the more time stars have had to use up their fuel and move off the main sequence. Old clusters should therefore have their turn off points further down the main sequence curve. In this way we know that globulars are the oldest objects yet discovered in the galaxy. They are thought to have all formed at least 13 billion years ago. The study of globulars continues to be an active area of research with searches now underway for a possible black hole at the core of some clusters.





Next time you look through your scope at one of these objects please take five minutes while looking through the eyepiece to contemplate the beauty not only of the object itself but the wonderful processes that are going on in these the oldest objects in our galaxy.

CONSTELLATION SCORPIUS

The constellation of Scorpius or less correctly known as Scorpio is one of the few constellations that resembles the creature it is meant to represent. Mythologically it is the scorpion that Juno sent to attack Orion The Great Hunter and Scorpius is now on the opposite side of the sky so the creature can no longer hurt him.

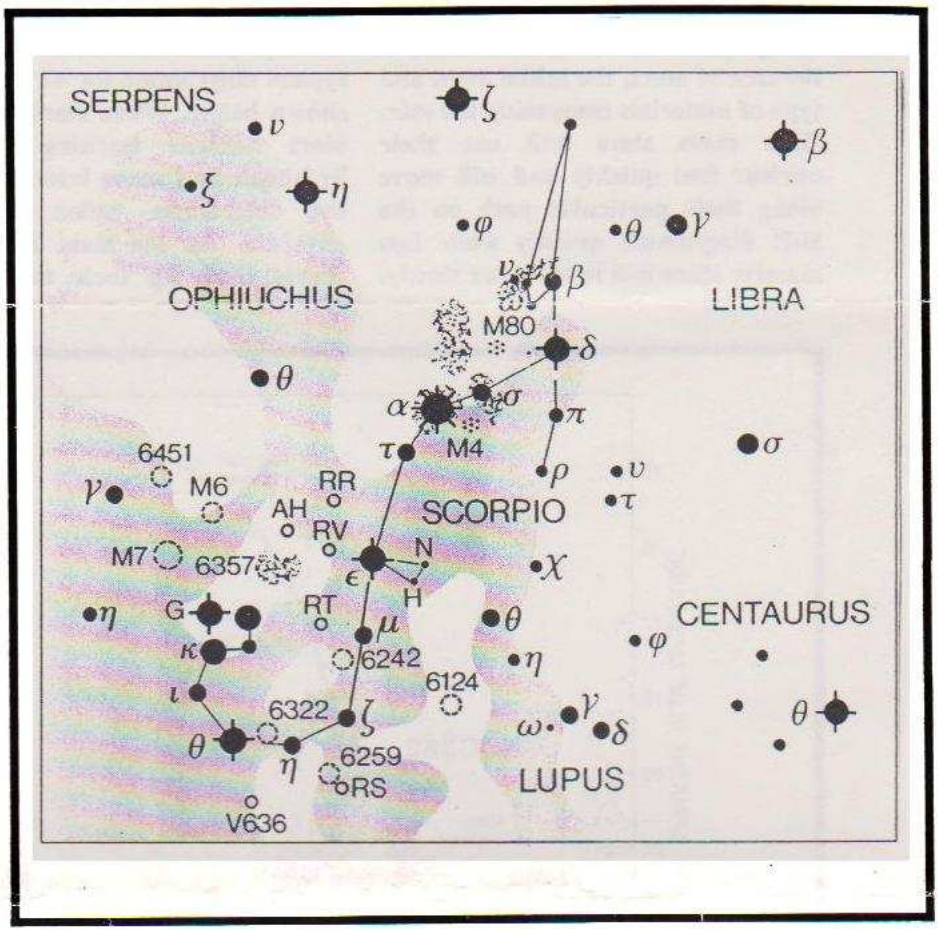
Scorpius is a very rich area of the sky and deserves more than a passing examination. The body of the scorpion is dominated by the red super giant Antares which is a slight variable (range 0.86 - 1.02 mag) as would be expected of these objects.

There are a number of variable stars in this region of the sky mainly Mira or Cepheid type. At maximum most of the Mira types are 6-7th magnitude and thus easily seen in binoculars or telescope. They generally fade to below 13th magnitude becoming invisible in small telescopes and thus represent excellent game for the variable hunter.

The constellation is well known for its double stars and there is a wide selection ranging from the 50 arcsecond binary pi-Scorpius in the head of the scorpion to a number with separations below one arcsecond.

With regard to clusters there are three globulars. The main one being the great cluster M4 seen close to Antares. Easily visible using binoculars on a dark night M4 or NGC6121 is quite bright at 5.9 magnitude. With a diameter of over 26" it can make quite a sight. The other two globulars are quite small and require good conditions and high magnification to find but do not be deterred. NGC 6093 (M80) and NGC6388 are both about 9" in diameter and about magnitude 8. Although difficult to find they are worth the effort.

The Scorpius area is fully of open star clusters and several have been



listed in the data section.

While some such as M6 and M7 are relatively large and bright some can represent a challenge such as NGC6400 which is only 8 arcminute in diameter and pushing 9th magnitude. It is worth watching for those clear dark skys around new moon to set aside some time to hunt down these objects.

	Hr	Min	Deg	Min	Dia	
NGC6124	16	25.6	-40	40	29'	Open Cluster
NGC6259	17	00.7	- 44	40	10'	Open Cluster
NGC6383	17	34.8	- 32	34	5'	Open Cluster with Nebulosity
NGC6405	17	40.1	- 32	13	15'	Butterfly Cluster
M80	16	17.0	- 22	59	8.9'	Globular
M4	16	23.6	- 26	32	26.3'	Globular
NGC6302	17	13.7	- 37	06	25"	Bug Planetary Nebula
NGC6337	17	22.3	- 38	29	48"	Planetary Nebula