



# TRANSIT

The Newsletter of



05 May 2007



An X-ray look at the famous Pillars of Creation reveals a region peppered by bright young stars. A composite of data from the Hubble Space Telescope and Chandra X-Ray Observatory, shows many bright X-ray sources in the Pillars of Creation in the Eagle Nebula.

Red objects depict sources of low energy X-rays, while green and blue hues suggest medium and high-energy objects, respectively. Few such X-ray sources are found within the pillars themselves, which astronomers believe may be a sign that the region is past its star-forming prime.

## Editorial

**Last meeting** : 13 April 2007 –Darran Summerfield on “The Moon”. An excellent review of the Moon past, present and with a suprising future.

**Remember!** Future meetings starting in May 2007 will be held at the Wynyard Planetarium, (don't forget to have a pee before you come – no co-located loo!)

**Next meeting** : 11 May 2007, Presidential Address: Title t.b.a.  
by Jack Youdale FRAS, Honorary President of CaDAS

**Following meeting** : 8 June 2007 - Keith Johnson will speak on "Astrophotography".

## Letters to the Editor :

*Any new observations, any comments on local or international astronomy, **anything** you want to share with your fellow members?*

Dear Editor,

The eloquent words of the late Carl Sagan from *Pale Blue Dot*, as printed in the April *Transit*, should be made compulsory reading for all politicians – not to mention the world's religious leaders!

Very similar thoughts were expressed three centuries earlier by Christiaan Huygens, who wrote a book in about 1690, with the cumbersome title *New Conjectures Concerning the Planetary Worlds, their Inhabitants and Productions*. Huygens, who thankfully lived in a country which wasn't oppressed by the Vatican and its pre-Copernican dogma, was one of the first to speculate that other stars might have life-bearing planets.

For many years, I've used his words as the opening to my “We Are Not Alone” talk:

“How vast those orbs must be, and how inconsiderable this Earth, the theatre upon which all our mighty designs, all our navigations, and all our wars are transacted, is when compared to them. A very fit consideration, and matter of reflection, for those kings and princes who sacrifice the lives of so many people, only to flatter their ambition in being masters of some pitiful corner of this small spot.”

Neil Haggath

## A life Under the Stars

from David Blenkinsop

I have been interested in astronomy all my life.

When I was six years old my father made me a telescope. It had an un-ground spectacle lens of one metre focal length and a concave eyepiece lens. It had a magnifying power of about x 20 and a small field of view. But it did show the craters of the Moon. That was in 1951 when we had no money.

In 1957 when "Sky at Night" started, Patrick showed where to look for the "Arnold-Rowland" comet. We saw it with that telescope. I thought it looked like a distant fire and the tail was smoke.

When we were going home after the cinema my father used to point out the stars and tell us magic names such as Sirius, Betelgeuse and Aldebaran.

When I was fifteen I was able to see Jupiter's moons with the telescope, that was after I found out which planet was Jupiter.

In my twenties I got a 4.5 inch Newtonian on a German equatorial mount. Saturn and Jupiter were OK but the telescope was not! In 1967 I sent for a 6" mirror from Frank's in Glasgow. I was not able to make a successful telescope with it at the time but it is now a good telescope. Later I sent for an 8" mirror and this time I was able to make a successful telescope.

In 1987 the year of the Supernova 1987A I built a 10" telescope. In 1977 I bought a Norton's Sky Atlas from W.H. Smiths. Also I started receiving "Sky and Telescope" by post from Universal Subscriptions. At that time my astronomy took off, I now had an 8" telescope and a good star map and "Sky and Telescope" to tell me what to look for. So, you see, I had a very long apprenticeship.

That is why I like to help other people to get as much out of astronomy as I do. I like to look at star clusters and double stars, the planets and galaxies are OK. Comets are a special something.

I also have a 16" Dobsonian telescope although I did not make this one. My telescopes perform well outside the Planetarium on a Friday night. I do not do astrophotography or variable star reports or make drawings. I am a life-long stargazer, come and share it with me.

I still use yards, feet and inches and miles (three cheers for Dave, *Editor*) and I do not understand kilometres.

## Earth like planet discovered

April 25, 2007

Astronomers have discovered the most earthlike planet outside our solar system to date, an exoplanet with a radius only 50% larger than the Earth and possibly having liquid water on its surface. Using the ESO 3.6m telescope, a team of Swiss, French, and Portuguese scientists discovered a super-Earth about 5 times the mass of the Earth that orbits a red dwarf, already known to harbor a Neptune-mass planet. The astronomers have also strong evidence for the presence of a third planet with a mass about 8 Earth masses.

This exoplanet — as astronomers call planets around a star other than the Sun — is the smallest ever found up to now and it completes a full orbit in 13 days. It is 14 times closer to its star than the Earth is from the Sun. However, given that its host star, the red dwarf Gliese 581, is smaller and colder than the Sun — and thus less luminous — the planet nevertheless lies in the habitable zone, the region around a star where water could be liquid!

"We have estimated that the mean temperature of this super-Earth lies between 0 and 40 degrees Celsius, and water would thus be liquid," explains Stephane Udry, from the Geneva Observatory (Switzerland) and lead-author of the paper reporting the result. "Moreover, its radius should be only 1.5 times the Earth's radius, and models predict that the planet should be either rocky — like our Earth — or covered with oceans," he adds.

"Liquid water is critical to life as we know it," avows Xavier Delfosse, a member of the team from Grenoble University (France).

"Because of its temperature and relative proximity, this planet will most probably be a very important target of the future space missions dedicated to the search for extra-terrestrial life. On the treasure map of the Universe, one would be tempted to mark this planet with an X."

The host star, Gliese 581, is among the 100 closest stars to us, located only 20.5 light-years away in the constellation Libra ("the Scales"). It has a mass of only one third the mass of the Sun. Such red dwarfs are at least 50 times intrinsically fainter than the Sun and are the most common stars in our Galaxy: among the 100 closest stars to the Sun, 80 belong to this class.

"Red dwarfs are ideal targets for the search for such planets because they emit less light, and the habitable zone is thus much closer to them than it is around the Sun," emphasizes Xavier Bonfils, a co-worker from Lisbon University. Any planets that lie in this zone are more easily detected with the radial-velocity method, the most successful in detecting exoplanets.

Two years ago, the same team of astronomers already found a planet around Gliese 581 (see ESO 30/05). With a mass of 15 Earth-masses, i.e. similar to that of Neptune, it orbits its host star in 5.4 days.

At the time, the astronomers had already seen hints of another planet. They therefore obtained a new set of measurements and found the new super-Earth, but also clear indications for another one, an 8 Earth-mass planet completing an orbit in 84 days.

The planetary system surrounding Gliese 581 contains thus no fewer than 3 planets of 15 Earth masses or less, and as such is a quite remarkable system.

The discovery was made thanks to HARPS (High Accuracy Radial Velocity for Planetary Searcher), perhaps the most precise spectrograph in the world. Located on the ESO 3.6m telescope at La Silla, Chile, HARPS is able to measure velocities with a precision better than one metre per second (or 3.6 km/h)! HARPS is one of the most successful instruments for detecting exoplanets and holds already several recent records, including the discovery of another "Trio of Neptunes" (ESO 18/06, see also ESO 22/04).

The detected velocity variations are between 2 and 3 metres per second, corresponding to about 9 km/h! That's the speed of a person walking briskly. Such tiny signals could not have been distinguished from 'simple noise' by most of today's available spectrographs.

"HARPS is a unique planet hunting machine," says Michel Mayor, from Geneva Observatory, and HARPS Principal Investigator. "Given the incredible precision of HARPS, we have focused our effort on low- mass planets. And we can say without doubt that HARPS has been very successful: out of the 13 known planets with a mass below 20 Earth masses, 11 were discovered with HARPS!"

HARPS is also very efficient in finding planetary systems, where tiny signals have to be uncovered. The two systems known to have three low mass planets — HD 69830 and Gl 581 — were discovered by HARPS.

"And we are confident that, given the results obtained so far, Earth-mass planets around red dwarfs are within reach," affirms Mayor

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## New research tool indicates those countries most at risk of 'small' asteroid impact

from School of Engineering Sciences, University of Southampton

Researchers at the University of Southampton have developed a software package for modelling asteroid impacts that enables them to assess the potential human and economic consequences across the globe.

The software, called NEOimpactor, has been specifically developed for measuring the impact of 'small' asteroids under one kilometre in diameter, and early results indicate that the ten countries most at risk are China, Indonesia, India, Japan, the United States, the Philippines, Italy, the United Kingdom, Brazil and Nigeria.

'The threat of the Earth being hit by an asteroid is increasingly being accepted as the single greatest natural disaster hazard faced by humanity,' comments Nick Bailey of the University of Southampton's School of Engineering Sciences, who developed the software with University colleague Dr Graham Swinerd, and Dr Richard Crowther of the Rutherford Appleton Laboratory .

'Since 1998 the international Spaceguard survey has been cataloguing all near earth asteroids (NEA) larger than one kilometre in diameter. However, small asteroids, under one kilometre in diameter, remain predominantly undetected. While the direct consequences might not be quite as extreme, these small objects exist in far greater numbers and therefore will impact more frequently. It is on these sub-kilometre asteroid impacts that we have been focusing to assess the consequences for both humans and for infrastructure across the globe.'

Initial investigations have examined how the consequences of an impact change with increasing impact energy. Taking a spherical stony asteroid travelling at 12,000 miles per second and varying the diameter to increase kinetic energy, the results indicate that a 100 metre diameter asteroid will predominantly cause localised casualties and damage across a few countries when impacting on either land or ocean. However, the consequences of a 200 metre diameter asteroid hitting the ocean increase significantly, with the generated tsunamis reaching a global scale. At 500 metres in diameter, almost any ocean impact will generate significant casualties and economic cost across the world.

The team used the raw data from the multiple impact simulations to rank each country based on the number of times and how severely they would be affected by each impact. Early results show that in terms of population lost, China, Indonesia, India, Japan and the United States face the greatest overall threat; while the United States, China, Sweden, Canada and Japan face the most severe economic effects due to the infrastructure destroyed.

In both rankings, the United Kingdom appears eighth in the list of countries most affected. Of the top twenty for each ranking, over half the countries appear in both lists.

'The consequences for human populations and infrastructure as a result of an impact are enormous,' continues Nick Bailey. 'Nearly one hundred years ago a remote region near the Tunguska River witnessed the largest asteroid impact event in living memory when a relatively small object (approximately 50 metres in diameter) exploded in mid-air. While it only flattened unpopulated forest, had it exploded over London it could have devastated everything within the M25.'

'Our results highlight those countries that face the greatest risk from this most global of natural hazards and thus indicate which nations need to be involved in mitigating the threat.'

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### **Caution urged on climate 'risks'**

by Pallab Gosh, BBC

**Two leading UK climate researchers have criticised those among their peers who they say are "overplaying" the global warming message.**

Professors Paul Hardaker and Chris Collier, both Royal Meteorological Society figures, are voicing their concern at a conference in Oxford.

Both scientists believe that man's activities are causing global warming

They say some researchers make claims about possible future impacts that cannot be justified by the science.

The pair believe this damages the credibility of all climate scientists.

They think catastrophism and the "Hollywoodisation" of weather and climate only work to create confusion in the public mind.

They argue for a more sober and reasoned explanation of the uncertainties about possible future changes in the Earth's climate.

As an example, they point to a recent statement from one of the foremost US science bodies - the American Association for the Advancement of Science (AAAS).

The association released a strongly worded statement at its last annual meeting in San Francisco in February which said: "As expected, intensification of droughts, heatwaves, floods, wildfires, and severe storms is occurring, with a mounting toll on vulnerable ecosystems and societies."

"These events are early warning signs of even more devastating damage to come, some of which will be irreversible."

According to Professors Hardaker and Collier, this may well turn out to be true, but convincing evidence to back the claims has not yet emerged.

"It's certainly a very strong statement," Professor Collier told BBC News.

"I suspect it refers to evidence that hurricanes have increased as a result of global warming; but to make the blanket assumption that all extreme events are increasing is a bit too early yet."

### **'Scientific basis'**

A former president of the Royal Meteorological Society, Professor Collier is concerned that the serious message about the real risks posed by global warming could be undermined by making premature claims.

"I think there is a good chance of that," he said. "We must guard against that - it would be very damaging.

"I've no doubt that global warming is occurring, but we don't want to undermine that case by crying wolf."

This view is shared by Professor Hardaker, the society's chief executive.

"Organisations have been guilty of overplaying the message," he says.

"There's no evidence to show we're all due for very short-term devastating impacts as a result of global warming; so I think these statements can be dangerous where you mix in the science with unscientific assumptions."

The AAAS said it would not be commenting directly on the professors' remarks.

"We feel that the recent consensus statement of the AAAS Board of Directors speaks for itself and stands on its own," a spokesperson explained.

"The AAAS Board statement references (at the end), the scientific basis upon which the conclusions are based, including the joint National Academies' statement and the Intergovernmental Panel on Climate Change."

### **The 'right thing'**

Professor Hardaker also believes that overblown statements play into the hands of those who say that scientists are wrong on climate change - that global warming is a myth.

"I think we do have to be careful as scientists not to overstate the case because it does damage the credibility of the many other things that we have greater certainty about," he said.



"We have to stick to what the science is telling us; and I don't think making that sound more sensational, or more sexy, because it gets us more newspaper columns, is the right thing for us to be doing.

"We have to let the science argument win out."

The pair have contributed to a pamphlet called Making Sense of the Weather and Climate, which will be presented on Saturday at the Garden Quadrangle Auditorium at St John's College, Oxford.

The AAAS position on climate can be read on the organisation's website.

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### **Figure Out How Dark Your Sky Is**

from Joe Rao, Hayden Planetarium

Those who are involved in popularizing astronomy are asked certain questions time and again. One of these is "How many stars are there?" Only when one is blessed with a rare glimpse of a star-spangled sky with its myriad luminaries can we understand why this question occurs. Special computer analysis can readily answer the question.

Most people probably want to know how many stars they can see with their unaided eyes. Unfortunately, few enjoy unspoiled, pollution-free skies. But for those who do, it is often said that the average naked-eye limit is magnitude 6.5. Over the entire celestial sphere there are 8,479 stars within that magnitude limit.

(On this scale, larger numbers represent dimmer objects, and the brightest objects have negative magnitudes. The brightest star, Sirius, shines at magnitude -1.42.)

Of course, we couldn't see them all at once since half of these available stars are always below the horizon. There is also the factor of atmospheric absorption, which severely reduces the number of stars visible near the horizon, even under ideal skies.

Because of all of this, the total number we can see at any given moment—under perfectly dark and clear conditions—is close to 2,500. In a city like London, with all the local glare, the number can dwindle to just 15 or so. So, poets who talk of millions of stars are either using a telescope or they exaggerate.

## What is out there?

Almost all of the sky objects visible to the naked eye are stars that reside in our galaxy. In fact the bulk of those you can see are relatively nearby, within a few thousand light-years. Most are actually within a few hundred light-years, with the exception of a few intrinsically brilliant stars that are many thousands of times more luminous than the Sun.

For comparison, the Sun is about 26,000 light-years from the galactic center, orbiting on an outer spiral arm. The galaxy itself is about 100,000 light-years wide. We see most of its contents only with powerful telescopes working at various wavelengths of light not visible to humans.

A light-year is the distance light travels in one year, racing at a speed of 186,000 miles per second. It's equal to about 5.88 trillion miles, or 9.46 trillion kilometers.

On a clear, dark night in the countryside at the right time of year, you can actually see the milky swath that gives our galaxy its name. It is a fuzzy region of the sky that represents the millions upon millions of stars toward the central disk of the galaxy, where the bulk of the Milky Way's stars are huddled in a bulge around a central black hole.

Seeing the Milky Way's main disk from our perspective is akin to standing near the edge of a cornfield, poking your head up, and trying to see the middle of the field during a thick ground fog.

## Counting down

There are roughly 300 billion stars in the Milky Way.

At most, 8,479 of them are visible from Earth to someone with perfect vision under ideal conditions. Not all these stars can be seen from any one location, of course. You miss about half of them by not travelling to the Southern Hemisphere, for example. The horizon, as well as the seasons, place further limits. Roughly 2,500 stars are available to the unaided eye in ideal conditions from a single spot at a given time.

## Your neighborhood

So, just how dark are the night skies in your neighborhood? An easy way to make a quick determination is to seek out the constellation Ursa Minor, the Little Bear, popularly known as the Little Dipper. In Ursa Major, the Big Bear, we have the bright and familiar stars of the Big Dipper. In contrast, the stars of the Little Dipper are rather faint, except for Polaris, the North Star at the end of the handle and the two stars in front of its bowl. These stars, Kochab and Pherkad have been called Guardians of the Pole because they march around Polaris like sentries.

The four stars in the bowl of the Little Dipper are composed of stars of magnitude 2, 3, 4 and 5. So, if you can see all four stars in the bowl, you have access to a good, dark sky. If, however, you can only see the Guardians, your sky quality can be considered fair-to-poor.

## **Pollution effects**

Sadly, the increase in light pollution -- defined simply as excessive or misdirected outdoor lighting -- especially over the last quarter-century has made finding such dark skies more difficult. David Crawford of the International Dark Sky Association notes: "Few members of the general public have ever seen a prime dark sky. For urban dwellers, star studded nights are limited to planetarium simulations."

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## **No more stars in your eyes?**

Fewer and fewer people are able to see the natural wonder of a star filled night sky. This is the conclusion of a survey run by the Campaign to Protect Rural England (CPRE) [1] and the British Astronomical Association's Campaign for Dark Skies (CfDS).

CPRE and CfDS asked people to count the number of stars they could see within the constellation of Orion – one of the most easily identified in the night sky – then tell us the number, along with the location of their observation. [3] In a truly dark sky about 50 stars might be visible to the naked eye within this constellation.

The results confirmed that light pollution, caused by badly-designed, inefficient outdoor lighting is blotting out the stars across much of the country and for most of the population.

People have been robbed of one of nature's most everyday yet awesome views – a star-filled night sky.

Nearly 2,000 people took part in the star count. Only 2% of people who responded to our online survey said they could see more than 30 stars, compared to 54% who saw fewer than 10 stars in Orion – a level which indicates severe light pollution.

Not surprisingly, the fewest stars tended to be seen in the more built up, developed areas where there is most outdoor lighting – as our map reveals.

Many people in rural areas were surprised at how few stars they actually saw, given that someone with good eyesight somewhere free of light pollution should see about 50 stars within Orion on a moonless, clear night. Light pollution can spread deep into the countryside from towns and cities. The two main causes of this pollution were poorly directed security floodlighting and sky glow from distant towns, mostly caused by street lighting.

An observer from Birmingham told us: ‘I grew up in East Africa with a firmament of stars over my head – they were the roof to my world. Once a year I go to rural Wales, wait for a clear night, and then lie looking up at the stars. I don’t go in until I have seen a shooting star. It’s as if I have to put the roof back onto my world.’

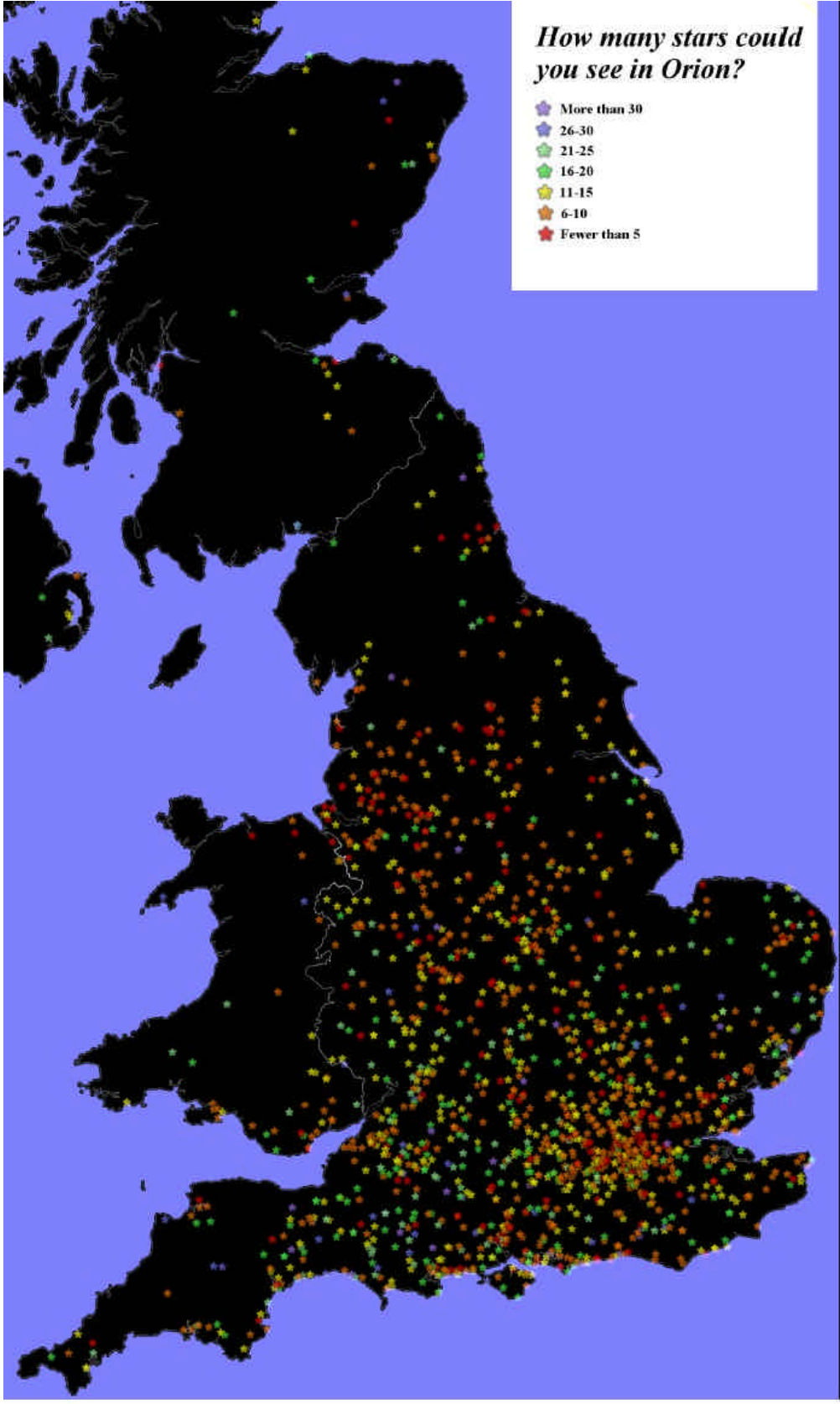
Several people mourned the loss of views of the Milky Way – our own galaxy. Most people in Britain can no longer see it in the skies around their home, due to light pollution.

<b>Number of stars counted within the constellation of Orion</b>						
<b>0-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-40</b>
258 (14%)	729 (40%)	441 (24%)	215 (12%)	105 (6%)	47 (2%)	34 (2%)

CPRE and the Campaign for Dark Skies hope to repeat the star count in future years. We want to build up a picture of the light pollution people experience across the country and monitor change, supplementing the mapping work both organisations have carried out.

Emma Marrington, CPRE dark skies campaigner said: ‘We’re very grateful to the people who took part in our star count. This evidence is a great way to show Government how badly we need the long awaited planning policy on controlling light pollution, which would help stop it spreading ever wider.’

Bob Mizon, UK co-ordinator of the Campaign for Dark Skies, said: ‘In an era when energy considerations loom ever larger, it makes a lot of sense to direct lights carefully and use sensible wattages, not just to reclaim our view of the stars but also to cut pollution and help ensure our energy stocks for the future.’



## The Struve Legacy

from Michael Gregory

The astronomical world in general and multiple star researching in particular owes a great deal to the Struve family who originated from the North German states but spent most of the 19<sup>th</sup> century in Russia. Initially 'von Struve', it was not until the 1920's that the prefix was finally dropped though it must be said that some articles never mention the prefix. Furthermore, there seems to be several ways of pronouncing 'Struve'!

The first traceable member of this family was Jakob von Struve who lived from 1755 until 1841. Later in life he was a grammar-school principal and living at Altona (then in Denmark), though to escape conscription, he had lived abroad in his younger days, mainly in the Baltic States. His second son, Friedrich Georg Wilhelm, was born at Altona in 1793. Wilhelm von Struve, as he was generally known, had a meteoric rise to fame. After finishing his secondary schooling at the age of fifteen (1808), he just escaped being press-ganged by French sailors for service in the Napoleonic armies, so his family sent him to Dorpat University (now Tartu in Estonia), where his elder brother, Karl, lectured in Philology. To subsidise his education at Dorpat he held tutorials for the children of landed gentry and thus became known in high places. He graduated in 1811 with full honours and was employed immediately at the university observatory, which at that time was rather run down. Six years later, at the age of 24, he was the director of the observatory at Dorpat!

In 1824 Wilhelm commissioned the 9.6"  $f/17.5$  Fraunhofer refractor at Dorpat. This came from the optical factory of Joseph von Fraunhofer; often termed 'the father of astrophysics' who mapped out what we now term the 'Fraunhofer Absorption Lines'. Fraunhofer invented the German equatorial mount, the clock drive, and the ring micrometer (as well as doing the ground work for what latter became Spectroscopy). In fact, the Dorpat refractor was so advanced for its time that it was known as a measuring instrument or engine rather than a telescope.



Pictured left is a 1/12<sup>th</sup> scale model of the Dorpat Fraunhofer refractor. This masterpiece was the work of William Gould of Santa Fe, New Mexico, in 1980.

The original telescope had a fir optical tube lined inside and out with mahogany veneer whilst the massive German equatorial yoke was fashioned from oak. The equatorial head itself was mainly machined brass. With this refractor, Wilhelm von Struve carried out a survey of the sky from the north celestial pole down to minus 15° declination, scrutinising some 120,000 stars for signs of duplicity. Following this, he later made micrometer measurements of some 3,000 candidates, 2,300 of which had not been measured before. Many of these stars had separations of 1.0 arc seconds or less, indicating not only the high quality of the instrument but also the skill and dedication of the observer!

Wilhelm produced the *Dorpat Catalogue* in 1827, and his discoveries all carry the designation S (upper case Sigma) in modern catalogues. He followed this with two supplements having the designations S I and S II. Then in 1837 Wilhelm wrote his *Stellarum Duplicum et Multiplicum* which went a long way towards proving that multiple star systems are governed by the laws of gravity and were in no way exceptional. Additional to all this, he made great strides in general research such as the study of galactic structure, geodetic triangulation and measurement.

In 1839 he became the director of the recently modernised Russian Imperial Observatory at Pulkovo on the outskirts of St Petersburg. This observatory had opened in 1718 but had become dilapidated and poorly equipped, so had been completely rebuilt in 1835. With the patronage of Tsar Nicholas I, who had personally chosen the site in the Pulkovo Hills in 1830, the observatory was equipped with a 15" refractor, then the largest of its type in the World. This patronage by the royal family was to cost the von Struve family dearly in the following century!

The plan was for Wilhelm to remeasure many of the stars from his *Dorpat Catalogue* and supplements with the 15" refractor, as well as searching for even closer pairs. In this quest his son, Otto Wilhelm von Struve, who was born at Dorpat in 1819, joined him at Pulkovo in 1839.

Wilhelm von Struve had married twice. His first wife was Emilie Halle, who was born in 1796 and died in 1834, having given birth to twelve children, eight of who survived infancy. After Emilie's passing, Wilhelm married a second time and this wife had six children. Many of his children became known as the Russian Struve's and went on to high positions in the Civil Service!

One of these was Bernard von Struve who became the Governor of Perm, then later of Astrakhan. His son, Pyotr Bernardavich von Struve became a politician and studied Marxist theory. During the 1917 Rising he played on both sides. Today Pyotr's grandson lectures in a west coast American university!

Otto Wilhelm, the previously mentioned son of Wilhelm, had studied astronomy at Dorpat (Tartu) University and he succeeded his father as director of the

Imperial Russian Observatory in 1862. By then Wilhelm was suffering from poor health and he died peacefully at 4am on November 11<sup>th</sup>, 1864, in his 71<sup>st</sup> year - forever remembered by all those who enjoy searching out multiple stars!

Otto Wilhelm continued his father's quest and he discovered some 500 new multiple systems, many of which he had included in his *Pulkovo Catalogue* as early as 1843 and all designated OS. He then produced a supplement to this catalogue that contained only very wide pairs, designated OSS, that same year. However, father and son revised their catalogues in 1850, adding *rej* (reject) next to entries they thought might be too widely separated to have any gravitational connections though a generation later W J Hussey remeasured many of these rejects and found some showing small signs of elliptical movement since the original Struve measures.

Otto Wilhelm von Struve carried out general astronomical research as well as measuring multiple stars. He estimated the sun's velocity, discovered a satellite of Uranus and studied the Saturnian ring system, nebulae and comets. Then in the early 1880's he turned to America and the Cambridge, Massachusetts, optical company of Alvan Clark who produced a 30" lens for a new refractor at Pulkovo. At this time Alvan Clark himself was an elderly man and production of this lens, then briefly the largest ever ground, was supervised by his son, Alvan Graham Clark. Otto Wilhelm commissioned the new refractor in 1885 but he retired from his post of director in 1889 and was followed by his son, Karl Hermann von Struve in 1890. Otto Wilhelm died in 1905!

Hermann von Struve, as he was generally known, was born in 1854 at St Petersburg and he obtained his Ph.D. in astronomy from the University of Tartu in 1882. He joined the staff at Pulkovo immediately, studying the satellites of Saturn amongst many other projects, though he does not appear to have been the Director. His forte did not include researching multiple star systems as, though some discoveries have been given the designation HS, Hermann receives scant mention in the 98,000-entry Washington Double Star catalogue.

In 1895 Hermann retired from his post at Pulkovo and returned to his grandfather's native country where he became the director of Konigsberg Observatory for some nine years. In 1903 he was awarded the Gold Medal by the Royal Astronomical Society and about this time the asteroid 768 Struveana was named jointly in honour of himself, his father and grandfather. Then in 1904 he became the director of the Berlin-Babelsberg Observatory, a position he held until his death at Bad Herrenalb in the Black Forest on August 20<sup>th</sup> 1920.

His son, Georg Otto Herman von Struve, was born in 1886. Little appears to be known of him though he probably gained a Ph.D., in astronomy. He died in 1933.



His son, Wilfried Struve, was born in 1914 and he received his Ph.D. in astronomy in 1939. Post World War II however, he gave up astronomy and became an acoustics engineer. He died in 1992!

Gustav Wilhelm Ludwig von Struve, a son of Otto Wilhelm and younger brother of Karl Hermann, was born at St Petersburg in 1858. He later joined his father and brother on the staff at Pulkovo after gaining his Ph.D., but then he moved to Kharkov where he became the director of the university observatory in that city. Though he was generally known as Ludwig von Struve, his double star designation is GS. After a determined search through the WDS digital catalogue, there is scant mention of Ludwig.

Otto von Struve was the son of Ludwig. He was born at Kharkov in 1897 and destined to follow his father and uncle, grandfather and great grandfather. Unfortunately he was in the middle of his astronomical studies at Kharkov when the Civil War broke out in Russia in 1917. As his family had personally been patronised by the Tsars of Russia, Otto served as a junior officer in the White Russian army (the royalists) and thus found himself on the losing side. In 1920 Otto and his father joined up in retreat and headed for Sevastopol in the Crimea, hoping to gain safe passage to Turkey. Regrettably, the journey proved too strenuous for Ludwig and he died near Sevastopol just three days after his 62<sup>nd</sup> birthday.

Shortly after this, astronomical connections spirited Otto away and he turned up in the state of Illinois in 1921 where he joined the staff of Chicago University's Yerkes Observatory just over the border at Williams Bay in Wisconsin. His forefathers would have been impressed with the 40" refractor there!

Otto received his Ph.D. from the University of Chicago in 1923 and he was naturalised in 1927 when, I assume, he dropped the prefix 'von' from his surname. He does not appear to have been a multiple star measurer of any note and no catalogues give him an upper case Sigma designation.

From 1932 until 1947 he was professor of astrophysics at the University of Chicago and director of its Yerkes Observatory and of the MacDonald Observatory, on Mount Locke in western Texas, this latter observatory belonging to the University of Texas; then from 1950 until 1959 he was professor of astrophysics at the University of California as well as being director of the university's Leuschner Observatory. During this time he made many important studies regarding stellar evolution, interstellar matter and velocity.

In 1960, Professor Struve became director of the National Radio Astronomy Observatory at Green Bank, West Virginia, where he remained until his death in 1963. So, technically, he was in charge there when Frank Drake made his first tentative search for extra-terrestrial radio signals. A huge step up from his great grandfather's clockwork telescope!

## Addendum

The Dorpat Fraunhofer refractor of 1824 has been beautifully restored and now resides in the Science Museum of Tartu University, Estonia, for all to see.

Unfortunately, the 30" Alvan Clark refractor of 1885, then the largest refractor in the World for two years, had an ignominious fate. After the Russian Revolution and then Lenin's death, St Petersburg was renamed Leningrad. Meanwhile the Clark refractor remained in what once was the Imperial Russian Observatory at nearby Pulkovo until the 2<sup>nd</sup> World War. During the siege of Leningrad the observatory and telescope were both destroyed. By a miracle perhaps, the lens itself survived unscathed and after the war the observatory was rebuilt in its original style and today continues at the forefront of astronomical education. The Clark refractor was not rebuilt though and the 30" lens is to this day displayed in the Pulkovo Observatory museum!

## Looking at the Sun's South Pole

from NASA

Less than one hundred years ago, the south pole of Earth was a land of utter mystery. Explorers laboured mightily to get there, fighting scurvy, wind, disorientation and a fantastic almost-martian cold. Until Roald Amundsen and Robert F. Scott reached the Pole in 1911 and 1912, it was *terra incognita*.

The situation is much the same today—on the sun.

"The sun's south pole is uncharted territory," says solar physicist Arik Posner of NASA headquarters. "We can barely see it from Earth, and most of our sun-studying spacecraft are stationed over the sun's equator with a poor view of higher latitudes." There is, however, one spacecraft that can travel over the sun's poles: Ulysses, a joint mission of NASA and the European Space Agency. And today Ulysses is making a rare South Pole flyby.

"On February 7th, the spacecraft reaches a maximum heliographic latitude of 80°S—almost directly above the South Pole," says Posner who is the Ulysses Program Scientist for NASA. Solar physicists are thrilled. Ulysses has flown over the sun's poles only twice before—in 1994-95 and 2000-01. The flybys were brief, but enough to prove that the poles are strange and interesting places.

Consider the following:

1. The sun's north magnetic north pole sticks out the south end of the sun. Magnetically, the sun is upside down!

"Most people don't know it, but we have the same situation here on Earth," notes Posner. "Our magnetic north pole sticks out of the geographic south pole."

Magnetically, Earth and sun have a lot in common. "Both the sun's and Earth's magnetic poles are constantly on the move, and they occasionally do a complete flip, with N and S changing places." This flipping happens every 11 years on the sun in synch with the sunspot cycle. It happens every 300,000 years or so on Earth in synch with--what? No one knows. "Studying the polar magnetic field of the sun might give us some clues about the magnetic field of our own planet."

2. There are holes over the sun's poles--"coronal holes." These are places where the sun's magnetic field opens up and allows solar wind to escape. "Flying over the sun's poles, you get slapped in the face by a hot, million mph stream of protons and electrons," he says. Ulysses is experiencing and studying this polar wind right now.

(Note: Earth has a polar hole, too--the ozone hole. The chemistry of the ozone hole is totally unrelated to the magneto-physics of coronal holes, but says Posner, "it is interesting that so many poles seem to have holes.")

3. Just as the sun's polar magnetic field allows solar wind *out*, it also allows galactic cosmic rays *in*. Could the space above the sun's poles be a place where we can sample interstellar matter without actually leaving the solar system? "That's what we thought before our first polar flyby in 1994," recalls Posner. "But we were wrong. Something is keeping cosmic rays out of the sun's polar regions. The current flyby gives us a chance to investigate this phenomenon."

4. Another mystery: There is evidence from earlier flybys that the north pole and the south pole of the sun have different temperatures. "We're not sure why this should be," says Posner, "and we're anxious to learn if it is still the case." Today's south polar flyby will be followed by a north polar flyby in early

In a sense, Ulysses is more like Richard E. Byrd than Amundsen or Scott. In November 1929, Byrd flew over Earth's south pole in a Ford Trimotor airplane named the *Floyd Bennett*. The plane barely gained enough altitude to overfly the high polar plateau, clearing some mountain peaks and glaciers by little more than a few hundred feet. Compasses were useless for direction-finding so close to the magnetic pole, and there were few landmarks in the white expanse below. Nevertheless, he managed to guide the plane straight to latitude 90 S. Like Byrd, Ulysses is a flier. "Today the spacecraft is gliding 300 million km (2 AU) above the sun's 'Antarctic.' That's a safe distance and a good place to sample the sun's polar winds and magnetic fields."

In the long run, however, Ulysses will follow Scott: "Had we lived I should have had a tale to tell of hardihood, endurance and courage..." Scott wrote shortly before his entire party perished from cold. They reached the pole, famously chasing Amundsen, but never made it home again. Ulysses will never come home either, eventually perishing in the cold of space when its internal power sources fail.

## Direct Hit, the Middlesbrough Meteorite

*Peter Cook recalls the day a meteorite struck Middlesbrough, reprinted from "Now and Then" magazine with thanks to Peter Cook.*

Then in 1881 – On the 14<sup>th</sup> March Bill Ellinor was a platelayer working with three of his mates on the Middlesbrough to Guisborough branchline at a spot called Pennyman's Sidings.

It was 3.35pm. Suddenly the four men stopped working and looked at each other in bewilderment as they heard a rushing, roaring sound overhead.

Instinctively they ducked as they heard a thud as something buried itself in the embankment a few feet away. Intrigued they went over to investigate and found a twelve inch deep hole, inside of which was what they would later describe as a 'milk warm' object. What they had found in fact was the Middlesbrough Meteorite, a six inch long piece of rock that had been formed 4,600 million years earlier at the same time as the Earth and the Solar System.

Its arrival in Middlesbrough captured the imagination of the leading Victorian scientists of the day, including the famous astronomer Alexander Herschel (the grandson of Sir William Herschel who discovered the planet Uranus). He and a team of experts immediately journeyed to Middlesbrough to examine this rare arrival, which, because of its soft landing was undamaged. Weighing three pounds, eight and a quarter ounces, with a crust of unusual thickness, it had a fluted surface, caused by its passage through the Earth's atmosphere. The scientists described it as having a rounded summit and sloping sides which were scored and deeply grooved, and the shiny object gave the impression of being polished with black lead.

Herschel calculated that it had struck the ground with a velocity of 412 feet per second. Realising the importance of the find, he supervised the careful excavation and placed it in a box to send to the British Museum who wanted it for their collection.

It was then that the North East Railway Company stepped in, claiming the meteorite was their property. They decreed it had fallen on their land and as such was 'lost property' and insisted it stay in Yorkshire. And that's where it resides today, in the care of the York Museums Trust.

On the 18<sup>th</sup> March 2006 almost 123 years to the day the Middlesbrough meteorite fell to Earth we had the closest near-miss ever recorded when an asteroid missed the Earth by 26,500 miles which is almost as close as some of the satellites orbiting the Earth. The asteroid was about 30 foot across and if it hit Middlesbrough it would have destroyed the entire town.

Most meteorites are the size of small grain of sand but large meteorites can cause mass destruction as was the case with the strike that wiped out the dinosaurs 65 million years ago. That meteorite left a 150 mile crater now buried below the jungle in the Yucatan Peninsula.

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## **Giant Remnants of Cosmic Collision Found Beyond Neptune**

By Ker Than

Shiny, gray space boulders floating in the outskirts of the solar system are the remnants of an ancient fiery collision involving two massive objects, the larger of which was nearly the size of Pluto, scientists say.

This rocky goliath could one day cross the orbit of Neptune and become one of the biggest comets ever known.

The findings, detailed in the March 15 issue of the journal *Nature*, mark the first "collisional family" detected in the Kuiper Belt and provide new insights about the solar system's murky history.

The Kuiper Belt is a vast expanse of space located beyond the orbit of Neptune. It is littered with rocky and icy bodies believed to be vestiges of the primordial disk from which the planets formed.

### **A suburban family**

The parent body of the new collisional family is thought to be 2003 EL61, one of the largest objects in the Kuiper Belt. It currently is football-shaped [image], with a diameter of about 930 miles (1,500 kilometers), but was probably spherical and 20 percent larger before the collision, the researchers say. Pluto is about 1,400 miles (2,300 km) wide.

2003 EL61 is thought to have collided with an object in its distant past that was roughly half its size and traveling at nearly 7,000 mph. The amount of energy generated by the blast would have equaled about 10 billion nuclear bombs, said study team member Darin Ragozzine of Caltech.

"In terms of collisions in the solar system, that's actually kind of mild," Ragozzine told *SPACE.com*.

The impact blasted large icy chunks from 2003 EL61 into space and sent the parent body reeling, causing it to spin end-over-end every four hours.

“It spins so fast that it has pulled itself into the shape of an American football, but one that’s a bit deflated and stepped on,” said Michael Brown, a Caltech planetary scientist who led the study.

The impact spawned at least seven other rocky objects—and likely more—with diameters ranging from 6 to 250 miles (10 to 400 km). The researchers lumped the scattered objects into a family based on their matching gray color and evidence of surface water ice derived from spectral analyses.

“None of the rest of the Kuiper Belt is as shiny and pristine” as these objects are, Ragozzine said.

About 35 other collisional families are known, but they are all located in the asteroid belt, the rocky region of space between the orbits of Mars and Jupiter.

### **A ‘milestone’**

Alessandro Morbidelli, an astronomer at the Laboratoire Cassiopee in France, who was not involved in the study, called the discovery a “milestone in Kuiper Belt science.”

Writing in an accompanying *Nature* news article, Morbidelli said the discovery provides a physical model for astronomers to test their theories about the kinds of large-scale collisions thought to be behind the birth of our Moon and the Pluto-Charon system.

Because such large collisions are relatively rare, scientists think the one involving 2003 EL61 occurred in the distant past, perhaps as far back as 4.5 billion years ago, when the Kuiper Belt was much more crowded than it is now and objects were more likely to bump into one another.

If scientists can pin down when the collision occurred, they will have a unique glimpse into a specific time in the solar system’s history and the evolution of the Kuiper Belt, Morbidelli said.

### **To be a comet**

Some of the shards from the impact have made their way to the inner Solar system, the researchers say.

“Probably, there are comets that we have seen that came from this collision,” Brown said in a telephone interview. “In fact, there are probably chunks of that collision here on the ground.”

One day, EL2003 EL61 will cross the orbit of Neptune and become a comet itself. “That’s going to be in about a billion years,” Brown said. “It’s a ways to wait.”

## Mystery in the clouds - Venus

: Seen through an ordinary backyard telescope, Venus seems bland. It's a featureless, cloud-covered orb about as interesting as a billiard ball. But if that same telescope is fitted with an ultraviolet filter, a mystery reveals itself. Venus' clouds are cross-crossed with fast-moving dark bands, shown here in a series of March 30th photos from Ed Lomeli of Sacramento, California:

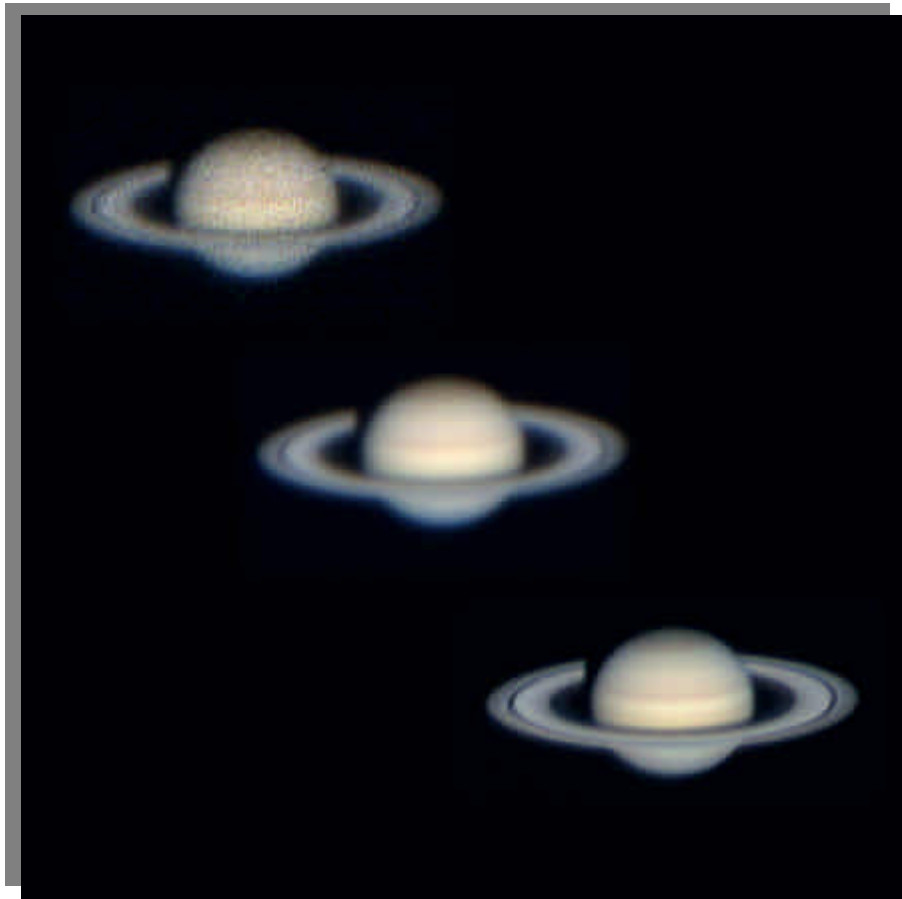


**Photo details:** Celestron 9-inch telescope, DMK 21BF04, UV pass filter

The bands are the mystery. Some unknown substance within them strongly absorbs UV light, accounting for almost half of the solar energy trapped by Venus. Whatever is in there, it plays a big role in maintaining Venus' hellish climate; the average temperature on the surface is about 460° Celsius. Astronomers have been studying the bands since Mariner 10 spotted them in the 1970s, but decades later no one knows the identity of the "UV absorbers." Candidates range from gaseous chlorine and sulfur compounds to alien life using UV radiation as a source of energy. Maybe Venus Express, a European spacecraft orbiting Venus now, will solve the puzzle.

To photograph the bands, Lomelli used a 9-inch Celestron telescope, a 640x480 monochrome ccd camera, and a 1.25-inch Schuler photometric UV pass filter. "I also have the Baader UV pass filter, but the Schuler is a better performer," he advises.

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**Above image** – Saturn captured and processed by Keith Johnson on a beautifully clear and steady night on 14 April 2007

Capture Details :

10 frames per second.

Camera Toucam Pro 2 and IRB filter

Celestron 9.25"

3X Barlow.

2598 frames aligned and stacked in Registax

Incidentally - this is not the best AVI, I've played all of the AVI's back and there are better ones than this one.

I will be making copies of the best ones and passing them out for members to use for themselves.

- Keith.

**Transit Tailpieces**

Articles : Please send contributions for the newsletter to Bob Mullen, 18 Chandlers Ridge, Nunthorpe, Middlesbrough, TS7 0JL, 01642 324939 ([b2mullen@hotmail.com](mailto:b2mullen@hotmail.com)) Copy deadline date is the 20<sup>th</sup> of each month.



# *Durham Astronomical Society*

**May Meeting:**

Talk by

**Dr. Richard Stephenson**

Entitled

**"Ancient Astronomy,  
Modern Science"**

**How ancient supernova and eclipse  
records help with modern day astronomy.**

St Oswald's Church Hall, Church Street,  
Durham

Friday 25 May 2007  
starting at 7.30 pm.

Members and Non – members welcome