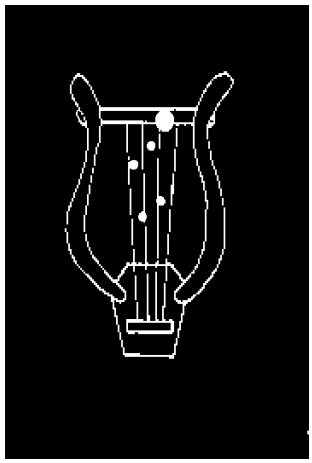
LYRA



The Magazine of Wolverhampton Astonomical Society

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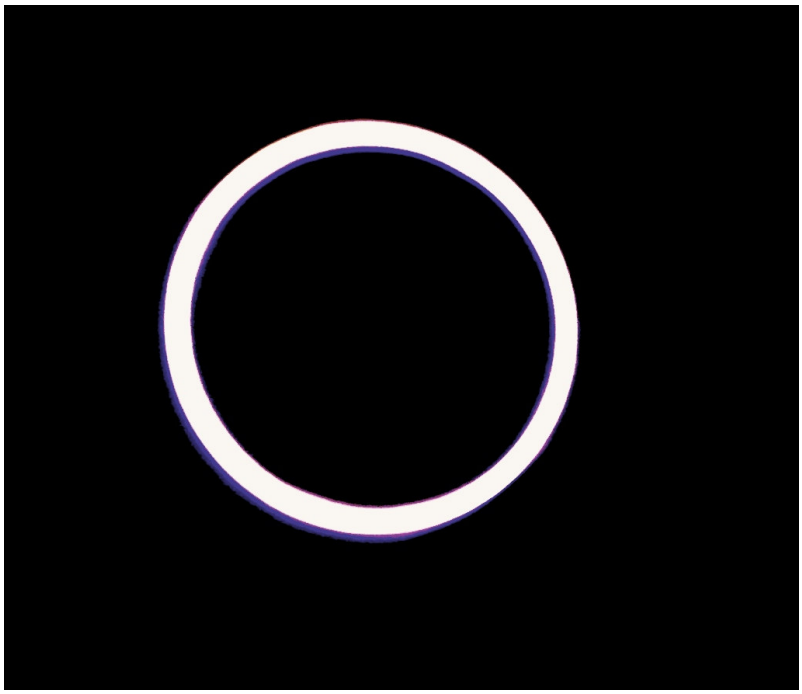
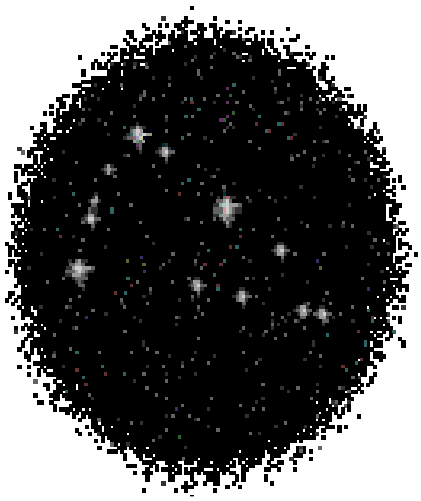


Inside this issue:

Star Party - 4th November 2005



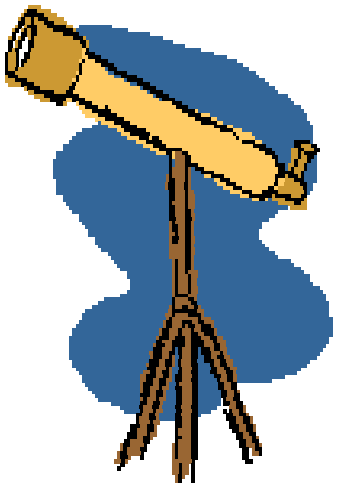
Reporter Chris Evans

At least a dozen society members gathered on Friday 4th November at Sydney Crump's house to enjoy a star party (not too easy to count head in the dark !)

Although it was cloudy at first, it cleared at the vital moment, revealing Mars and a number of Messier objects. Several scopes were in use : Paul Pope's 10" Newtonian reflector, Martyn Filzak's 4" Newtonian reflector and Craig with his ETX. Ralph Pinder was using the society's 6" Helios refractor whilst I brought along the society's new 8" Celestron Nexstar SCT.

Whilst Mars was rather bland, Paul did particularly well to find a number of Messier objects including M57, M13, M31, M32 and M35 together with some doubles, and Martyn found the large open cluster NGC1647 in Taurus.

With such a cold evening, the highlight of the night was Di's homemade pumpkin soup, followed by traditional bangers with lashings of onions and tomato ketchup.



Our grateful thanks go to Di and Heather for laying on a very welcome spread. One member (who shall be nameless) was lucky enough to procure the last two sausages, but couldn't find a roll to turn them into a hot dog. Syd was despatched to find another roll, but in spite of thorough searches, no roll could be found. The discerning member finally settled for brown bread, and to his surprise found it just as tasty as a roll ! Well done Di and Syd.

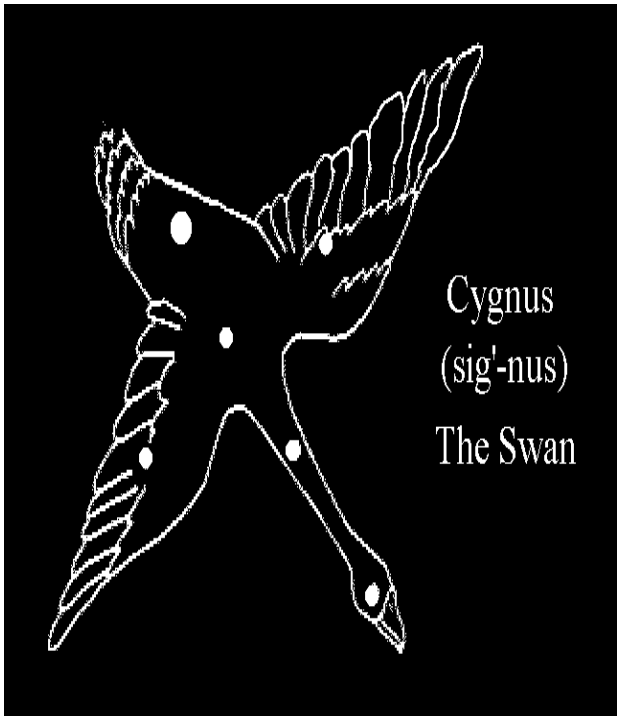
Lyra – new lease of life!

At the AGM, three members (Graham Mogford, Mike Gallear and John George) most kindly offered to revive our in-house Lyra magazine by providing editorial, publishing and illustration skills. Everyone at the meeting was keen to see Lyra's rebirth and we are all most grateful to the three members concerned. However, Lyra will only continue if EVERYBODY in the society gives it support by submitting articles for publication. This can be on any aspect of astronomy and related subjects, including reviews of books, society meetings or conventions. There is no minimum size for an article, so PLEASE try and make a point of submitting SOMETHING at least once a year. That way, we can keep the magazine going and hopefully move from strength to strength.

Chris Evans

As promised - a page three bird...

...this issue Cygnus.



Competition

Win a copy of the complete reprint of 'Dan Dare—Prisoners of Space' published by Titan Books. Send answers to this question to Graham Mogford by end of January (contact details below)

Which town was Dan Dare's batman, Digby from?

Competition entries or submissions for the next issue of Lyra to Graham Mogford, either by hand at meetings, e-mail to

grahammogford@hotmail.com

Or mail to
46 Aldersley Road,
Tettenhall,
Wolverhampton.
WV6 9LZ

Population III Stars - Have we seen the light?

In his lecture on stellar evolution (31 October 2005), Roger Pickard explained how the stars in our galaxy can be divided into two distinct classes: older Population II stars in the halo of globular clusters and younger Population I stars (like the sun) in the plane of the galaxy where, unlike the globular clusters, new generations of stars are still being formed.

Roger explained how stars of about one or more solar masses not only produce elements heavier than helium by continued nuclear fusion, but end their lives distributing a significant proportion of these heavier elements into interstellar space, either as 'planetary' nebulae or as the debris from type II supernovae. For Population I stars, the expelled material contributes to the molecular clouds from which later generations of stars form in the galactic plane. As this region of the galaxy evolves, succeeding generations of Population I stars gradually increase their proportion of heavier elements such as carbon, nitrogen and oxygen - or 'metals' as astronomers like to call them. Hence we can refer to the globular cluster Population II stars as relatively 'metal-poor' and Population I stars as relatively 'metal-rich'.

The Hubble Space telescope and the best ground-based telescopes can now detect galaxies at huge distances - recall that the further away is an object, the further back in time we are effectively seeing. Due to the expansion of the Universe, the light from these objects is shifted towards the red end of the spectrum and is measured in terms of the redshift factor, z. The most distant galaxies/quasars observed (z = approx 6.5) represent objects existing about 1 billion years (1Gyr) after the formation of the Universe, now colloquially referred to as the 'Big Bang'. The consensus for the present estimated age of the Universe is about 13.7 Gyrs. (It is not correct to use the analogy of 'Doppler' shift in this instance. The redshift is not due to relative velocities in space but to the 'stretching' of the medium through which the radiation is propagating. And 13 Gyrs is a long stretch in anyone's imagination!)

(Continued on back page)

Annular Eclipse Reports

Those of us who stayed in Wolverhampton for the Annular Eclipse on October 3rd this year were unfortunately confounded by totally overcast conditions, the only bright spot being Syd's appearance on regional telly that evening! However two of our members were lucky enough to be in places where they could see the eclipse, in the case of Ted, where he could see the entire eclipse in its full glory.

REPORT ON THE SOLAR ECLIPSE OF 3rd OCTOBER 2005

by Simon Barnett

The solar eclipse of 3rd October 2005 was annular in Portugal, Spain, and parts of Africa. Originally, I had intended to observe the eclipse from Javea, in Spain, but had to withdraw this option for health reasons. Therefore, a decision was made to observe the eclipse from the UK. A tentative plan was to observe from either May Hill in Gloucestershire, or Portland Bill in Dorset, but on the Sunday night, it became clear that the weather would be cloudy from these locations on eclipse day. The only clear parts of the UK were to be the south-east, Newcastle-Upon-Tyne, and parts of Scotland around Aberdeen. A decision was therefore taken to head south-east in the early morning hours. I left home at 03:00BST, and the weather was overcast. Only on passing Milton Keynes on the M1 did the first breaks in the cloud cover occur. Soon, the whole sky to the south-east was clear. I stopped briefly at Thurrock Services on the M25 to observe a beautiful sunrise; a promise of fine eclipse weather. I decided to continue on the M2 towards Dover, and managed to get to the small village of Selsted, about five miles north of Folkestone. Here, in a country lane near the village, overlooking a field, I set up my camera. (This consisting of a Sony video camera mounted on a tripod, a 2x converter, and a Baader solar filter). By now, the whole sky was clear, apart from a line of cloud on the northern horizon!

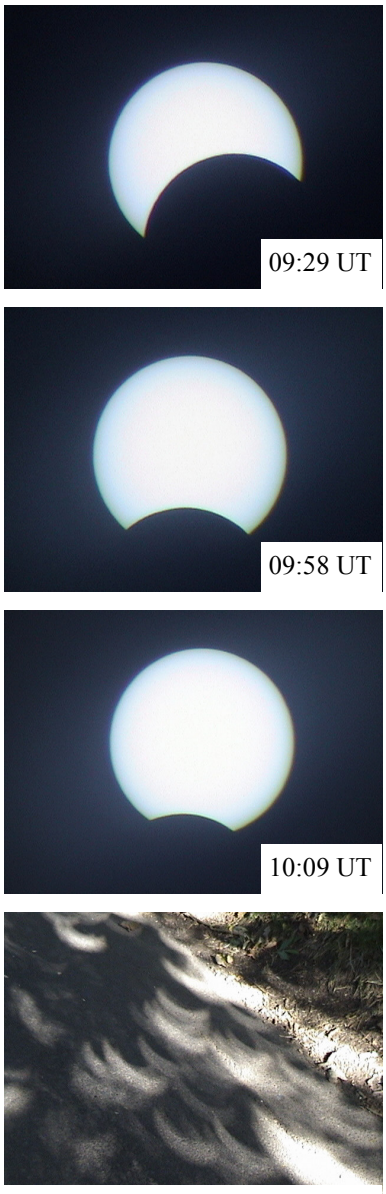
The eclipse began at 08:49BST, and first con-

tact was duly observed. The eclipse slowly progressed, and soon pinhole images of the Sun on the ground, cast by surrounding trees and bushes showed clear "bites" out of them. Maximum eclipse of magnitude 0.657 occurred at 10:01BST, and the Sun was reduced to a wide crescent. The landscape took on a subdued light, with a yellowish quality, as you might expect about an hour before sunset. However, the sky retained the same shade of blue as before the eclipse. On the ground, shadows took on a "spiky" appearance, and the country lane was a myriad of dancing "crescents" on the ground.

About ten minutes after maximum eclipse, the yellowish light passed, and the landscape began to resume its former lustre. In the distance, I heard the sounds of children in the playground of nearby Selsted primary school. Would they or their teachers have been aware of the eclipse? I remember being in a similar situation at school when I was ten, during the eclipse of 29th April 1976. I was aware of that morning's event, but had no way of observing it, and no guidance from the teachers either. I feel that schools should take advantage of these events, as they are of great educational value if supervised properly.

The eclipse finally ended at 11:20BST, and the Moon departed from the lower limb of the Sun, and the shadows resumed their usual appearances. The eclipse was over. The remainder of the day consisted of a drive along the south coast from Folkestone, via Dungeness, Brighton, and Southampton, and then north along the A34 and M40 back home.

All in all, a good eclipse, although I would have loved to have been in Spain for the annular phase. I do intend to travel to Turkey for the eclipse in March 2006, and hope for good luck with that one.



Pinhole images at 09:08 UT

Report upon the Annular Solar Eclipse observed in Madrid on 3rd October 2005

The roof terrace of the Hotel Emperador on the Gran Via seemed like a good observation spot when I booked the trip back in March. However, I met a group of twenty or so astronomers from the Solar Eclipse Mailing List on the Sunday before the ASE the next day and it was suggested that the Templo de Debod was a good location on a hill overlooking the city. I checked this out but didn't fancy lugging my tripod and telescope for twenty or so minutes to get there – it seemed much simpler to ride four floors in the lift to the roof terrace.

The hotel seemed well organised and advertised that the roof terrace would open two hours early at 09:00 hr to accommodate the ASE. This was variously amended to 08:30 hr. I was second in the queue at 08:15 hr and the numbers grew steadily, in stifling heat, causing one lady to faint at the exit to one of the two lifts. There seemed no rush to open the doors. After much prompting this was achieved but entry to the swimming pool area, the favoured observation location, was refused on the basis that no lifeguard was available. This seemed unreasonable because none of the residents had seen one previously! At 09:00 hr it was agreed by the four people possessing telescopes that we should assist one another to climb the gate and get set up.

It was quite cool and breezy in the morning air. The bonus though was that the sky was absolutely cloudless.

Central European Summer Time is two hours ahead of Universal Time. For observation I used a Televue Ranger, fitted with a Kendrick Astro Instruments solar filter to the front aperture and a 20mm Televue Plossl eyepiece, on a Televue Tele-Pod tripod. My timings of the events using my G-Shock wrist watch (accurate to +/- 2 seconds) were as follows:

Event	Predicted Time (CEST)	Observed Time (CEST)
First Contact	09:40	09:40:15
Second Contact	10:56	10:55:50
Maximum Eclipse	10:58	10:57:58
Third Contact	11:00	10:59:40
Fourth Contact	12:23	12:23:00

Features of the eclipse around the time of maximum eclipse were:

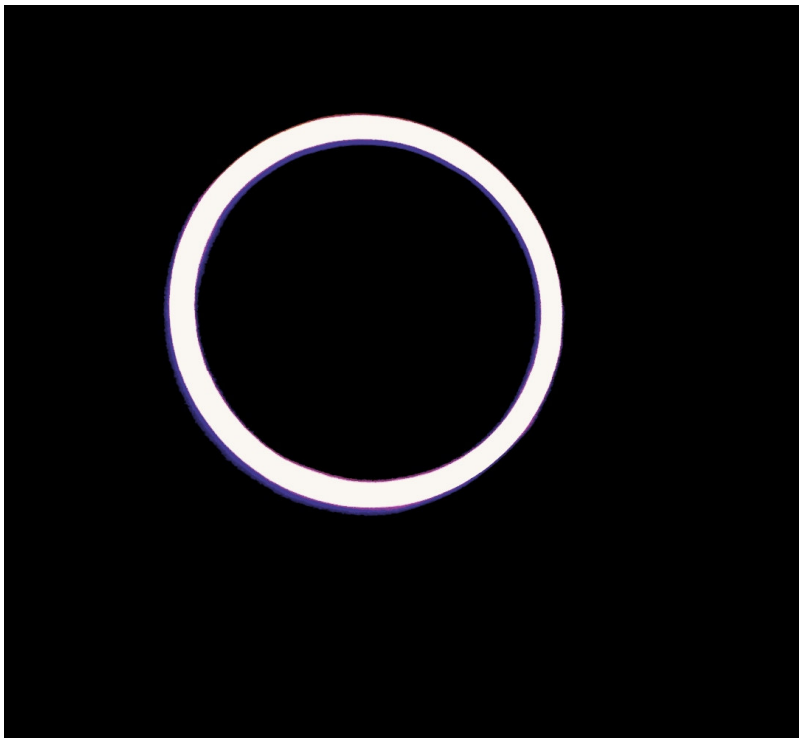
- Noticeable temperature drop
- Reduced light level
- Increased wind speed

Although I was unable to capture them using the afocal technique I used for taking pictures, the presence of many Baily's beads was observed at the eyepiece.

This, my second ASE, was the most spectacular by some distance although the

shine was removed by striking French air traffic controllers who refused to permit entry into French airspace. This delayed take-off by three hours and required an extended trip home overflying the Med, Italy, Switzerland, Germany and Belgium before reaching the UK.

Ted Thurgur.
7th October, 2005.



Stars Like To Have Company

By Chris Evans.

It's interesting to know that like humans, most stars probably prefer life as a member of a binary system, rather than solitude. It's not easy to find out the true incidence of 'binarity' – it's difficult to measure as some of a binaries characteristics work against their discovery e.g. wide orbits with correspondingly rather slow orbital velocities, but estimates of binarity range from 20% to 90%. In fact, not only do we find binary systems, we also find 'hierarchical binaries', where one binary system (or more) orbits another binary system. In this case the separation of the stars in each binary is much smaller than the separation of the main components. Two good examples are Epsilon Lyrae and Zeta Ursae Majoris ('Mizar'). Mizar is a well known hierarchical binary with components A and B separated by about 14 arcseconds.

We shouldn't be surprised that stars like company. Star formation involves the gravitational collapse and fragmentation of a large cloud of gas and dust. So protostars stand a good chance of forming in such close proximity to each other, that they remain gravitationally bound.

A few binaries can be spotted directly if there is a wide enough separation of the stars, or where the one star eclipses the other and leads to a change in the observed magnitude of the system, but these 'eclipsing binaries' can only happen in the rare cases where we are viewing the system edge-on. A good example is Algol in Perseus. During eclipses, the visual magnitude drops from 2.1 to 3.3 and happens every 70 hours. This is easily seen without even binoculars, so it is well worth a viewing. But most binaries are found, using large telescopes, by observing a periodic Doppler shift of the spectral lines of at least one of the components due to its orbital motion. These are known as 'spectroscopic binaries'.

The fact that stars form binaries is a stroke of good luck for astronomers, as the stellar companion effectively gives us a device to measure star mass, and with eclipsing binaries, the star radius.

If the two stars are close enough, they can also interact by mass flowing from one star to the other, producing spectacular events, particularly if the mass gainer is a compact object, i.e a white dwarf (cataclysmic variables), a neutron star or a black hole. As the compact object is very small, the matter leaving the mass donor loses a

large amount of gravitational potential energy before it accretes on to the compact star. Most of this energy heats up the transferring material to temperatures which can reach tens of millions degrees Kelvin, giving rise to high energy radiation (X-ray binaries). The conservation of angular momentum usually forces the stream to swing into an orbit around the star, eventually forming an accretion disc, which then feeds material onto the other star. There are many variations on this theme, but interacting binary stars make a fascinating area of study.

THE WINTER NIGHT SKY ROUNDUP

The Spring Night Sky covers the period from March 2004 through to May 2004. All times given below (mainly for sunrise, sunset, occultations, and eclipses) are Universal Time (UT) unless otherwise stated. The times of eclipses and those of occultations are correct for Wolverhampton.

	Dec 5	Dec 19	Jan 2	Jan 16	Jan 30	Feb 13	Feb 27
SUN-RISE	08h 02m	08h 16m	08h 20m	08h 11m	07h 54m	07h 29m	07h 00m
SUNSET	15h 56m	15h 55m	16h 06m	16h 25m	16h 50m	17h 17m	17h 43m

THE EARTH

The Winter Solstice occurs on 21st December at 18:35, and the Earth reaches perihelion on 4th January at 00:00.

PHASES OF THE MOON

The principle phases of the Moon during the winter are given in the table below:

NEW MOON	FIRST QUARTER	FULL MOON	LAST QUAR-TER
DEC 1	DEC 8	DEC 15	DEC 23
DEC 31	JAN 6	JAN 14	JAN 22
JAN 29	FEB 5	FEB 13	FEB 21
FEB 28	MAR 6	MAR 14	MAR 22

THE PLANETS

Mercury - is a well-placed morning object in December, reaching greatest western elongation

(21º) on 12th December, when it will rise 2 hours before the Sun. At superior conjunction on 26th January, Mercury quickly becomes an evening object, reaching greatest eastern elongation (18º) on 24th February, when it will set 1¾ hours after the Sun.

Venus - is an evening object during December, setting 2 hours after the Sun at Christmas, but the planet is rapidly closing with the Sun, being at inferior conjunction on 14th January. Venus quickly becomes a morning object, rising 1¾ hours before the Sun at the end of January, and 2¼ hours before by the end of February. Mag. 4.0, diam. 62.5".

Mars - now past opposition can be considered an evening object. Moving retrograde in Aries, the red planet is already fading, and will continue to do so during the winter. Stationary on 10th December, Mars resumes its direct motion, and moves from Aries into Taurus in early February. Mag. 0.2, diam. 10.4".

Jupiter - is a morning object in Libra, rising at 04:00 in December, and at midnight by the end of February. Mag. 1.9, diam. 34.5".

Saturn - is also a morning object, but in Cancer. The ringed planet rises at 19:00 in December, and is at opposition on 27th January, when it will be visible all night. By the end of February though, it will be setting at 06:00. Mag. 0.2, diam. 20.3".

Uranus & Neptune - are both evening objects in Aquarius and Capricornus respectively. Uranus sets by 20:30, mag. +5.9, diam. 3.4", whilst Neptune sets around 18:00, and is unlikely to be noticed, mag. +8.0, diam. 2.2". Neptune is in conjunction with the Sun on 6th February.

OCCULTATIONS

During the winter, there will be just one occultation of note; a lunar occultation of Chi Leonis. The Moon will be a waning gibbous phase, not long risen.

DATE	OBJECT	MAG.	DISAPPEAR-ANCE	REAPPEARANCE	MOON'S PHASE
FEB 14	Chi Leo	+4.6	19h 51m	20h 51m	0.97

EXTRA-TERRESTRIAL EVENTS

Mercury - Venus, now past opposition is an "evening object", in conjunction on 31st January, while the Earth is also an "evening object", in conjunction on 26th January. Jupiter is at opposition on 25th December in Virgo, mag. 2.2, diam. 39.3", and Saturn is also at opposition; on 4th December in Cancer, mag. 0.1, diam. 18.8".

Venus - Since Venus rotates "backwards" or in retrograde motion, some of the planetary configurations are reversed, (ie, planets are evening objects before opposition, and morning objects thereafter). So, Mercury is an evening object until superior conjunction on 31st January, and a morning object thereafter. The Earth would be a splendid object in the Venusian sky, if it were not for the Venusian cloud cover. It reaches a perihelic opposition on 14th January in Gemini, mag. 6.8, diam. 65.8". Mars is just past opposition, and may be found in Taurus.

Mars - Venus is a morning object in the Martian sky, reaching greatest western elongation (29º) on 10th February, lying in Scorpius, mag. 1.8, diam. 11.8". The Earth is also a morning object in the Martian sky, reaching greatest western elongation (38º) on 20th February, lying in Libra, mag. 1.7, diam. 14.0". The giant planet Jupiter is a morning object in Libra, mag. 1.4, diam. 29.8", and Saturn is a morning object in Cancer, mag. +0.1, diam. 20.4".

Jupiter - Seen from Jupiter, the inferior planets would appear too close to the Sun for adequate observation. For instance, the Earth is an evening object, and is at greatest eastern elongation (10º) on

6th February, lying in Aries. This is very close to the Sun in the sky, although it does manage mag. +1.4, diam. 3.3". Saturn is an evening object in Gemini, mag. +1.7, diam. 15.8".

Saturn - Seen from Saturn, the inferior planets would appear even closer to the Sun than from Jupiter. The Earth is at inferior conjunction on 27th January, and then becomes a morning object, though not observable. Jupiter is a morning object in Sagittarius. The giant planet is now moving through the far side of its orbit, and displays a waxing gibbous phase of 74%, mag. 0.2, diam. 18.8".

Uranus & Neptune - Seen from these far planets, the only planets on view would be the giant planets. From Uranus, Jupiter is an evening object in Leo, and displays a waning gibbous phase of 85%, mag. +1.5, diam. 8.3". Saturn is a morning object in Leo, and displays a waxing gibbous phase of 96%, mag. +3.4, diam. 5.9". Neptune, having passed opposition in 1993, is now an evening object in Sagittarius, mag. +6.3, diam. 4.8".

From Neptune, Jupiter is an evening object in Leo, and displays a waning gibbous phase of 68%, mag. +2.3, diam. 6.2". Saturn is out of view, and is at superior conjunction in December. Uranus is a morning object in Gemini, displaying a waxing crescent phase of 22%, mag. +5.4, diam. 5.0".

(Continued from page 3)

From current theory, the first three minutes after the 'Big Bang' saw the formation of the first elements, about 75% hydrogen, 25% helium and traces of lithium 7. (This agrees well with the observed baryon density of the Universe.) After about 300,000 years, when neutral atoms had formed, the Universe became transparent to radiation for the first time - we see the effect of that in the Cosmological Microwave Background (CMB) radiation, the dying embers of the original 'fireball'.

But what happened between 300,000 years and 1 billion years? This, of course, is mere conjecture without observational evidence. The light even from the most distant galaxies shows the existence of stars which are not devoid of 'metal' content. This suggests that there must have been an even earlier generation of stars, the first objects to form from the original elemental mix of hydrogen and helium. These stars are usually referred to as Population III stars and stellar evolution theory predicts they will tend to be more massive than 'metal-rich' stars formed in more recent times - in the region of 100 solar masses. It is known that such massive stars have correspondingly short lives, only a few million years, before ending their days as supernovae, whose massive cores theoretically collapse to form 'black holes'.

Is it possible to detect the remnant radiation from these first-born stars? Rather like the CMB radiation, the light from these early stars would now be redshifted by a large factor ($z=20 \rightarrow 50$), observable in the near-infrared (NIR) region of the spectrum. Kashlinsky *et al* now make this claim, as fluctuations seen in the cosmological NIR background radiation (Nature, 3 November 2005) using the Spitzer Space Telescope (SST) NIR array camera (NIRAC).

The 2.5 year SST mission was launched in August 2003 into an earth-trailing solar orbit, designed to use as little cryogenic as possible to cool the detectors. With an aperture of only 85cm the telescope is unable to detect individual sources, only the combined NIR background. This was measured at four wavelengths; 3.6, 4.5, 5.8 and 8.0 μm. A major difficulty is the removal of contributions from foreground sources which have formed since, and an extrapolation was necessary to exclude distant galaxies too faint to be seen by NIRAC.

However, the method appears to work equally well using different methods to remove foreground effects and over all four wavelengths. The results were also consistent when observed in different regions of the sky, when observed on dates 6 months apart and also were consistent with the source having been produced over a short time span. If this research group is correct, they have observed the remnant radiation from objects which formed about 100 million years after the birth of the Universe, though it is not yet possible to calculate a precise time.

Is this the signal from the putative Population III starlight, or perhaps the radiation emitted by residual gas falling into the black holes of their supernovae remnants? These findings will no doubt spark a considerable amount of interest and discussion. Population III stars, and the early history of the Universe, will be the subject of further research for the next generation of space telescopes.

Phil Barnard