

SCORPIO

Journal of the Astronomical Society of Frankston Inc

Vol 2, No.1

P.O.Box 596, Frankston Victoria 3199

JAN/FEB 1993

FUTURE EVENT

GENERAL MEETING

No General Meeting will be held in January

17 February 1993

Speaker: Peter Lowe

Subject: Dark Matter- Where is it?

VIEWING NIGHTS

Four public viewing nights are planned at The Briars on the 7th, 14th, 21st, and 28th of January. These viewing nights are planned to support The Briars during their summer activities, in particular their night walks

The Briars is located off Nepean Highway at Melways Map 145, E11

COMMITTEE MEETING

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

20 January 1993

25 February 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.

BBQ at CRANBOURNE

A few members are planning a BBQ lunch at the Cranbourne Royal Botanical Gardens on Sunday January 17th. Please come along and join in.

The Botanical Gardens cover 350 hectares of diverse heath and woodlands with a network of walking tracks.

The BBQ starts at around noon. Gas BBQ's and picnic facilities are available. BYO everything else.

The Gardens are located at the end of Ballarto Road off the South Gippsland Highway. { Melways Map 133, K10 }

I look forward to seeing you there.

New Baby Star at Skilton's

A new amateur astronomer was born to Peter and Ros Skilton at 1004UT on the 12th December. Named Cassandra, she weighed in at 4kg which classifies her as a "A" type.

Congratulations Peter and Ros

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 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

Frankston Council Grants

Each year the Frankston Council makes grants of financial assistance to local clubs and societies. Last year we were unsuccessful in trying to get better equipment for our public viewing nights. Following the old adage "If at first you don't succeed, try try again": this year we have made three submissions for grants. The submissions fall into the broad activities we believe are essential to the long term development of the Society.

1) Telescope Making Classes

It is proposed to offer telescope making classes later this year to make ten 150mm Dobsonian instruments. These classes will become a regular part of the Societies activities to attract new members as well as hone our skills at ATM

2) Astronomical Audio/Visual Aids

We all know the excellent work Bob Heale does preparing his "Sky for the Month" presentations. This submission proposes to prepare our own astronomical slide sets as well as purchasing other slides and videos. With these, Bob can no doubt enhance his presentations and the Society can use the audio/visuals at viewing nights for schools and other clubs.

3) Light Pollutions Survey.

Light pollution is steadily rising in the Frankston area and this is already limiting the types of observations that can be made from the region. This submission proposes to employ two local students and under take a light pollution/astronomical seeing survey under our direction. The objective is to produce a map showing the distribution of sky light and its possible future changes.

All three of these projects are considered important to the future development of the Society and we hope the Council will look upon us favourably this year.

E=mc²

Did you know that an unpublished manuscript written by Albert Einstein detailed special relativity, including the famous formula E=mc² was sold at auction for \$1.2 million US. The sale set new records for any unillustrated manuscript in the world

REVIEW OF 1992

1992 has gone and 1993 begins. As we move into another year of astronomy it is opportune to review last year and our future. During 1992, we introduced a number of changes to the Society's operations giving some successes and some failure. I have listed the major ones below:-

1) We were a blinding success at our public viewing nights and our popularity amongst the schools is reaching new heights. Despite the inclement weather, more than 1,500 people looked through our telescopes. The Society received more monies from these events than it did from subscriptions and these activities should remain a vital part of our Society activities.

2) The Society magazine "Scorpio" was upgraded in format and content. Its principle objective is to provide a general interest magazine with topical data in an easy, readable form. In general this has been achieved

3) The format of the Monthly General Meeting have been changed to include "Technical Sessions". These sessions allow people to explore a subject in an open forum. Why the Technical Sessions have been generally successful, we are still looking for other means whereby the monthly meeting can be made more entertaining.

4) A small number of special interest groups were formed but generally failed. The solar systems group was the most active but slowly declined until only Peter and Ros Skilton were doing any observations. The Telescope Making Group has been meeting in the hour before the General Meeting but still consists of individuals making mirrors rather than a working group. The Deep Sky Group had a few successful meets but eventually faded and the Variable Star group quickly fell below naked eye visibility, never to be seen again.

5) We failed almost completely to retain our membership during the winter months. Membership rose during the summer months chiefly due to the public viewing nights and then poor weather and basic inactivity meant we lost these new members.

6) Steady progress has been made toward establishing a permanent observatory site at The Briars Homestead.

These successes and failures are a challenge for the committee to build a better Society. At the December committee meeting, a number of these issues were discussed and it was agreed that a presentation paper would be prepared for more detailed consideration at the January Committee meeting. I am currently preparing this paper and hope to be able to present a development plan at the February General Meeting.

The Society has received a number of catalogs and price lists from ELKEN RIDGE Pty.Ltd. which is a company setup by Clive Garner, an early member of the ASF. The catalogs cover a vast array of telescopes, accessories and computer equipment. I have bound the catalogs up for the library. If you would like to speak to Clive direct his number is 03-751 2176.

WHAT'S NEWS IN ASTRONOMY

Pluto and Charon

Scientists have calculated the densities of the double planet Pluto/Charon. The total mass of the double planet system has been known from astrodynamic studies to be about 1/400th of the Earth. By using observations from the Hubble Space telescope, it has been possible to establish the relative masses of the two planets showing Pluto to be some eleven times the mass of Charon. Combining these determinations with the diameter measurements established during recent eclipse observations, has made it possible to calculate their densities. The two planets are quite different. Pluto with a density of 2.1 grams per cubic centimetre consists of about 75% rock and 25% water ice while Charon with a density of 1.4 must consist almost entirely of water ice. The results support the theory that the two planets were originally separate and became gravitationally connected due to a collision.

GALILEO REHABILITATED

359 years after the Inquisition of the Roman Catholic Church sentenced Galileo Galilei to life in prison, the church has now officially agreed that Galileo was right in his beliefs about planetary motions.

The Inquisition did not as popularly believed test Galileo's astronomical observations but rather questioned the logic of his arguments from specific to general cases and how his assertions re-interpreted the scriptures. For instance Galileo pointed to the miniature "solar system" of Jupiter's moons as proof that the Earth moved around the Sun.

The Inquisition's methods were based more on what we would call philosophical rather than scientific argument. Remember our "scientific" methods had not been developed 359 years ago. {To some degree Galileo brought the Inquisition down upon himself. If he hadn't been such a self centred, loud mouthed general know all, he might have got away with it. }

LUNAR CEMETERY??

Japanese mortician's are proposing the build a cemetery on the moon to alleviate the shortage of space in Japan. { Presumably all amateur astronomers go this way !! }

The Case For Black Holes Gets Stronger.

Observations from the Hubble Space Telescope are providing convincing evidence for the existence of black holes at the centre of active galaxies. The high resolution abilities of the space telescope has revealed bright starlike objects at the heart of several active galaxies, in particular the giant elliptical M87. While no direct observation of a black hole has been made, the circumstantial evidence has reached the point where their existence is almost a certainty. There are three basic supporting observations. First the energy output for these galactic cores can vary over time periods of only a few days. This sets a limit on the size of the objects to a few lightdays at most, probably much smaller. The core must therefore be compact and very energetic. Secondly the orbital speed of stars and dust in the vicinity of the core can be seen to be very high almost in turbulent. These studies suggest extremely massive central objects. Some astronomers argue for million plus solar mass objects. Thirdly the amount and type of radiation coming from the core cannot be from normal stellar sources. Radiation right across the spectrum up to gamma rays have been detected including 511 keV gamma rays only seen in matter-antimatter annihilation. It seems to be generally agreed now that a blackhole forms at the centre of most galaxies and possible globular clusters slowly consuming the millions of stars that get too close. The problem now is to explain how these objects convert this stellar mass into the tremendous amount of radiation and atomic particles we see with our telescopes.

Some Dark Matter Found.

At one time it was thought most of the matter in the universe was in the form of stars and an accurate star count would give the total mass of the universe. This theory soon began to strain when it was realised there was not enough matter to close the universe. That is the mass in the universe was insufficient to halt the observed expansion and thus the universe would expand forever. It was therefore postulated that a lot of matter must exist in forms other than stars. Observations of the rotation rates of galaxies and the movements of galaxies within clusters have support this view but the exact form of the additional matter has remained unknown. Everything from brown dwarfs, planets, interstellar dust, gravitons, exotic sub-atomic particles and miniature black holes have been suggested. No direct evidence on the nature of this "dark matter" has been forthcoming. Recent observations by the German Roentgen satellite have produced a picture of the X-ray radiation coming from three galaxies in the NGC 2300 group. Surrounding the three galaxies is an immense cloud of plasma or hot ionised gas. The gas temperature approaches 18 million degrees and the gas cloud extends some 1.3 million lightyears across containing a mass equal to about 500 billion solar masses. This immense gas cloud can only be held in position if the mass of the galactic cluster is up to 25 times more than seen in the stars alone. While this is only the first observations, it is the first clue to the location of dark matter.

There's GOLD in Them There Suns.

The abundances of the naturally occurring elements has been determined mainly from studying stellar spectra. Most of these elements have been detected in our Sun's spectrum including low abundance elements such as gold. The only spectral line attributable to gold in the solar spectrum is a blue line at 3122.8 angstroms. A recent study of this line has suggested there are about 9 gold atoms for every trillion (10^{12}) hydrogen atoms. This seems a pretty miniscule amount but remember the Sun's total mass is 2 octillion (2×10^{27}) tons which means the Sun contains 10 quadrillion (10^{16}) tons of gold. It's a pity we can't mine it, think what a telescope that would buy!!

THE ONE THAT DIDN'T GET AWAY

A Japanese ship moored in the Bay of Mikawa has reported being hit by a meteorite. The meteorite struck the ship's deck and cracked into several pieces.

QUESTIONS AND ANSWERS

WHAT WAS THE STAR OF BETHLEHEM ?

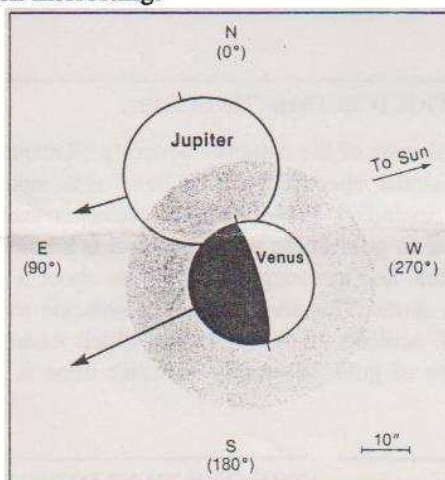
At this time of the year, it seems traditional to speculate about the origin of the Star of Bethlehem. Two thousand years after the event the detail has become somewhat blurred however it seems certain the astrologers of the day observed an event out of the ordinary from their viewpoint. The story talks of a bright, long lived star in the West. More than a bright star; an event sufficiently persuasive to prophesies a major world event. Assuming the whole story is not just a case of ancient journalistic license, astronomers have been exploring the possibilities for some time. The exploration has covered ancient Chinese astronomical records, studies of Middle East history, astrology and even computer explorations of the astronomical events of the day. For reasons associated with the way the years have been numbered, it is generally agreed the actual birth of Christ occurred several years BC. The explorations have uncovered several Star of Bethlehem possibilities:-

1) Chinese records reveal a bright comet in 5BC. The comet was visible for 70 days and thus must have been both large and bright. Some of the Gospels do support a comet-like description. Unfortunately the astrologers of the day were use to prognosticating the meanings of comets which were believed to bring doom, disaster and generally bad news. It is generally considered a comet would not meet a Messiah prophesy.

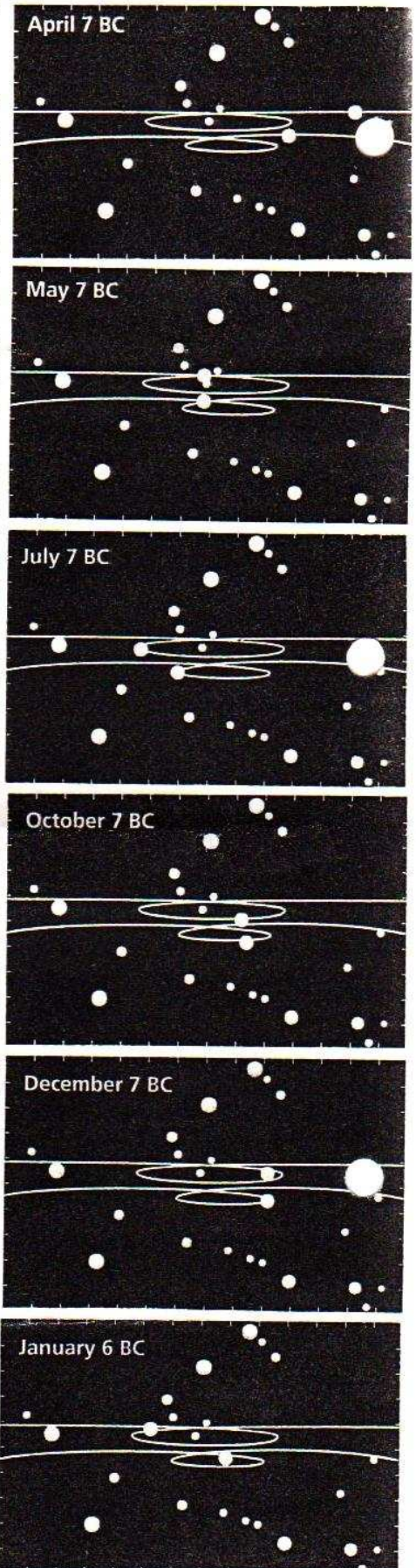
2) In the year 7BC, there was a triple conjunction of Jupiter and Saturn in the constellation of Pisces. This seems a very promising event. Jupiter slowly caught up with Saturn by May 7BC and the two planets could be seen to perform synchronised movements to the end of the year. While this is not a bright star event, astrologically it is significant. The constellation of Aries as a sign of the Zodiac represented the Jewish people. The Planet Jupiter is the King of the Gods and Saturn represented justice and the land of Palestine. It doesn't take too much to see how this could be interpreted as the coming of a Jewish Messiah.

3) On 17 June 2BC a very close conjunction of the planets Jupiter and Venus occurred. The planets approached each other so closely they would have appeared to merge into one object. While this may have given a bright star, it would have been quite short lived and the year 2BC is hard to reconcile with other known events that occurred after Christs' birth.

After two thousand years our hindsight is sufficiently blurred that we will probably never know the facts but the astronomical exploration of the possibilities has been interesting.



Details of the Jupiter-Venus Conjunction June 17th, 2 B.C. The shaded area marks the area of sky where the limb of Venus might have been seen, depending upon the position of the observer on Earth

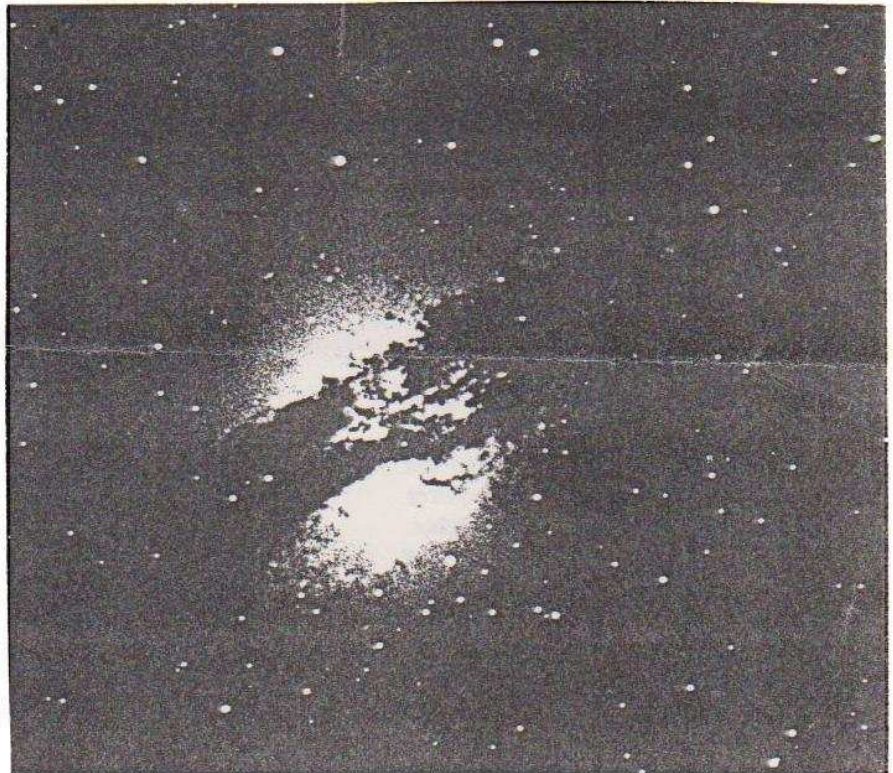


DISCUSSIONS - DUST IN SPACE

Something we are slowly losing these days is the clear, unheeded view of the sky above us. The loss is no more clearly highlighted than when you take a trip to the far countryside and there above is the Milky Way delineated of course with dark Dust Bands. It shows you how light pollution is slowly changing our view of the skies. When was the last time you saw the "Coal Sack" from Frankston. Amateurs who observe distant galaxies frequently see dust bands. We now know that dust clouds at a common feature in our galaxy's structure and interstellar dust and gas are vital components to future stars, solar systems and ultimately the formation of life. Understanding the nature of dust clouds is a fairly recent event. It was generally considered years ago, the "dark" holes in the sky were regions where no stars existed. The dust bands or dark regions were thought to be a sort of "tunnel" through which you could look out into extragalactic space. Studies of globular clusters suggested something was wrong with the way we measured distances to interstellar objects and this problem was eventually resolved when it was realised the light from distant objects must be slowly dimming over the distance travelled. Interstellar dust had been discovered. It was quickly realised the dark regions were not holes in the stellar distribution but large clouds of very tenuous material that slowly absorbed the light passing through it. If there is a lot of material, more light is absorbed and from our viewpoint we see a dark region in the sky. When I say "a lot of material", the space inside a dust cloud is still very, very tenuous. A volume the size of, say The Exhibition Building in Melbourne, would contain a few thousand atoms, mainly hydrogen. Inside the same volume we would also find only one grain of dust. A dust grain is too small to be directly seen being less than a thousandth of a millimetre across. Although these grains are small and thinly spread, the distance between stars is so great that light from distant stars must pass an

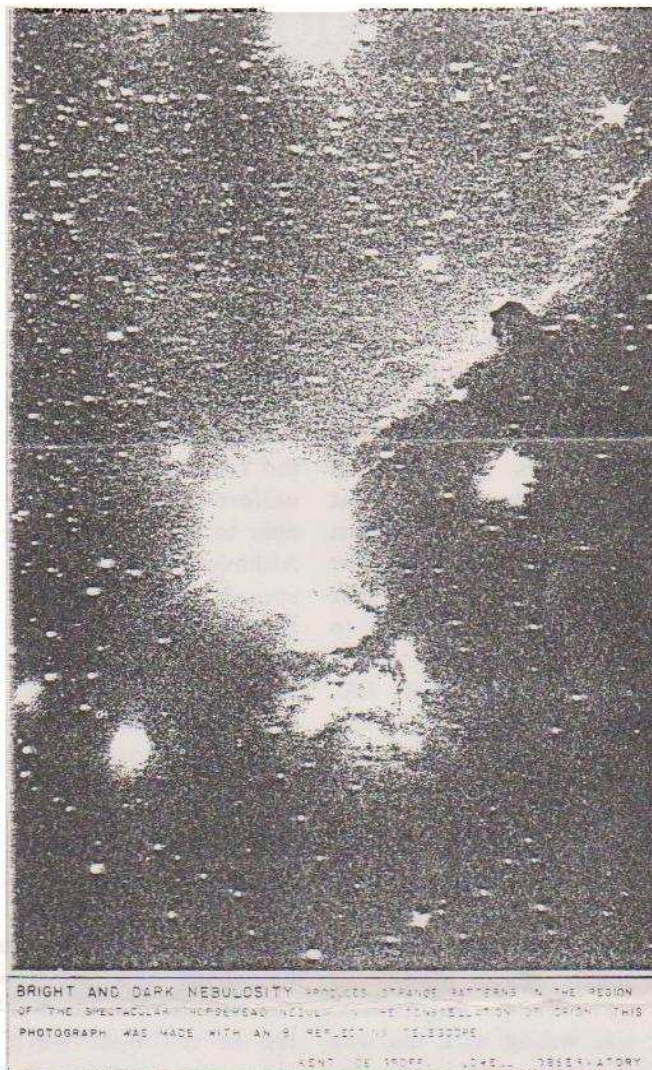
immense number of grains to reach us. (As an exercise try working out how many and what is the probability of a particular photon of light reaching us from a distant star). Generally light from a star 3000 lightyears away is dimmed by half before it reaches us. A star a further 3000 lightyears away is dimmed half as much again or one quarter of its original brightness. If it was not for the fact that interstellar dust is not uniformly spread we would not be able to see much around us at all. Although interstellar dust is thinly spread, it is possible to study it's properties by observing how light changes when passing through it. In the 1902's the Swiss astronomer Robert Trumpler found that stars observed through a dust cloud not only dimmed but also appeared slightly reddened. He concluded that blue light was more easily absorbed by dust than red light. This immediately sets a size limit of the dust grains. The dust particles must be about the same size as the wavelength of blue light but not as big as red light wavelengths. The size range corresponds to 0.4 - 0.7 micrometres. (A micrometre is one thousandth of a millimetre) Furthermore the light from stars shining through a dust cloud is

polarised. This suggests that dust grains are somewhat elongated in shape and they tend to line up parallel to the weak interstellar magnetic fields. Studying the light from distant stars through dust clouds can also give us clues to its chemical structures and origins. While dust absorbs light passing through it, the light is absorbed easier at some wavelengths than at others. This is known as the absorption spectrum. In the infrared portion of the spectrum, dust absorbs radiation at 9.7 micrometres. We know this corresponds to the spectra of silicates similar to some terrestrial rocks. These contain metals such as iron, magnesium and aluminium combined with silicon and oxygen. In addition we know from other absorption bands that other elements are present such as carbon, nitrogen, oxygen and hydrogen. Furthermore detailed studies of absorption spectra across the infrared, radio and visible bands show how these various elements can combine chemical to produce a large variety of compounds. For instance ordinary water H_2O , ammonia NH_3 , methane CH_4 , carbon monoxide CO , carbon dioxide CO_2 , formaldehyde H_2CO and ethanol C_2H_5OH . At the interstellar temperatures these



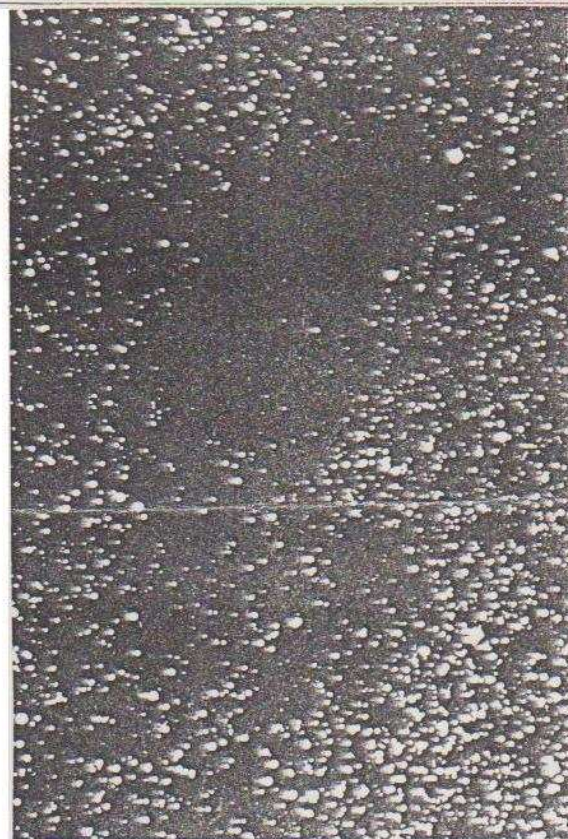
The elliptical galaxy NGC 5128 in Centaurus. (© Association of Universities for Research in Astronomy, Inc. The Cerro Tololo Inter-American Observatory)

compounds are frozen onto the grains of silicates or carbon as basic ices. Mixtures of these elements and compounds has been shown under laboratory conditions to generate organic type molecules when irradiated by ultraviolet light. Thus we can postulate that interstellar dust has quite a complex structure. Grains of carbon or silicates are coated with basic ices which convert under long term ultraviolet irradiation into organic compounds. These "coated" particles slowly clump together to form interstellar dust particles. Our Sun and its solar system were formed from such an assemblage of dust and hydrogen gas. It comes as no surprise that the elements present are similar to those found on Earth. After all they are amongst the commonest elements observed in the universe. During the formation of the Solar system the largest objects, such as The Sun and major gas planets swept up vast amounts of hydrogen gas and dust particles. Because the dust particles would tend to stick together through electrostatic charges they formed denser objects that through a process of accretion produced the inner rocky planets such as our Earth. Our Solar System is comparatively free of dust now because the original dust has been swept up into the Sun and planets or was blown away from the Sun during its T Tauri phase which all stars are believed to go through when they are born. The gentler solar wind today still forces away any remaining dust entering from interstellar space or produced by comets. The larger particles are blown radial outward from the Sun while those particles smaller than the wavelength of light are not affected by sunlight pressure and slow spiral down into the Sun. This residual dust can be seen as it scatters light. Under the right conditions a zodiacal light called the Gegenschein can be seen. It requires exceptionally dark and clear nights. Next time you are outside on one of those exceptionally dark and clear nights (not around Frankston) looking at the dust clouds in Orion, give a thought to our origins from the dust in space.



BRIGHT AND DARK NEBULOSITY PRODUCES STRANGE PATTERNS IN THE REGION OF THE SPECTACULAR HORSEHEAD NEBULA IN THE CONSTELLATION OF ORION. THIS PHOTOGRAPH WAS MADE WITH AN 8" REFLECTING TELESCOPE.

KENT DE VROEF, LOWELL OBSERVATORY



DARK NEBULA B133. A prominent dark cloud in the Aquila Milky Way, about 2° south of Deneb, Aquila. M.A.S. 1967. Observatory 100-inch telescope photograph.



Above - Society BBQ at the Cranbourne Botanic Gardens on
12th January 1993

Photo - *By John Cleverdon*