

# SCORPIO

Journal of the Astronomical Society of Frankston Inc

Vol 2, No.5

P.O.Box 596, Frankston Victoria 3199

SEPT/OCT 1993

## FUTURE EVENT

### GENERAL MEETING

15 September 1993

Discussion Night

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20 October 1993

Show & Tell Night

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### VIEWING NIGHTS

To be advised at meetings

### COMMITTEE MEETING

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

23 September 1993

28 October 1993

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.

### SPECIAL EVENTS

A number of special event are being planned in the next few months.

#### 1) Jurassic Park Film.

A special social get together has been arranged to see the film Jurassic Park at the Cranbourne cinemas. After which there is a supper at Steve and June Malone's.

Film costs are at a special discount rate.

{see back page for details}

#### 2) Society Dinner.

A dinner at Bunurong Restaurant has been organised for November 5th.

This is a three course meal for \$10 per person. It will be necessary to book for this event and a list of people attending will be made up at the October general meeting. Details will available at this meeting or can be obtained from Peter Lowe.

Let's help make these events a success

### BRIAR'S BBQ/VIEWING NIGHT.

The viewing night held at the Briars on the last Saturday in August was well attended and enjoyed by all. As usual we had a BBQ before the observing. While the almost full moon limited the amount of viewing possible, a number of the new members enjoyed themselves at the telescopes. As the night got colder, more and more people surrounded the open fire and by the end of the evening the telescopes had been abandoned in favor of a group discussion near the warmth of the glowing embers.

### EDITORS MESSAGE

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

### 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

Visitors are always welcome

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### Annual Membership Fees

Full Members \$20

Concession Members \$15

Family Members \$30

Family Pensioners \$25

Membership Fees due 1st January each year

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### President

Peter Lowe, 4 Grainstore Court

Langwarrin (03)775 9347

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### Treasurer

Peter Brown, 7 Kiandra Court

Frankston (03)789 5679

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### Secretary

Don Leggett, 4 Vellvue Court

Tootgarook (059)85 4927

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### Committee

Peter Skilton (03)776 5898

Ros Skilton (03) 776 5898

Tony Hales (03)781 3251

Bob Heale (03)787 1748

Laurie McIntyre

Steve Malone

## SOCIETY NEWS

In keeping with our policy of having a social event each month in addition to the general meeting, a number of activities are being considered by the committee for the next few months. A film night has been arranged to view the film "Jurassic Park" on Sunday 24 October. Details will be given out at the September meeting. We are considering a car rally as part of the Christmas Breakup Party but would appreciate some ideas from the members. Another possibility is a Society Dinner at Bunurong Restaurant in early November. Plans for our summer observing program are being prepared. It is hope to start the school viewing nights in October. The first viewing night has already been successfully held for the 1st Ranleigh Cub Pack. It is hope to proposal for The Briars observatory will be put to Mornington Council soon. First contact has been made with The Royal Botanic Gardens at Cranbourne to discuss the possibility of setting up an observing site within the gardens. If this is possible we hope it could become a future observatory site. It was agreed that the payment of subscriptions should be changed so they become due by calender month. Thus next year subscriptions will become due in January. A system of adjusting membership fees for existing members will be worked out. It was also agreed that there will be a January meeting next year. It has been our practice not to have a January meeting in the past but this is consider restricting. One possibility may be have the January meeting at The Briars. Another change being considered is a set of astronomy lectures to be held through the winter months. It has always been difficult to hold member through the winter months and it is hope a lecture series may be more popular.

## QUESTIONS AND ANSWERS

### WHAT IS THE RED SHIFT?

In studying the universe about us, astronomers use a phenomena called the doppler effect to extract information of spectra about the relative speed of objects to us on Earth. The doppler effect is a change in the wavelength or colour of light cause by the relative movement between an observer (on Earth) and a source of light in the sky. If the object is moving toward the Earth the light wavelength is shortened or blue shifted and if the object is moving away from the Earth the wavelength is lengthened or red shifted. The amount of blue or red shift enable astronomers to compute the relative speed between the object and us. This curious effect is a consequence of the universal observation that the speed of light is the same for all observers. This consistency in the measured speed of light forms one of the basic assumptions used to establish the theory of relativity. In everyday experience when two observers moving relative to one and other interact in some way their speeds are additive. For instance consider two observer on two trains moving past each other on adjacent tracks. If the trains are moving at 100k/hr and one observer throws a ball across to the other observer. The second observer would measure the balls velocity at 200k/hr. The velocities of the two observers thus add together. However if instead of a ball, the first observer sent a light pulse toward the observer he would measure the speed of the pulse at the speed of light. When the second observer received the light pulse he would also measure its speed at the speed of light. This is what is meant when we say the speed of light is the same for all observers.

Electromagnetic theory tells us that the speed of light in a vacuum is given by the expression:- speed of light = frequency X wavelength Within an electromagnetic photon a small packet of energy is regularly oscillated between electric and magnetic fields. The frequency is the number of times this process occurs per second and the wavelength is the distance over which one conversion cycle occurs. Thus if an object emits a light photon of wavelength L, then an observer on that object will measure the speed of light equal to C and the frequency of the photon as  $\hat{a}=C/L$ . Assume the object is moving toward the Earth at a speed V when it emitted that photon. When the photon reaches you on Earth, you would still measure the photons speed equal to the speed of light C. Because relative to the photon you are moving toward it at a speed V, you would see the oscillatory conversion of energy within the photon occurring a bit faster. Thus the light has a higher frequency and therefore a smaller wavelength. The light has thus been blue shifted. Conversely if the object is moving away from you the observed frequency will be reduced and the wavelength increased. The light will have been red shifted. You can use this to calculate the recession velocity of a distant galaxy. For instance light front galaxies in the constellation of Virgo has been observed to have wavelengths 0.4% longer than that observed in the laboratory. We find a velocity  $V=0.004C$  or  $(0.004)(3 \times 10^8 \text{ metre/sec}) = 1.2 \times 10^6 \text{ m/sec}$  (2.7 million miles/hour)

### ODDSPOT

A group of protestors waving signs at the Jet Propulsion Laboratories claim NASA has deliberately destroyed the Mars Observer Probe to prevent confirmation observations of relics from past Martian civilizations.

## WHAT'S NEWS IN ASTRONOMY

### ANDROMEDA DOUBLE TAKE

Using the Hubble Space Telescope, US astronomers have probed the core of our nearest giant spiral galaxy Andromeda with surprising results. The galaxy's central region was photographed at yellow and infrared light revealing two distinct cores. The two cores are very close physically being apparently only some six lightyears apart but astronomers are nevertheless excited at the discover of a double core. Andromeda is the nearest giant galaxy to our own Milky Way and the largest member of our own local galactic cluster known as the Local Group. Double cores have been found before in distant galaxies or quasars but at 2.4 million lightyears distant the Andromeda galaxy is sufficiently close to study the dynamics of the core in fine detail. Studies so far have shown the fainter of the two core components is at the exact centre of the galaxy. Material near this region is orbiting at high speeds and calculations strongly suggest the region contains a massive black hole. The two components may be orbiting each other which means the second component must also contain a lot of matter otherwise it would be gravitationally drawn into the first component black hole. The second component may be massive enough to also be a black hole. While astronomers are not sure quite what a double core signifies but a hot favourite is the merge of two smaller galaxies to produce a giant spiral galaxy. This may not be such an unusual event when you consider the possibility the two Magellanic galaxies LMC and SMC may ultimately merge with our own Milky Way galaxy. (see below)

### LMC/MILKY WAY COLLISION

Radio mapping of the hydrogen gas around the Milky Way revealed years ago that the two small irregular Magellanic galaxies are intimately connected to our own galaxy. US astronomers using the 4 meter reflecting telescope on Cerro Tololo in

Chile have been able to estimate the proper motion of stars in the Large Magellanic Cloud by measuring their positions relative to faint background galaxies. These measurements which have taken over 15 years to gather suggest the visual part of the Large Magellanic Cloud is at the end of a stream of stars and gas torn apart by gravitational interaction with the Milky Way galaxy. This is strong evidence that the Large Magellanic Cloud will eventually merge with the Milky Way.

### AUSTRALIAN FOSSILS HELP TIE DOWN THE FORMATION OF LIFE ON EARTH.

A crucial question in the Search for Extra Terrestrial Intelligence is "How easily does life develop from inanimate matter"? After all if the mechanism leading to the development of early life is very rare, we should not expect to see much in the way of other life forms. To answer this question one needs to look at the only known example of life in the universe, namely our Earth. The formation of the rocky type planets such as Mercury, Venus, Earth and Mars is fairly well understood and we now know these planets have formed by the slow accretion of meteorite materials. Every time a meteor is seen in the sky that's a further small amount of material being added to our Earth. During the formation of the Earth, meteor bombardment must have been spectacular. Every part of the surface was repeatedly hit by meteorites. The Earth's surface is believed to have been molten for most of this period making the formation of life very unlikely. We know from studies of lunar rocks and meteorites that the Solar System formed about 4.6 billion years ago. It is thought from planetary studies and computer simulations of planet formation that the bombardment phase of rocky planet formation was essential over 3.9 billion years ago. Thus life could not have formed before this time. Fossils found in north west Australia are believed to the oldest known on

the planet. The fossils appear to be a form of cyanobacteria such as blue-green algae and the surrounding rocks have been estimated at 3.465 billion years old. Therefore life has appeared on the planet some time between 3.9 and 3.465 billion years ago, a period of about 400 million years. Now blue green alga is a very sophisticated life form. It consists of cellular structures strung in long filaments. A lot of evolution must already have taken place to develop blue-green algae. Earlier, less developed life forms must therefore have existed but have yet to be found in the fossil record. We do not know how long it takes to evolve a cellular life form from the primeval chemical soup of the early oceans but it is reasonable to suppose it would take a few hundred million years. The time window for the formation of life on the planet is thus getting quite small. Before 3.9 billion years ago the planet was uninhabitable yet 3.465 billion years ago we have a highly structured and evolved life in the form of blue-green algae. This suggests that life formed very early in the 400 million year time window. Now if life formed that quickly it might not be too outrageous to suggest that life formed easily. That is the mechanism for the formation of life processes was inherent in the formation of the planet and given the first opportunity life blossomed quickly. What does this tell us about the possibility of life elsewhere? We know you need more than just a suitable planet to develop life, after all Mercury, Venus and Mars appear to be lifeless, however given the right conditions in terms of star type, planet size and surface temperature it appears the formation of life might be easy. We do not know if the formation of life on a planet inevitability leads to intelligent life but if life forms easily this must enhance the chances of intelligent life developing across the galaxy.

## SPACE AUCTION.

Boy! Has the Soviet space programme hit rock bottom, literally. To raise cash the Soviets are going to auction some of the historic objects associate with the early space programme including moon rock. The auctions include space suits, instruments, space capsules and even the telegram Soviet leader Nikita Krushchev sent to Yuri Gagarin, the first man in space. How the mighty have fallen.

## OCTOBER BLUE MOON

When we talk about something happening "Once in a blue moon"; how often is that?? A Blue Moon is the second Full Moon of the month. The Moon takes 28 days to complete an orbit about the Earth and thus apart from February it is possible to have two Full Moons within a month. This October has a Blue Moon because there is a Full Moon on October 1 then a second Full Moon on October 30

## INDONESIA SAYS:

"WE WERE HERE FIRST"

Indonesia and Tonga have been arguing about the ownership of a geostationary satellite orbital slot. Indonesia has been operating a telecommunications satellite in a slot allocated to Tonga and has refused to move the satellite to a new orbit. They claim it would be more economic for Tonga to move its own satellite to an alternative slot {and besides they were there first!!} It is the first time countries have started to argue over the rights of geostationary slots where competing satellites are in the same position in the sky.

## GLOBAL FIRES & SEASHELLS

The evidence that the Earth was hit by an asteroid or asteroids 65 million years ago has been building up. Further evidence for this global catastrophe has been found in the fossil record of seashells. The rare isotope carbon-13 is selectively

concentrated into seashells because plants prefer to use the more common carbon-12. An excess carbon-13 is thus incorporated into seashells. Researchers have found a sudden drop in the level of carbon-13 in fossil seashells found at the boundary separating Cretaceous/Tertiary period 65 million years ago. This layer in the geological record known as the K-T boundary was the first evidence found to support the asteroid impact hypothesis. A sudden drop in proportion of carbon-13 to carbon-12 suggests a sudden increase in the amount of carbon-12 contained in the atmosphere and this is being attributed to global fires that occurred after the impact. Calculations suggest that about 25% of all the world's biomass was burnt. The seashell finding supports earlier work in the analysis of soot also found that the K-T boundary.

## NO STARS UP CHIMNEY

One of the great debates of this century has been the answer to the question "If you could look at a small enough area of sky, could you see stars against the background sky" The argument suggests the sky brightness should decrease as the area of sky under observation decreases and eventually the stars should become visible. It is claimed that if you look up from the bottom of a well you should see the stars. The Australian glass maker Pilkington is currently re-building one of its float glass making tanks at Dandenong. Part of the re-build involves cleaning and repairing the 243 metre high chimney. The chimney has a 5 metre inside diameter. This was a perfect opportunity to test the "bottom of the well" hypothesis. A group of us took the opportunity to climb through the refractory tunnel from the glass melting furnace to the base of the chimney and looked up. We saw no stars. The sky looked as bright and blue as ever. This is not a conclusive test but at least for this up well we saw no stars.

## MARS PROBE LOST IN SPACE

Just as the Mar Observer probe was about to go into Martian orbit all communications with the space craft have been lost. It is not know what happened to the craft and all attempts to contact it have failed. The on-board radio transmitter was turned off as part of a planned pressurisation of the craft's fuel tanks and it never turn on again. One possible theory for the failure is a failed transistor in the spacecraft's clock which controls the onboard computer. The transistor is from the same batch that is thought to have cause a failure in the NOAA-13 weather satellite.

The only hope now is to wait until the onboard computer make contact on its own. If it has not received any radio communication after 5 days, the computer has been programmed to go into a safety mode and try to establish contact with Earth . It is a long shot and the hope is the craft has followed its programming and automatically gone into Martian orbit otherwise it is lost to space.

The probe was intended to start radar mapping of the Martian surface. I guess this is a case of "You win some, you lose some"

## VIOLENT STAR BIRTH

Australian astronomers using the latest infrared array camera have discovered the site of a gigantic explosion in the Orion Nebula. The explosion was highlighted when a number of overlapping IR photographs were joined together. The photographs are thought to show the effects of star birth on surrounding gases clouds. When a protostar's internal temperature and pressure becomes high enough thermonuclear reactions begin to release sufficient energy to create a normal star. The increase in energy output blows the surrounding gas and dust away. The latest IR photographs suggests this material is being blow away at high velocity.

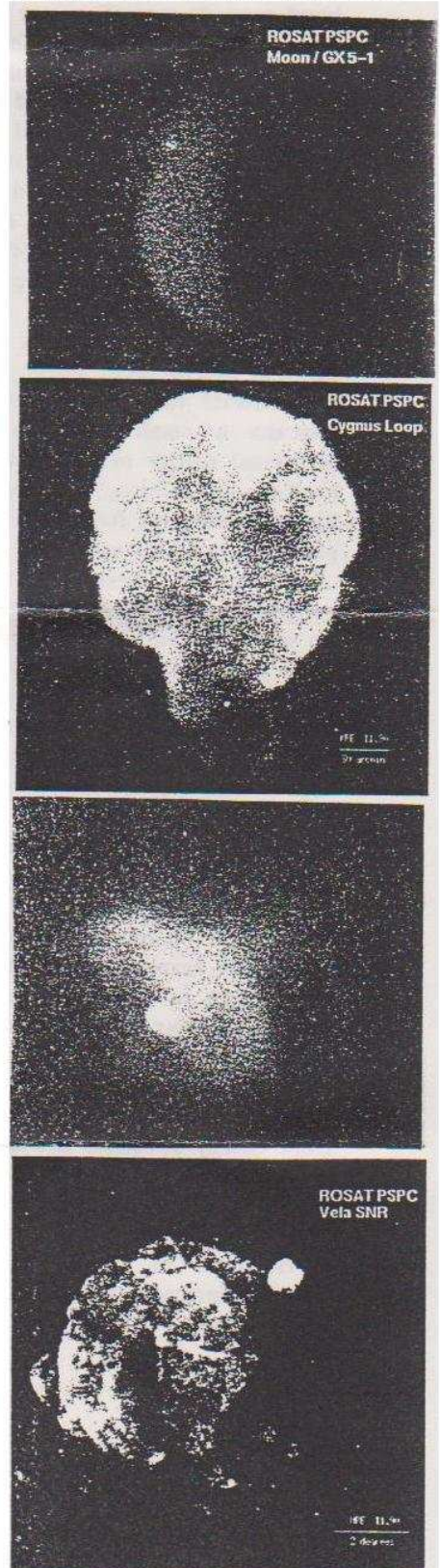
## DISCUSSIONS - X-RAY ASTRONOMY

For much of this century, astronomers have been restricted to observing within the visible and radio part of the electromagnetic spectrum. The Earth's atmosphere has effectively limited the observations to these bands because little radiation from other parts of the EM spectrum reached to ground. During the latter part of this century, astronomers have had this atmospheric murk lifted or rather have been lifted above this atmospheric murk through the use of firstly instrumented balloons and more recently orbiting astronomical observatories. Every part of the electromagnetic spectrum has been opened up to astronomical scrutiny and the veritable flood of discoveries has been totally changing our views of the heavens. Different part of the EM spectrum allows astronomers to study processes requiring different energies and the X-ray region has allowed astronomers to observe the most energetic processes in the universe. X-rays from space were first detected using balloons and rockets to raised instruments above the atmosphere. These early observations used instruments with very poor angular resolution. The instruments could recognise sources by counting each X-ray photon detect however the angular resolution was very poor. Astronomers could thus only tell approximately where in the sky the sources were located. The first orbiting observatory was the "Uhura" satellite launched in December 1970. Uhura scanned the sky by rotating about its axis. By timing the detection of individual X-rays the position of sources could be determined. While it took some considerable time to complete a scan of the sky, Uhura increased the known sources from 30 to over 200. X-ray astronomy took a giant leap forward with the launch of the HEAO-2 satellite, later named the Einstein Observatory to commemorate the centenary of the physicists' birth. HEAO-2 carried the first true X-ray

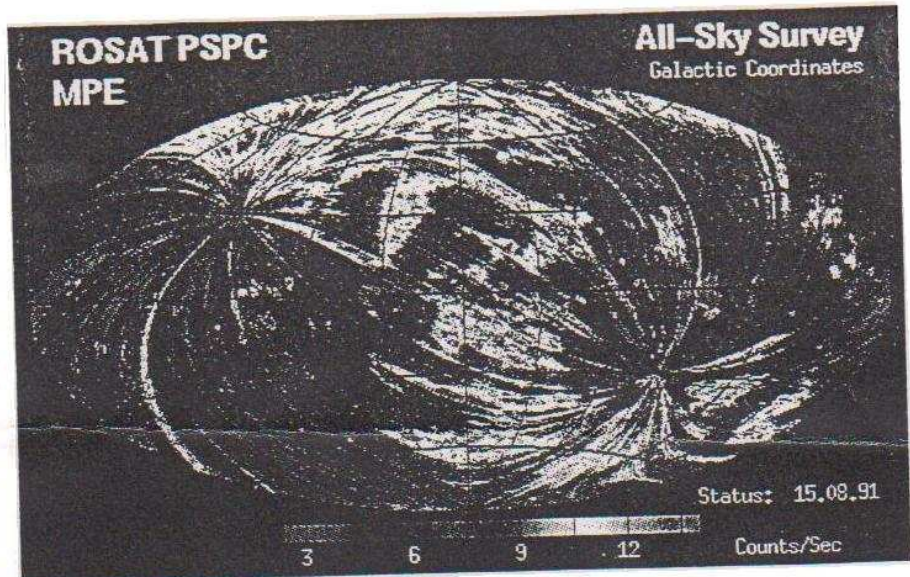
telescope into orbit. Through an ingenious use of nested cylindrical mirror the X-rays could be focused to produce an image. Astronomers could now study objects by pointing the telescope and taking a picture. The telescope covered an area about a degree square. The Einstein observatory was a great success with a sensitivity 1000 times greater than anything preceding it. Later stations such as the Small Astronomy Satellites (SAS) and the European ROSAT satellite pushed the detection of X-rays to higher energy up into the gamma ray region of the EM spectrum. These instruments have opened up a completely different view of the universe around us and the processes involved. The first results from the imaging X-ray telescopes were all sky surveys. To date some 60,000 X-ray sources are known with about 25% identifiable with optical counterparts. Perhaps the most enigmatic discovery was the highly variable nature of X-ray sources. The X-ray sky is one of constant change. Sources come and go on time scales ranging from months down to fractions of a second. Most of these sources have been identified with systems containing compact stars - white dwarfs, neutron stars or possibly black holes. The high energies involved require temperatures of several million degrees and sufficiently strong gravitational fields to convert the gravitational energy into X or gamma ray radiation. The X-rays from these sources are believed to originate from gaseous matter transferring from a giant star onto a compact companion star. The atmosphere of the giant star is so extended that some of it actually falls onto the compact star. If sufficient mass accretes onto the low mass companion a thermonuclear reaction occurs releasing X-rays. One of the surprises from these X-ray telescopes has been the large number of supernova remnants visible at X-ray frequencies. Examples of these are

Photographs below are:-

- 1) Moon with source GX5-1 about to be occultated
- 2) Supernova Remnant Cygnus Loop
- 3) Crab Nebula
- 4) Supernova Remnant Vela Nebula



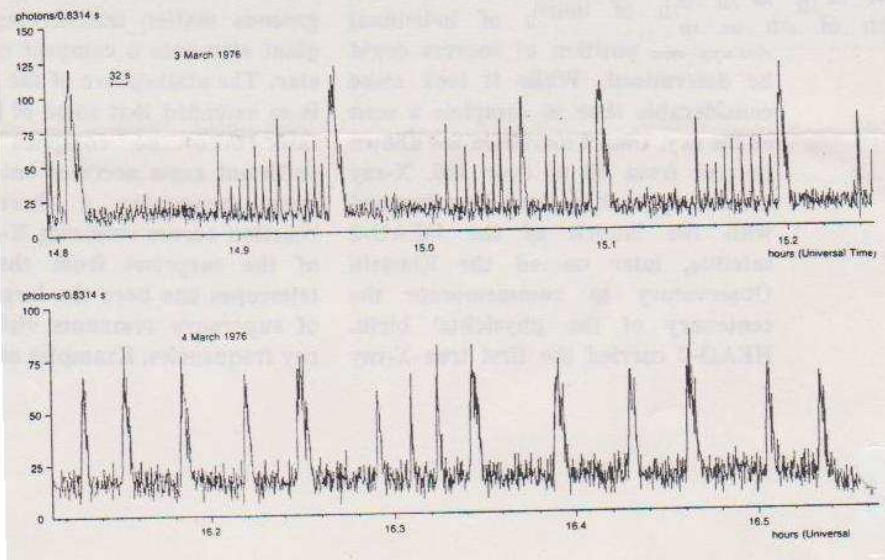
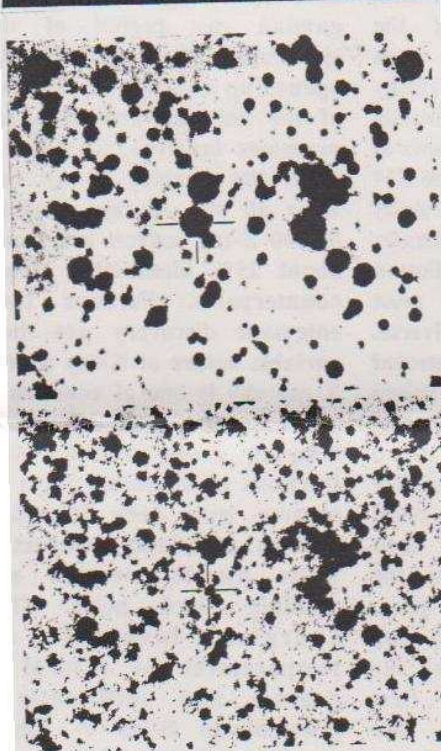
shown in Figs 2-4. Even the Moon was found to be a source of X-rays as its surface is bombarded by high energy particles and radiation. Of particular interest are the so called X-ray Bursters. These sources flare up on time scales of a few seconds and can show semi-periodic bursts. An example of a rapid X-ray burster is shown in Fig 5. The rapid rise of the burst suggests a small source possible only hundreds of kilometre in size. A form of relaxation phenomena is visible in the burst namely if a small burst occurs the next burst follows quickly while if a large burst occurs then a longer quiet period occurs before the next burst. This evidence suggests an accumulation of matter onto the surface of a compact star followed by a detonation. A large detonation blows away a lot of material and it takes longer to build up material for the next explosion whereas a small explosion allows additional matter to build quickly to another detonation. At the even higher gamma ray frequencies similar gamma ray burster have been observed but these seem to be completely different types of objects. To date no gamma ray burster has been seen to re-occur. No optical counterpart has been discovered. The energies involved with gamma rays suggest temperature of a few billion degrees that suggests the intermittent heating of the surface of a neutron star by infalling material. A great deal of improvement is need to improve the resolution of our gamma ray eye before these objects can be studied in detail. The development of these high energy eyes in space has completely transformed our understanding of the sky around us. We now know the universe about us is bathed in an ether of X and gamma ray radiation. High energy processes are occurring all around us and objects thought to be near the end of their lives are still highly energetic. No doubt the development of bigger and more sensitive instruments will give us a clear picture of the high energy universe.



The above all-sky map was generated from the ROSAT satellite. The centre of the Milky Way is at the centre of the photo.

The two photos at left shows the X-ray source GX339-4 discovered by the OSO-7 satellite. The object has varied in brightness from visible magnitude 15.4 to dimmer than mag 21. Similar variations in X-rays have also been observed. It is believed this is a massive binary star where matter is being transferred from a giant star onto a compact companion.

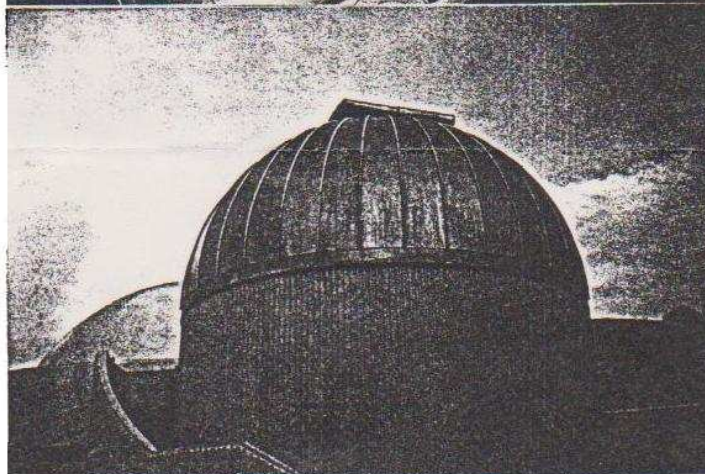
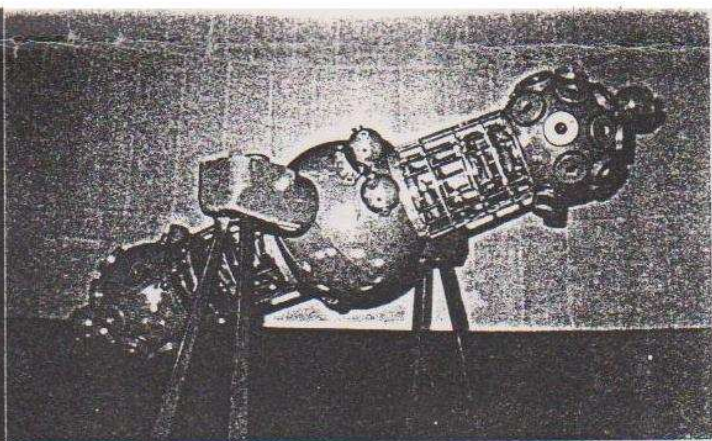
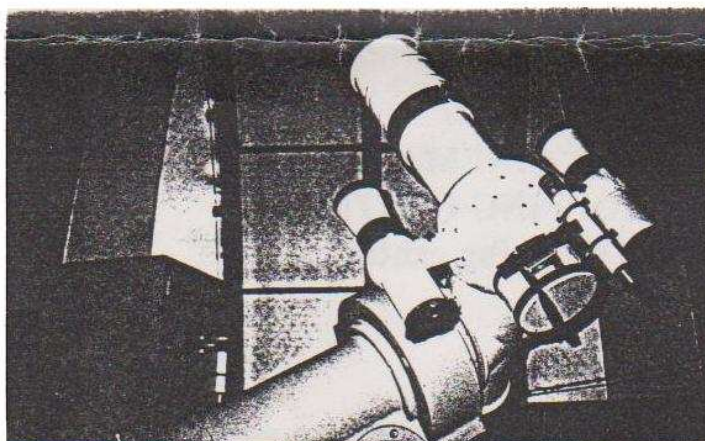
Below is a trace showing the rapid variations of the X-ray burster MXB1730-335. The burster is located in a globular cluster and is called a rapid burster because the average interval between outbursts is only a few seconds. It is interesting to note that when the strength of an outburst is strong, there is a long quiet period following it.

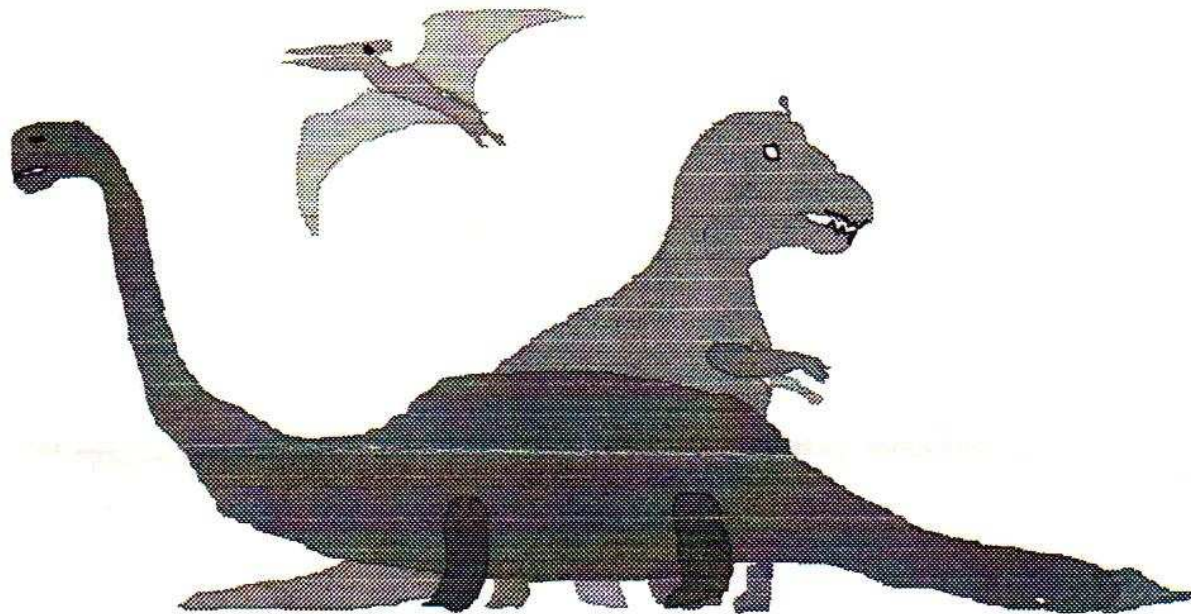


## VISIT TO BRISBANE PLANETARIUM

During the July school holidays, we travelled up to Brisbane. While there, I visited the Sir Thomas Brisbane Planetarium, at Mount Coot-Tha, a few kilometres to the west of Brisbane. The planetarium was established by the Brisbane City Council in 1978 and is the largest in Australia. The images are projected onto a 12-metre dome by a Carl Zeiss Jena projector. Up to 144 people can be seated in the theatre. Having booked a seat, I went out to the planetarium. However, instead of a leisurely 2 kilometre walk from the nearest railway station, I had to run part of the way because of a late train and arrived dripping with perspiration, and just made it in time to buy the ticket. The show lasted about 45 minutes and was split into two parts; a description of what was in the night skies of Brisbane around that time, and the main topic (these are changed every 3-4 months), which was about the search for extra-terrestrial intelligence. It began with a brief history of the Earth and the Solar System, and continued on, talking about Galileo and the realisation that the Earth was not the centre of the Universe. The show followed on this line, to the present day and radio astronomy, describing the attempts made to let anyone else out there find out us, and our listening for them. The second part was a presentation of what was currently in the night sky. The planetarium can produce the darkest skies in Brisbane, and can also vary the amount of background light to demonstrate the effects of light pollution. Such things as the constellations and the zodiac were displayed, along with the location of the planets. Even some of the brighter deep-sky objects were displayed. Pointing out objects was made easier by a small arrow that was projected. The foyer of the planetarium has displays with photos and information about the sun, moon, planets and deep-sky objects, as well as displays on meteorites and space missions. Souvenirs are available for sale. there is also a lecture theatre in the building. For those interested in getting a view of the night sky, the planetarium has two telescopes. These are a 15 cm (6 inch) refractor and a 44 cm (17.5 inch) Dobsonian reflector. Observing sessions also need to be booked. I didn't get the chance to use these because 1) they were booked out, and 2) our rainmaking ability didn't desert us, with the weather cloudy for most of the time we were in Brisbane. The planetarium is well worth a visit whenever you are next in Brisbane. It has the added bonus of being adjacent to the scenic Botanic Gardens. The planetarium program times are: Wednesday - Friday: 3.30 pm, 7.30 pm (also 1.30 pm during Queensland school holidays). Saturday: 1.30 pm, 3.30pm, 7.30 pm. Sunday: 1.30 pm, 3.30 pm. The prices are: Adult: \$7 Child (under 15): \$3 Student/Pensioner: \$5.50

John Cleverdon





# JURASSIC PARK FILM

**WHERE:** CRANBOURNE CENTURY 4 CINEMAS  
CRANBOURNE PARK SHOPPING CENTRE  
{ Cinema located at back of shopping centre }

**DATE:** 24th OCTOBER

**COST:** ADULTS \$6.50  
CHILDREN \$5.50

**For an extra \$3.50 Steve and June Malone are providing a supper at their home after the film.**

**TIME:** Meet at Cinema at 3.15pm for the film  
start at 3.45pm

**CONTACT:** Peter Lowe (03)-775 9347 for details

[ Graphics by J.Cleverdon ]



# October/November 1993

- **22 Oct (Friday)**

- Orionids Meteor shower (2 Oct to 7 Nov)
- Max of 30 per hour.

- **28 Oct (Thursday)**

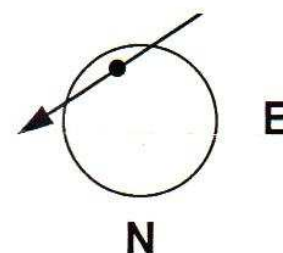
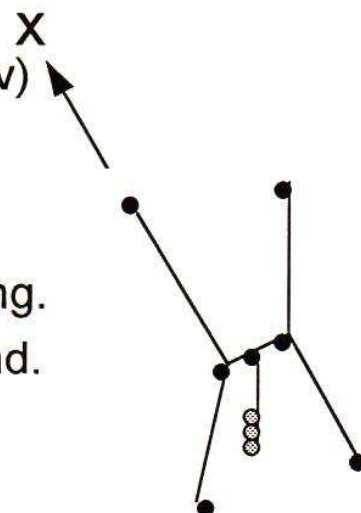
- Mercury & Mars 2.5 deg apart in evening.
- Mercury very visible to eye to month end.

- **31 Oct (Sunday)**

- Daylight Savings starts.

- **6 Nov (Saturday)**

- Mercury transits across face of Sun!
  - » Start 2:05 pm.
  - » Mid 2:56 pm.
  - » End 3:47 pm.
  - » 1 mm across on an 8 inch Sun.
- Asteroid Harmonia (mag 11.9) occults star (mag 9) over Australia.
  - » 9:08 pm.



- **8 Nov (Monday)**

- Venus & Jupiter 0.4 deg apart in morning.

- **14 Nov (Sunday)**

- Partial Solar Eclipse!
  - » Start 6:51 am.
  - » Max 7:25 am.
  - » End 7:59 am.
  - » 9 degrees up from E horizon.
  - » 31% of Sun's disk covered.



## DOTWATCHER EXTRACTS No. 1. 4/1994

## MASS EXTINCTIONS FROM EARTH IMPACTORS.

On August 10th 1972 a huge meteor of around 1000 tonnes streaked through the upper atmosphere over Wyoming's Teton Mountain and luckily bounced back off into space.

If the approach trajectory had been only a few degrees steeper it would have impacted with the force of a nuclear bomb.

The HOBA meteorite of some 6 tonnes (Namibia 1920) is the largest intact piece of meteorite found to date.

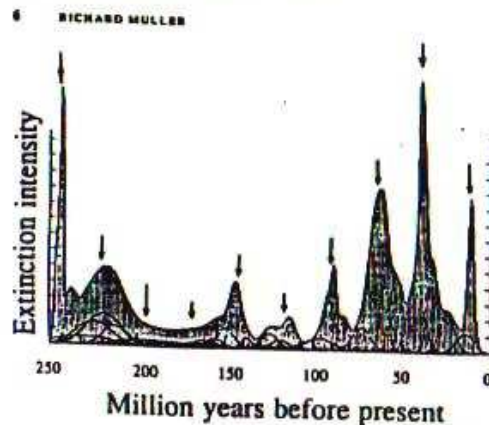
The Arizona Meteor Crater occurred 50,000 years ago and was caused by a 300,000 tonne iron/nickel meteorite. The crater is 1200 meters across and 180 meters deep.

Australia has two excellent examples in the Woolf Creek Crater and the Gosse's Bluff crater. There are 19 known Impact Craters in Australia.

In 1908 a small rocky asteroid or comet (with a probable diameter of 100 metres and a mass of one million tons) exploded as an air-burst devastating 2000 sq. kms. of forest in Tunguska, Siberia. An equivalent impact in the Tasman Sea would create a Tidal Wave that would deluge Sydney, Newcastle, Brisbane and Auckland. The wave would perhaps be stopped by the Blue Mountains.

There is plenty of evidence of massive impacts throughout Earth's geological history and recent satellite observations revealed that the CHICXULUB CRATER in Mexico's Yucatan Peninsula is over 300 kms. in diameter. This crater's age matches the impact date of 65 million years ago, the impact that killed off the Dinosaurs at the end of the Cretaceous period.

RAUP and SEPKOSKI found from the fossil records that mass extinctions have occurred regularly every 26,000,000 years and these events matched perfectly the deposits of IRIDIUM found in clay layers corresponding to those dates.



IBL 8611-4774

The data of paleontologists Raup and Sepkoski that show great mass extinctions occurring every 26 million years, as replotted by the author. This plot inspired the Nemesis theory.

Iridium is extremely rare at least on the Earth's surface and any found is nearly always of extra-terrestrial origin. Like all the heavy metals including the members of the Platinum group (Rhodium, Iridium and Osmium) Iridium migrated to the inner molten core. The impact that caused the mass extinction of the Dinosaurs, 65 million years ago involved the depositing of 50,000 tonnes of Iridium worldwide. It has been calculated that an 8 km. wide Impactor would be necessary for this.

Where did these crashing bodies come from?

One theory is that they might have originated from the Oort Meteor Cloud. Jan Oort calculated that there are more than 100 billion comets out in this cloud.

Alternatively the offenders could be the Asteroids most of which lie between MARS and JUPITER. This 240,000,000 km. wide main asteroid belt contains millions of rocky asteroids. Estimates suggest that there are more than 5,000 asteroids of over 15 kms. in diameter. The inner planets are maintained relatively free of these monsters by the gravitational sweeping effect of Jupiter

Passing stars could easily perturb both the Asteroid and Comet belts.

### DINOSAUR EXTINCTION.

It is now well accepted that there have been many periodic mass extinctions. two of the largest being 39 mill. and 65 mill years ago. The 65,000,000 year ago event saw the total extinction of all Dinosaurs other than the ones that became the Birds.

This Impactor was either a Comet or an Asteroid, was at least 8 kms. in diameter and struck with a velocity of 30kms. per second. (Well within the range of size for the Apollo asteroids). Estimates suggest Mankind has a 1:2,000 to 1:10,000 chance of meeting it's end this way.

The impact point would have reached a temperature at least 100 times that of the Sun's surface and the energy released would be equivalent to 100 million Megatons of TNT i.e. 10,000 times greater than the Nuclear Arsenal of the U.S.A. and RUSSIA combined.

Debris would have rocketed 15 miles into the atmosphere and numerous new Volcanoes would have instantly erupted. It has been estimated that 100 trillion tons of dust would have spread over the world.

If the impacter hit the oceans (66% chance.) TSUNAMI's travelling at 700 km h. and nearly as high as the Rocky Mountains would have engulfed the world.

Instant blackness due to total forest fires resulting from extensive intercontinental secondary bombardment and the formation of Nitric and Sulphuric acid Rain would immediately ensue.

The equivalent to a 3 month NUCLEAR WINTER would cause the average temperature to drop to as low as minus 20° Celsius.

Every animal over 20 kg. would die.

Over 2/3 of all species became extinct, not only the Dinosaurs but Mammals, Fish, Corals, Shellfish and Microscopic animals. Spore bearing plants were the first to recover.

Lets go back to these fantastic Dinosaurs. The brightest mammals around at that time were no cleverer than the giant lizards with whom they had been competing unsuccessfully for 100 million years. The majority of mammals also became extinct and we are the result of evolution from a small furry rat like survivor.

At the time of the Dinosaur extinction there was a dinosaur called Stenonychosaur that had a high Brain to Body weight ratio. Intelligence had already evolved.

Imagine where Earth's Intelligence rating would be now after some 56 million years of uninterrupted Dinosaur development.

Without that mass extinction intelligent Dinosaurs might be well on their way to intergalactic travel. Dinosaurs were certainly not an evolutionary dead end. They were a far more successful species than us mammals.

Dr. Richard MULLER proposes that a Death Star—NEMESIS having a 26,000,000 year orbit caused gross perturbations in the Oort Comet cloud.

Nemesis would be a companion star to SOL (which is somewhat unusual if it really is a single star.)

Several observatories are searching for a Red Dwarf (on a mathematically calculable orbit) having the correct Red Shift.

WHEN IS IT DUE TO RETURN ?.

Other Explanations.

- # Dramatic reduction in sea levels
- # Drop in Ocean salinity.(Melting snowcap's)
- # Dramatic change in temperatures
- # Exceptional Volcanic activity.
- # Reversal of Earth's Magnetic Fields.
- # Natural decline of dinosaurs.

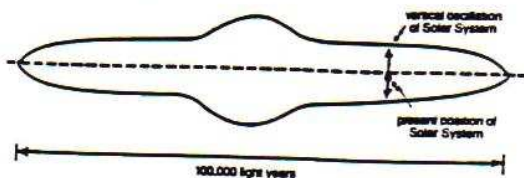
# Supernova of nearby star.

- : 1 every 50 yrs in Milky Way
- : Last one visible 350 yrs ago.
- : No evidence of one near Solar System for a million years.

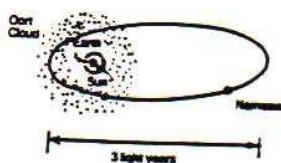
IMPACT THEORY remains most likely option.

- : NEMESIS HYPOTHESIS
- : GALACTIC PLANE HYPOTHESIS
- : PLANET " X " HYPOTHESIS

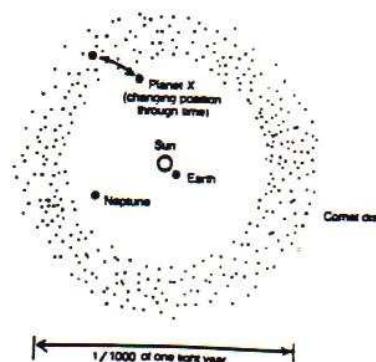
GALACTIC PLANE HYPOTHESIS



COMPANION STAR HYPOTHESIS



PLANET X HYPOTHESIS



MAN MADE IMPACTORS.

There are now 2,500 bits of Aerospace and Military junk in orbit around Earth. Lots of these have NUCLEAR power plants.

They wont cause mass extinctions but could cause problems on re-entry or collisions.

Dr. Dai Lewis.