# TRANSIT

**The Newsletter of**

Cleveland & Darlington Astronomical Society

10 February 2007

Comet McNaught, imaged by John Ollett at the

Wynyard Woodland Park Planetarium

10 January 2007

## Editorial

**Last meeting :** 12 January 2007**,** Members' Night.

Another night of local Society excellence with contributions from :-

Rob Peeling on limb darkening using a fascinating software- IRIS - which slices through an image of the Sun producing pixel related luminosity for temperature analyses along the slice. A thought-provoking talk by Michael Roe on Alien intelligence. A brave and humourous John Crowther who uttered the words "Von Daniken" in the Parish Hall and survived. A very well thought out Powerpoint presentation by Jurgen Schmoll on Light Pollution that may very well influence Tees Valley Council actions on street lighting. Neil Haggath finished off with a very strange terrecentric poem.

**Next meeting :** 9 February ,"The Formation of Stars and Planets"
by Dr. Rene Oudmaijer of Leeds University

**2007 Grubb Parsons Lecture –** 28th February 2007

The 2007 Grubb Parsons Lecture in the Durham University Science Department will be "Touchdown on Titan" by Prof. John Zarnecki. Start at 4.30pm.

## 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 December Transit brought its usual crop of interesting, thought-provoking stuff. The one that jumped out for me was the one entitled "Early Optics". Light has always been a fascinating subject for me. The wave-particle duality I have never really come to terms with, it is so strange and counter-intuitive. How does it decide which to adopt and why? As for the double-slit and interference when there are single photons taking part, the deep philosophy of the quantum world will never be easy.

We astronomers (well, all except the radio boys, like Bob Mullen) depend entirely on glass. Even with modern, solid-state, photon detectors an image is still required – generated by clever chunks of glass. Now I can deal with the old ray-tracing diagrams showing how images are formed and where but imagining waves and photons passing through the glass is beyond my puny brain. So the history of when the ideas developed to make lenses and combine them in telescopes and microscopes has always been an interest.

The Transit article traced the accepted history of the subject, from Venetian crystal early in the Fourteenth Century, to Lipperhay and his telescope and so on. Once again the puzzle was raised as to why it took so long for spectacle lenses to develop into combinations of lenses in scientific instruments.

There is evidence for an even earlier start to the business of spectacles and lenses. A few years ago, I came across a book by Bob Temple called "The Crystal Sun"; I think it was reviewed in New Scientist. His researches show that good quality glass was produced in Roman times. In the book are photographs of glass artefacts, demonstrating the quality of the glass. My wife and I went to the British Museum to have a look at some of the originals and, sure enough, they are wonderful!

Bob Temple also points out that silica and other "clear" crystals were also used for Roman artefacts which clearly demonstrated the refraction of light. Most of the surviving objects are bowls and statuettes and the like. He also found in various museums things which were undoubtedly lenses, with references to spectacles being made in Roman times. If you are at all interested in this subject, I recommend "The Crystal Sun" (ISBN 07 12 67 88 83) to intensify you interest.

For some reason all this technology disappeared for hundreds of years. Or did it? One speculation (is that a pun?) has been that they were kept secret by the upper classes, who wanted to hold on to the secrets. There is even a suggestion that telescopes were indeed developed but again kept as secret "weapons" of war, very useful both on land and on sea. How such a secret could be prevented from leaking out and being developed commercially is not explained.

Nevertheless, it is odd that it took so long from the discovery of refraction to the invention of a telescope. It was almost three centuries from the perfection of spectacle lenses to their combination into what we call instruments. All very strange to our modern way of thinking but maybe indicative of the mind set of early Reformation Times. I keep hoping Alan Chapman will take up the subject and give us an academic historian's study of the whole episode.

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Which also prompts some more thoughts on lenses and cameras and telescopes and astro-photography – brought about by Jurgen's photographs in the December issue. Noticing that the exposures were up to 300 seconds on a digital camera has taught me that digital SLRs now come with a "bulb" facility. My own digital camera can do a manual setting up to 15 seconds at f3.5 with sensitivity ISO 1600, which I thought was fairly good. Another piece in my jig-saw puzzle of how to observe variable stars and another possible expense! Oh, no!

Alex Menarry.

# Comets Hold Life Chemistry clues

By Jonathan Amos
Science reporter, BBC News, San Francisco

The idea that comets delivered the chemical "seeds" for life to the early Earth has been given a big boost.

Scientists studying the tiny grains of material recovered from Comet Wild-2 by Nasa's Stardust mission have found large, complex carbon-rich molecules.

They are of the type that could have been important precursor components of the initial reactions that gave rise to the planet's biochemistry.

The first full analysis of the Wild-2 grains is reported in Science magazine.

"Whatever it took to get life started, the more variety of molecules you had in the mix and the more they looked like the kinds of molecules that life uses now then the easier it should have been," Dr Scott Sandford from Nasa's Ames Research Center told BBC News.

The Stardust spacecraft flew past the 5km-wide icy "mud-ball" known as Comet 81P/Wild-2 in January 2004.

The probe swept up particles fizzing off the object's surface as it passed some 240km (149 miles) from the comet's core, or nucleus. These tiny grains, just a few thousandths of a millimetre in size, were then returned to Earth in a sealed capsule.

## Lab clues

Distributed among the world's leading astro-labs, the specimens are giving researchers a remarkable insight into the conditions that must have existed in the earliest phases of the Solar System when planets and comets were forming.

Dr Sandford led the organics investigation; some 55 researchers in more than 30 institutions. His team sees many delicate, volatile compounds that are quite unlike those familiar in meteorites that have fallen to Earth.

These Wild-2 compounds lack the aromaticity, or carbon ring structures, frequently found in meteorite organics. They are very rich in oxygen and nitrogen, and they probably pre-date the existence of our Solar System.

"It's quite possible that what we're seeing is an organic population of molecules that were made when ices in the dense cloud from which our Solar System formed were irradiated by ultraviolet photons and cosmic rays," Dr Sandford explained.

"That's of interest because we know that in laboratory simulations where we irradiate ice analogues of types we know are out there, these same experiments produce a lot of organic compounds, including amino acids and a class of compounds called amphiphiles which if you put them in water will spontaneously form a membrane so that they make little cellular-like structures."

No-one knows how life originated on the cooling early Earth, but it has become a popular theory that a bombardment of comets may have deposited important chemical units for the initiating reactions.

The Stardust results, also reported here at the American Geophysical Union Fall Meeting, will give support to this idea.

## Hot and cold

They will also allow researchers to "re-tune" the models they use to describe how materials were moved and mixed up in the early Solar System.

The Stardust mineral grains generally show a huge diversity, and, very surprisingly, there are materials incorporated into the samples that must have formed close in to the proto-Sun.

These include calcium-aluminium and magnesium-olivine fragments.

"They form in the hottest possible place in the Solar System, so it's quite stunning to find something like them in a body that came together in the coldest place in the Solar System," said Dr Don Brownlee from the University of Washington and who is the principal investigator, or lead scientist, on Stardust.

"There must have been some way of getting them from the new Sun to the outer fringes of the proto-planetary disc," commented Professor Monica Grady from the UK's Open University.

"There must have been major turbulence and currents and disc-wide mixing, which hadn't really been predicted."

The international team of scientists has used a wide variety of sophisticated laboratory analytical techniques to study the samples. But there is a realisation that technologies improve and some comet samples will be kept back for future study.

Just as with the Moon rocks returned by the Apollo programme, researchers are likely to be working on the Stardust samples for decades.

"The information from Stardust has been a revelation and will continue to be as we couple it with other comet data we get from Nasa's Deep Impact mission and Europe's Rosetta mission, which is coming up in seven years' time," said Professor Grady.

Of interest. in the UK, scientists from the Open University, Imperial College London, the Natural History Museum and the Universities of Kent, Manchester and Glasgow have been involved in the analysis.

# What Really is a Year and a Day?

from Phil Plait of Bad Astronomy

The year, of course, is the time it takes for the Earth to orbit the Sun, right? Well, not exactly. It depends on what you mean by "year", and how you measure it.

Let's take a look at the Earth from a distance. From our imaginary point in space, we look down and see the Earth and the Sun. The Earth is moving, orbiting the Sun. Of course it is, you think to yourself. But how do you measure that? For something to be moving, it has to be moving relative to something else. What can we use as a yardstick against which to measure the Earth's motion?

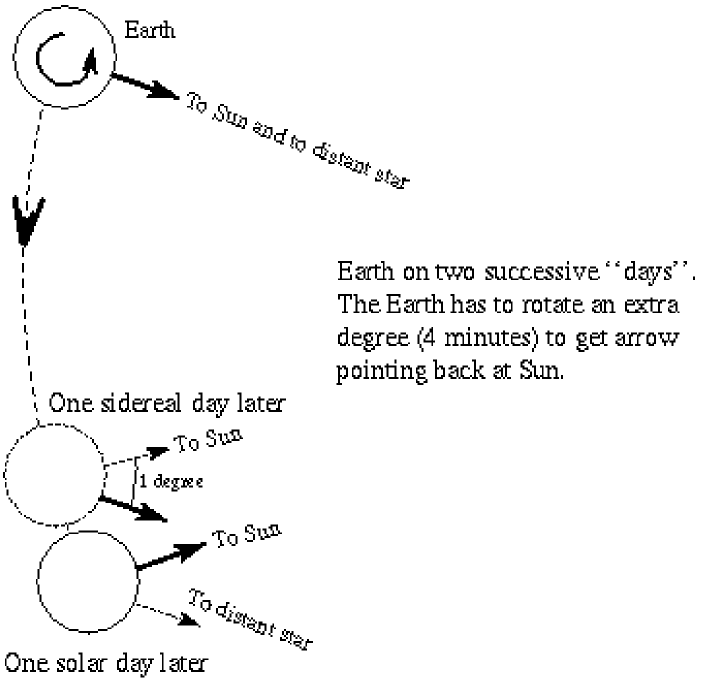
Well, we might notice as we float in space that we are surrounded by zillions of pretty stars. We can use them! So we mark the position of the Earth and Sun using the stars as benchmarks, and then watch and wait. Some time later, the Earth has moved in a big circle and is back to where it started in reference to those stars. That's called a "sidereal year" (*sidus* is the Latin word for star). How long did that take?

Let's say we used a stopwatch to measure the elapsed time. We'll see that it took the Earth 31,558,149 seconds (some people like to approximate that as pi x 10 million (31,415,926) seconds, which is an easy way to be pretty close). But how many days is that?

Well, that's a second complication. A "day" is how long it takes the Earth to rotate once, but we're back to that measurement problem again. But hey, we used the stars once, let's do it again! You stand on the Earth, and define a day as the time it takes for a star to go from directly overhead to directly overhead again: a sidereal day. That takes 23 hours 56 minutes 4 seconds = 86,164 seconds. But wait a second (a sidereal second?) — why isn't that exactly equal to 24 hours?

It's because the 24 hour day is based on the motion of the Sun in the sky, and not the stars. During the course of that almost-but-not-quite 24 hours, the Earth was busily orbiting the Sun, so it moved a little bit of the way around its orbit (about a degree). If you measure the time it takes the Sun to go around the sky once — a solar day — *that* takes 24 hours, or 86,400 seconds. It's longer than a sidereal day because the Earth has moved a bit around the Sun during that day, and it takes a few extra minutes for the Earth to spin a little bit more to "catch up" to the Sun's position in the sky.

Here is a diagram from Nick Strobel's fine site Astronomy Notes that will help explain this:




See how the Earth has to spin a little bit longer to get the Sun in the same part of the sky? That extra 4 minutes (really 3 m 56 s) is the difference between a solar and sidereal day.

OK, so we have a year of 31,558,149 seconds. If we divide that by 86,164 seconds/day we get 366.256 days per year.

Wait, that doesn't sound right. You've always read it's 36**5**.25 days per year, right? But that first number, 366.256, is a year in *sidereal* days. In *solar* days, you divide the seconds in a year by 86,400 to get 365.256 days.

Phew! That number sounds right. But really, *both* numbers are right. It just depends on what unit you use. It's like saying something is 1 inch long, and it's also 2.54 centimetres long. Both are correct.

Having said all that, I have to admit that the 365.25 number this is *not* really correct. It's a cheat. That's really using a *mean* or average solar day. The Sun is not a point source, it's a disk, so you have to measure a solar day using the center of the Sun, correcting for the differences in Earth's motion as it orbits the Sun (because it's not really a circle, it's an ellipse) and and and. In the end, the solar day is really just an average version of the day, because the actual length of the day changes every, um, day.

But back to the year: that year we measured was a sidereal year. It turns out that's not the only way to measure a year.

You could, for example, measure it from the exact moment of the vernal equinox in one year to the next. That's called a tropical year. But why the heck would you want to use *that*? Ah, because of an interesting problem! Here's a hint:

The Earth precesses! That means as it spins, it wobbles very slightly, like a top does as it slows down. The Earth's wobble means the direction the Earth's axis points in the sky changes over time. It makes a big circle, taking over 20,000 years to complete one wobble. Right now, the Earth's axis points pretty close to the star Polaris, but in a few hundred years it'll be noticeably off from Polaris.

Remember too, that our seasons depend on the Earth's tilt. Because of this slow wobble, the tropical year (from season to season) does not precisely match the sidereal year (using stars). The tropical year is a wee bit shorter, 21 minutes or so. If we don't account for this, then every year the seasons come 21 minutes earlier. Eventually we'll have winter in August, and summer in December! That's fine if you're in Australia, but in the northern hemisphere this would cause problems.

So how do you account for it? You adopt the tropical year as your standard year. Done! You have to pick *some* way to measure a year, so why not the one that keeps the seasons more or less where they are now? This means that the apparent times of the rising and setting of stars changes over time, but really, astronomers are the only ones who care about that, and they're a smart bunch. They know how to compensate.

Okay, so where were we? Our standard year (also called a *Gregorian* year) is the tropical year, and it's made up of 365.24 mean solar days, each of which is 86,400 seconds long, pretty much just as you've always been taught. And this way, the vernal equinox always happens on or around March 21 every year.

But there are other "years", too. The Earth orbits the Sun in an ellipse, remember. When it's closest to the Sun we call that perihelion. If you measure the year from perihelion to perihelion (an *anomalistic* year) you get yet a different number! That's because the orientation of the Earth's orbital ellipse changes due to the tugs of gravity from the other planets. It takes about 100,000 years for the ellipse to rotate once relative to the stars! Also, it's not a smooth effect, since the positions of the planets change, sometimes tugging on us harder, sometimes not as hard. The average length of the anomalistic year is 365.26 days, or 31,558,432 seconds. What is that in sidereal days, you may ask? The answer is: Well, do the math yourself.

Let's see, what else? Well, there's a pile of years based on the Moon, too, and the Sun's position relative to it. There are ideal years, using pure math with simplified inputs (like a massless planet with no other planets in the solar system prodding it). There's also the Julian year, which is a defined year of 365.25 days (those would be the 86,400 seconds-long solar days). Astronomers actually use this because it makes it easier to calculate the times between two events separated by many years. I used them in my PhD research because I was watching an object fade away over several years, and it made life a lot easier.

So there you go. As usual, astronomers have taken a simple concept like "years" and turned it into a horrifying nightmare of nerdy details. But really, it's not like we made all this stuff up. The fault literally lies in the stars, and not ourselves.

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*In Oxford the souvenir shops sell a postcard which reads*:

"The more I study, the more I learn,
The more I learn, the more I forget,
The more I forget, the less I know.
So... why study?"

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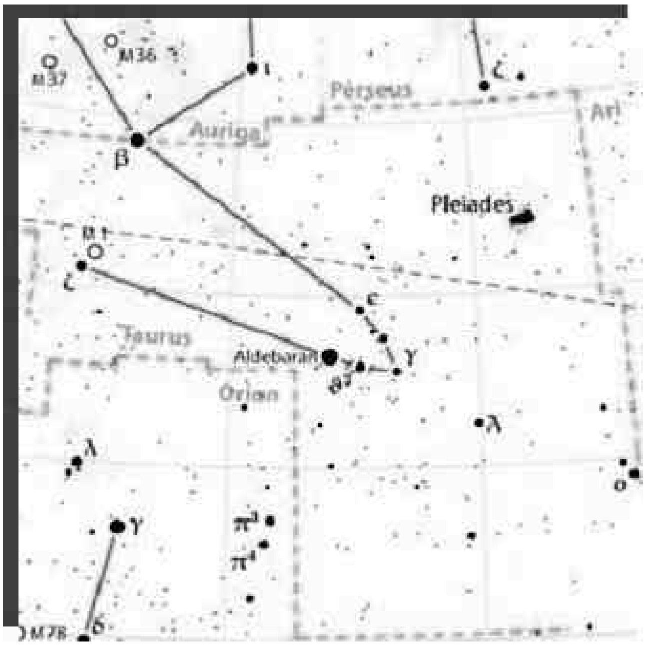
## Constellation Taurus

Permission has been granted to use the original
text from Richard Dibon-Smith's website, www.dibonsmith.com.
(a highly recommended website full of goodies)



The constellation shows mainly the horns, and exceedingly long horns they are. The left (southern) horn starts from the group of stars known as The Hyades, of which Aldebaran seems (erroneously) to be a member. It extends from Aldebaran to zeta Tauri, near the eastern edge of the constellation.

The right horn lifts up just west of the Hyades, from delta Tauri through tau Tauri and finally to its tip at beta Tauri (El Nath: remember this star as part of Auriga?)

The rest of the bull is rather disappointing; a slight body and two spindly legs. It may be that the bull is half-emerged in water, as it carries Europa across to Crete.

### The stars of Taurus:

Taurus' eye is bright and piercing. This is *Aldebaran (alpha Tauri)*, an orange giant about 40 times the size of the Sun. Aldebaran is an old star. For billions of years it has burned its supply of hydrogen until there is little left. Its future won't be as a spectacular explosion of a supernova but rather a gradual dimming into a white dwarf.

Following the lower horn out to its tip we find *zeta Tauri*. This is a shell star. Shell stars are main-sequence stars which rotate rapidly, causing a loss of matter to an ever-expanding shell.

Most of the interesting features of Taurus are found in the centre of the constellation and toward the west. Around Aldebaran are a number of stars which go by the collective name of *The Hyades* (see below).

Aldebaran is not a member of this group. Not only is it closer to us, but its proper motion is at a different angle. Aldebaran is moving at an angle of 161 degrees, the stars of the Hyades at around 102-109 degrees.

### Double stars in Taurus :

Taurus has an abundant selection of binary stars, including many Struve binaries that we haven't mentioned. Below is a very small selection of some of the easier doubles to resolve.

> *Theta*$^2$ and *theta*$^1$ form a fixed binary of wide separation, *theta*$^2$ just below and to the east. Note that *theta*$^2$ is the primary: 3.4, 3.8; PA 346º and separation 337".
> *Kappa*$^1$ and *kappa*$^1$ form an easily resolved binary: 4.2, 5.3; PA 328º, separation 5.3".
> *Sigma*$^2$ and *sigma*$^1$ is another wide fixed binary. And again, *sigma*$^2$ is the primary: 4.8, 5.2; PA 193º and separation 431".
> *80 Tauri* is a difficult visual binary with an orbit of 189.5 years: 5.5, 8.0; current PA 17º and separation of 1.8" (very nearly its maximum separation).
> *Struve 422* is a wide visual binary with an orbit of over 2000 years: 5.9, 8.8; PA 269º, 6.7". It's located at 9º SW of *nu Tauri*, just north of the brighter *10 Tauri*.

## Variable stars in Taurus:

Many of the more notable variable stars in Taurus are of a type not noticed by casual observation, such as *alpha Taurus*, which is classified as an Lb type variable. These are irregular giants whose variation can only be detected by means of photoelectric photometry. *Alpha Taurus* only changes in visual magnitude by 0.2, from 0.75 to 0.95, and the period is irregular.

> *BU Tauri (Pleione)* is a gammaCas type variable, from 4.77 to 5.50. GammaCas variables are also characterised by an irregular period, which may sometimes be very rapid. These are B stars, quite young, and rotate very rapidly. This rotation results in the throwing off of material, which then forms a shell around the star. The cause of its variation is still not understood.
>
> *Zeta Tauri* is also a gammaCas type variable, with a variation from 2.88 down to 3.17 roughly every 133 days.
>
> *Lambda Tauri*, in the Hyades cluster, is a good example of an eclipsing variable. The variability is caused by the partial eclipse of the primary by its companion, dimming the 3.3 visual magnitude down to 3.8 every 3.95 days.
>
> *R Tauri* is a Mira-type variable with a 320.9 day period. Usually at 7.6, it drops to a very dim 15.8 once a year. In 2000 the maximum should occur in the first week of May.

## Deep Sky Objects in Taurus:

Taurus contains two well known Messier objects: the Crab Nebula and the Pleiades. Besides these two there is the `other' cluster, known as The Hyades, and the curious "Hind's Variable Nebula".

Just northwest of zeta Tauri is the first of Messier's objects: M1, the *Crab Nebula*. Early observers thought the object to be a star cluster, something like a dimmer version of the Great Orion Nebula. Messier was so intrigued by it, on the night of 12 September, 1758, that he began his catalogue - the purpose of which was to keep observers from mistaking such objects for comets.

It takes a rather large telescope to see any of the filamentary features of the nebula; most viewers come away disappointed.

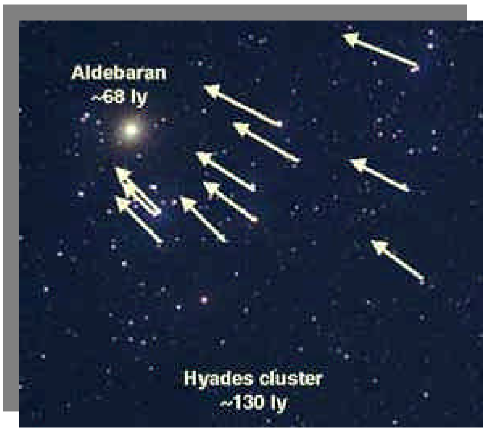
The Crab Nebula is a remnant of a supernova, whose explosion occurred (or rather, was visibly recorded) in July of 1054. Chinese and Japanese astronomers witnessed the event. In fact, it would have been difficult not to notice, for the night sky would have been lit up by a star with the visual magnitude of about -5, bright enough to be seen even in the daytime for nearly a month.

The star that exploded, producing the nebula, is now an optical pulsar. Even now, nearly a thousand years later, the nebula is hurtling through space at roughly a thousand kilometers per second. And it continues to grow; the nebula is now over thirteen light years in diameter (four parsecs) according to the *Facts On File Dictionary of Astronomy*.

### M45, The Pleiades.


This open cluster contains as many as three thousand stars. The brightest seven go under the name The Seven Sisters" (from brighter to dimmer): Alcyone (eta Tauri), Electra, Maia, Merope, Taygeta, Celaeno, and Asterope. Added to the list are also Pleione (BU Tauri = 28 Tauri), just east of Alcyone, and Atlas (27 Tauri) who are actually Mum and Dad for the seven sisters. (The two are often seen as one star; it takes a clear night to see them as two separate stars.)

### The Hyades




This open cluster of about two hundred stars is only 150 light years away, and considered to be about 600 million years old. It is shaped like a "V", just to the west of Aldebaran. The proper motions of all the Hyades stars are observed as co-moving as an independent group and moving parallel towards Aldeberan as shown on the image.

Just as the Pleiades have individual names, so did the Hyades at one time. In fact, these stars were supposed to be the half-sisters of the Pleiades, and Robert Burnham (*Celestial Handbook*) gives their names - and a great deal more on this group. Theta$^2$ is the brightest star of the group, which forms a binary with theta$^1$ (see below). The group is thought to be about 400 million years old.

These nine stars, then, constitute the minimum count, easily seen with the naked eye, while there are actually as many as 250 stars which belong to the group.

The cluster is estimated to be 415 light years away. Even a small telescope brings this famous star cluster alive.

### *Hind's Variable Nebula (NGC 1555)*

This curious deep sky object is located two degrees west of epsilon Tauri, and two degrees north of delta Tauri. First look for the rather dim variable T Tauri. Burnham (*Celestial Handbook*) has a finder's chart, on page 1833. The star has an irregular variability, from 9 to 13.

Very close to T Tauri, just off to the west, is a cloud-like object. This is Hind's Variable Nebula. Its variability is long-lasting; from 1869 to 1890 it couldn't be found at all. Presently, it seems to be gaining slightly in visual magnitude, although its actual visual magnitude hasn't been determined.

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With their radio telescopes radio astronomers can capture wisps of radiation so preposterously faint that the *total* amount of energy collected from outside the solar system by all of them together since collecting began (1951) is "less than the energy of a single snowflake striking the ground"
*The words of Carl Sagan, (from Bill Bryson's book – "A Short History of Nearly Everything")*

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- Particle physicists tend to favour WIMPs - (**W**eakly **I**nteracting **M**assive **P**articles).
- Astrophysicists tend to favour the stellar explanation of MACHOs - (**M**assive **C**ompact **H**alo **O**bjects).
- Bill Bryson tends to favour DUNNOS – (**D**ark **U**nknown **N**onreflective **N**ondetectable **O**bjects **S**omewhere).

*Bill Bryson on the subject of, as yet, unknown dark matter.*

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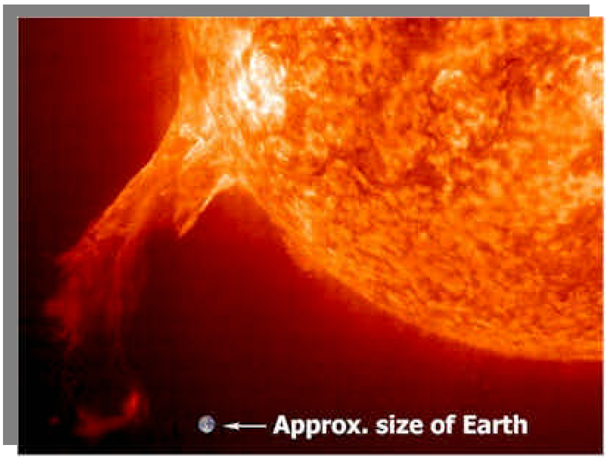
On discoveries – It is remarkable how often the first interpretations of new evidence in a discovery have confirmed the preconceptions of the discoverer.

*John Reader,*

# Scientists Predict Big Solar Cycle

from NASA

Evidence is mounting : the next solar cycle is going to be a big one.



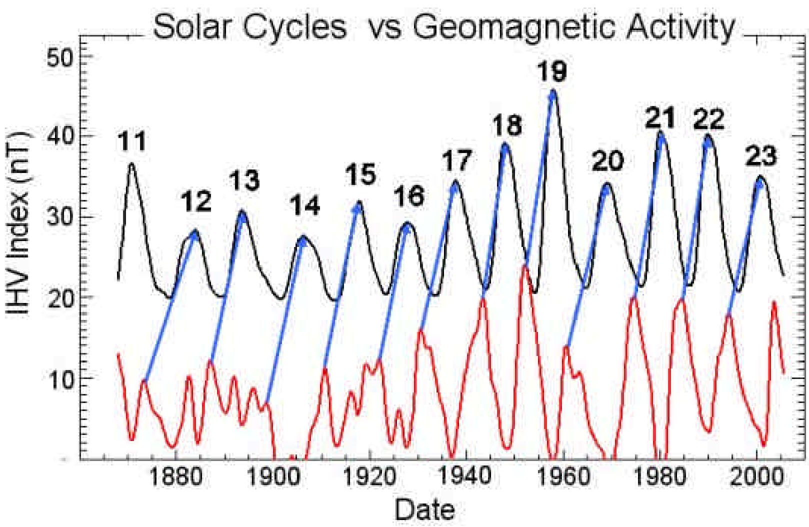

**Left:** An erupting solar prominence photographed by the Solar and Heliospheric Observatory (SOHO).

Solar cycle 24, due to peak in 2010 or 2011 "looks like its going to be one of the most intense cycles since record-keeping began almost 400 years ago," says solar physicist David Hathaway of the Marshall Space Flight Center. He and colleague Robert Wilson presented this conclusion last week at the American Geophysical Union meeting in San Francisco.

Their forecast is based on historical records of geomagnetic storms.

Hathaway explains: "When a gust of solar wind hits Earth's magnetic field, the impact causes the magnetic field to shake. If it shakes hard enough, we call it a geomagnetic storm." In the extreme, these storms cause power outages and make compass needles swing in the wrong direction. Auroras are a beautiful side-effect.

Hathaway and Wilson looked at records of geomagnetic activity stretching back almost 150 years and noticed something useful:. "The amount of geomagnetic activity now tells us what the solar cycle is going to be like 6 to 8 years in the future," says Hathaway. A picture is worth a thousand words:



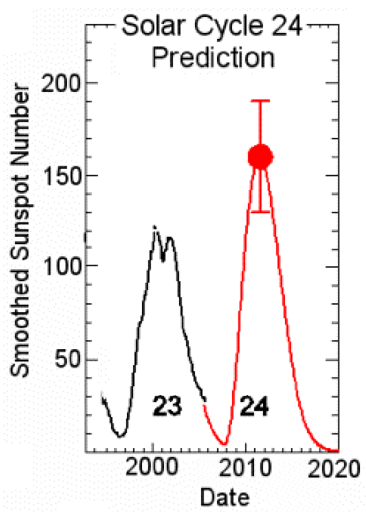

**Above:** Peaks in geomagnetic activity (red) foretell solar maxima (black) more than six years in advance.

In the plot, above, black curves are solar cycles; the amplitude is the sunspot number. Red curves are geomagnetic indices, specifically the Inter-hour Variability Index or IHV. "These indices are derived from magnetometer data recorded at two points on opposite sides of Earth: one in England and another in Australia. IHV data have been taken every day since 1868," says Hathaway.

Cross correlating sunspot number vs. IHV, they found that the IHV predicts the amplitude of the solar cycle 6-plus years in advance with a 94% correlation coefficient.

"We don't know why this works," says Hathaway. The underlying physics is a mystery. "But it does work."

According to their analysis, the next Solar Maximum should peak around 2010 with a sunspot number of 160 plus or minus 25. This would make it one of the strongest solar cycles of the past fifty years—which is to say, one of the strongest in recorded history.




**left:** Hathaway and Wilson's prediction for the amplitude of Solar Cycle 24.

Astronomers have been counting sunspots since the days of Galileo, watching solar activity rise and fall every 11 years. Curiously, four of the five biggest cycles on record have come in the past 50 years. "Cycle 24 should fit right into that pattern," says Hathaway.

These results are just the latest signs pointing to a big Cycle 24. Most compelling of all, believes Hathaway, is the work of Mausumi Dikpati and colleagues at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado. "They have combined observations of the sun's 'Great Conveyor Belt' with a sophisticated computer model of the sun's inner dynamo to produce a physics-based prediction of the next solar cycle." In short, it's going to be intense.

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## Why Earth is Closest to Sun in Dead of Winter

By Mary Lou Whitehorne

It's winter in the Northern Hemisphere and we're at our closest point to the Sun. Closest? Yes, you read that right. Closest. For northerners, the winter solstice has just passed. But the truth is, on January 3, 2007, Earth reaches perihelion, its closest point to the Sun in its yearly orbit around our star.

At first glance, it makes no sense. If Earth is closest to the Sun in January, shouldn't it be summer? Maybe, if you live in the Southern Hemisphere. So what does this mean?

Earth's orbit is not a perfect circle. It is elliptical, or slightly oval-shaped. This means there is one point in the orbit where Earth is closest to the Sun, and another where Earth is farthest from the Sun. The closest point occurs in early January, and the far point happens in early July (July 7, 2007). If this is the mechanism that causes seasons, it makes some sense for the Southern Hemisphere. But, as an explanation for the Northern Hemisphere, it fails miserably.

In fact, Earth's elliptical orbit has nothing to do with seasons. The reason for seasons was explained in last month's column, and it has to do with the tilt of Earth's axis. But our non-circular orbit does have an observable effect. It produces, in concert with our tilted axis, the analemma.

If you plot the noontime position of the Sun in the sky over a one-year period, it produces a figure-eight shape on the sky (Figure A). This is the analemma. You may have seen it drawn on a globe of Earth. The shape results from the combination of two things: the 23.5° tilt of Earth on its spin axis, and the elliptical shape of Earth's orbit around the Sun.

**Figure A.** The noontime position of the Sun in the sky, plotted over a year, produces a figure eight-shaped curve known as the analemma. Earth's elliptical orbit produces the curve of the analemma. Its lowest and highest points are, respectively, the winter and summer solstices. The vertical line running through the analemma is the meridian. This view shows the Sun at noon on 4 January 2007, the day of perihelion – Earth's closest approach to the Sun.

The highest point on the analemma is the Sun's noon position on the summer solstice. The lowest point marks the winter solstice. The difference in the Sun's noontime height in the sky is caused by Earth's tilted axis. What about the left-to-right variation in the analemma's curve?

That's where our elliptical orbit comes in! Look at Figure A again. Notice the vertical line running up from the south point on the horizon? That's the meridian. The meridian runs straight up and over the sky, from due north to due south.

If Earth's orbit was a perfect circle, the Sun would cross the meridian at noon every day (ignoring daylight savings time). But our orbit is slightly oval-shaped. In July, we are at our furthest point from the Sun, and Earth moves slower than average along its path. In January, we are closer to the Sun, and Earth speeds up a bit in its orbital progress. The result of this change in speed means the Sun crosses the meridian a little early, or a little late, depending on where Earth is in its orbit. For all points along the curve to the left of the meridian, the Sun is "slow." It crosses the meridian after 12:00 p.m. For all points along the curve to the right of the meridian, the sun is "fast," crossing the meridian slightly before noon.

Astronomers call this the equation of time. It is marked on many sundials. The equation of time is defined as the difference between true solar time (determined by the Sun's position in the sky) and mean solar time (the time told by your watch). The two times can vary by as much as 16 minutes over the course of a year.

Earth reaches perihelion on January 3, 2007. The Earth-Sun distance will be 147,093,602 km. Aphelion, the greatest distance from the Sun, occurs on July 7, 2007, when the Earth-Sun distance will be 152,097,053 km.

The difference between the two is 5,003,451 km, (3.3 percent), and not enough to cause the seasons. Even though, at this time of year, we're as close to the Sun as we can get, for the Northern Hemisphere, it will always be winter.

## Skywatcher's Almanac: Celestial Highlights in 2007

from Joe Rao, Space.com

This astronomical almanac of sorts can serve as a planning guide. Specific events will be discussed in greater detail just prior to their occurrences.

### THE PLANETS

**Mercury** will have two very good evening apparitions for Northern Hemisphere observers in 2007. The better of the two comes during late January into the first half of February when Mercury will be evident as a bright yellowish-orange “star” low in the west-southwest sky, to the lower right of brilliant Venus. Mercury will arrive at its greatest elongation, 18-degrees to the east of the Sun on Feb. 9. The other good evening apparition comes during the last half of May into the first week of June, when it will shine low in the west-northwest from one and a half to 2 hours after sundown.

For early risers, Mercury will put on an excellent showing through much of November, being readily visible in the east-southeast sky for up to 90 minutes before sunrise. In fact, from Nov. 5 through the 12th, Mercury will rise in a completely dark sky before the start of morning twilight.

A moderately good morning apparition of Mercury stretches from mid July into the opening days of August, with this rocky little world glowing through the midsummer dawn twilight near to the east-northeast horizon up to 90 minutes before sunrise.

**Venus** will have a spectacular 2007. It will be a brilliant evening object from now through the start of August, dominating the western evening sky. It will then transition into the morning sky, becoming a very prominent object in the eastern sky from the final days of August on through the balance of the year.

**Mars** is currently a morning object, teamed with Jupiter and the bright red star Antares, but from now through the end of April it will be rising only minutes before the start of morning twilight. It’s rather unimpressive during this interval, but beginning in May it starts a very slow climb up into the eastern sky and gradually brightens as it approaches the Earth. Toward the end of August it’s rising around midnight (local daylight time). By the start of October it will shine as bright as a zero-magnitude star and by the second week of December, it will have swelled in brilliance to rival even Sirius, the brightest of all the stars. Mars is nearest to Earth on December 18th at a distance of 54.8 million miles (88.2 million kilometers) and is at opposition on Christmas Eve when it rises near sunset, peaks high in the south about midnight and sets near sunrise.

**Jupiter** starts 2007 in the morning sky, rising in the east-southeast around 4:30 a.m. It rises about four minutes earlier each day, however, so it ever-so-gradually will begin to appear at more convenient hours: rising around midnight (local daylight time) by mid April and around the end of evening twilight by mid May. It will arrive at opposition on June 5, and then will be a prominent evening object for the rest of the year. Unfortunately, it will spend much of the year in the Scorpius-Ophiuchus region of the sky, not far from the ruddy star Antares, which means it will not get very high up for those living north of latitude 45-degrees north.

**Saturn** will be in prime position for evening viewing during the winter and early spring months, sedately shining like a very bright, but not dazzling, yellowish-white zero-magnitude "star" in Leo, the Lion. By mid-April it is already past the meridian as darkness falls, and during July it gradually becomes swallowed up by the evening twilight glow. It reappears in the eastern morning sky by mid-September. Brilliant Venus pays Saturn a visit twice in 2007, the first in the July evening sky and the second in the October morning sky. The famous ring system is visible in small telescopes magnifying 30-power or more, but their inclination toward Earth diminishes quite noticeably, especially later in the year.

## METEOR SHOWERS

The peak of the annual performance of the famous Perseid Meteor Shower very nearly coincides with a New Moon late on the night of Aug. 12-13, which will make for excellent observing conditions for viewing meteors at rates of 50 to 100 per hour.

Astronomer Peter Jenniskens at NASA/Ames Research Center is predicting an outburst of bright meteors on the morning of Sept. 1, for those living in western North America . Unfortunately, a bright gibbous Moon will be in the sky, but hourly rates might possibly be in the tens to hundreds.

The December Geminids—which many now consider to be the best display of the year—occurs in 2007 when the Moon is a waxing crescent and sets early in the evening, meaning excellent viewing conditions for the nights of Dec. 13 and 14, when 60 to 120 meteors per hour may be seen.

## ECLIPSES

There will be two total lunar eclipses in 2007. The first is on March 3rd. Europe and Africa are in prime position to see it, though parts of eastern and central North

America will get a view of it as the Moon rises that evening. The other total eclipse comes on Aug. 28, and will favor the Pacific Rim. Western and central North America will be able to see it much of it just prior to moonset; eastern North America's view will be interrupted by the setting Monn

A partial eclipse of the Sun occurs on March 19th for eastern Asia; from parts of Alaska, the opening stages of this eclipse might be glimpsed just before sunset on the evening of the 18th. On Sept. 11 another partial solar eclipse will take place, this time over southern South America and Antarctica.

# OBSERVING OS 525 (LYRAE)

from Mike Gregory

One late summer evening in 2003 Dave Blenkinsop, John Faddian, Steve Sawdon and myself, yes, the usual suspects, were observing at Wynyard Woodland Park when we came across a wide, rather nondescript double known as OS 525 (Otto Struve 525) in the constellation of the Lyre (or Lyrae). Little did I know I was setting off on a personal odyssey!

OS 525 (simply 525 from now on) is situated almost a full degree north of M57, the Ring Nebula, and at first glance consists of a yellow primary with a very wide blue companion. However, this apparent companion, known individually as South-Herschel 282, has no connection with the primary star. The yellow primary is some 1,200 light years away and the blue component considerably nearer at 900 light years away from Earth. There is another even wider and much dimmer component that seems as though it might share the primary's parallax. However, there appears to have been no professional measurement of this last star since 1910.

For some unknown reason I thought there was mention of 525 in the text pages of Burnham's Celestial Handbook, but this was incorrect. However, Burnham does mention it in the lists of multiple stars as having a relatively close companion that apparently (might) share an identical though minute common proper motion. Magnitudes and separation for this close pair are 6.0 + 10.2 and 1.7" though the magnitude for the dim companion tends to vary between catalogues. Some quote a full magnitude or more brighter (9.2). According to the Washington Double Star Catalogue, the shared proper motion of the pair is 6 mas/yr (milli-arc-seconds per year) east in Right Ascension and 4 mas/yr south in Declination. However, to confuse the issue somewhat, Redshift 5.1 suggests the pair do not share common proper motion though the figures quoted are so close to the WDS figures to make little difference. Perhaps the close pair is gravitationally bound though it might be thousands of years before the beginnings of an orbit can be discerned.

I decided to put all the statistics into the Lord Nomogram and see if 525 would be a viable target for my 102mm refractor! The Lord Nomogram is the brainchild of Christopher Lord of Cambridge and allows you to ascertain if two close stars of unequal magnitude could be separated in a telescope of given aperture. Sorry if that is not clear but at least I think I know what I mean!

For my 102mm refractor the answer was "yes but just, given that the seeing is exceptional". Well, zero chance of that in the north east of England outside of the Rev. Thomas Espinall Espin's Tow Law skies of a century ago! Nevertheless, I thought I would have a try.

I was disheartened to find that I could see no sign of the close companion from Wynyard Woodland Park in telescopes as diverse as a 200mm Meade LX90/200 hybrid and a 250mm Dobsonian, especially as the latter had a light grasp more than six times that of my refractor.

Worse was in store for me when I aimed my refractor at 525 from my rear garden. Conditions were usually so poor that any powers much over 60 times always overpowered the conditions. Even a late night solo trip onto the moors above Kildale proved pointless. Not long after midnight the almost full Moon suddenly appeared. A beautiful night nonetheless – shirt sleeves in late September.

So back to observing from my garden and still zero success. After a few fruitless attempts I did not quite give up but certainly put 525 on hold!

On the evening of October 7th 2003, I set my refractor up in the garden to have a try for a few 'new to me' doubles in Cassiopeia, the seeing conditions at best being marginal. However, the almost vertical viewing position produced a plethora of physical aches and I was soon reduced to looking for less muscular stress-inducing targets. As conditions looked to be better in the northwest, I aimed for the base of Lyrae. Incredibly, 525 could just be glimpsed with the naked eye and, even at 60 times magnification; there was the tiny, close companion with a thin sliver of blackness separating the pair. However, when I doubled the magnification with a two times Barlow, the dim companion simply disappeared! A case, perhaps, of over-powering the conditions and at that time I did not have a suitable eyepiece to split the difference. So I decided to lay siege to 525!

I altered the height of the tripod so that I could sit comfortably at the eyepiece and found a piece of old curtain to cut out any local lighting. Then seated comfortably, I removed my spectacles and refocused to suit. Finally I adjusted the Right Ascension slow motion so that the target was momentarily out of the field of view. Then I sat quietly and allowed the target to drift back into sight. After doing this several times the dim companion became very clear and was positioned exactly where the guide catalogues say it should be. So some success on a night when conditions could not be termed ideal!

One rule I keep about my 'Observing Record' is that no star is entered until it has been split on two separate occasions with my own refractor. Hence 525 would not be included until the close secondary was clearly seen separated from the primary again. Despite many determined efforts in the last thirty-nine months, no real successes. On occasions I have seen the secondary but not clearly separated!

September 8th 2004 was a beautifully clear evening even from the garden so I loaded the car and drove out to near Windy Hill adjacent to the very minor road from Hutton Rudby to Seamer, having the refractor set up with all its ancillaries by twenty past midnight on the 9th. The sky looked magnificent and I thought I would practise on a few relatively easy doubles first such as Arrakis near the head of Draco. I was in for a rude shock. It was split but just. I knew 525 was a no-go target once again though I did have a tentative look. And ever the eternal optimist, I also had a look at 78 Ursa Majoris, a true binary star that will be an even tougher test than 525. According to the Pittsburgh Amateur Astronomers, 78 Ursa Majoris is one of the most impressive binary stars in the northern hemisphere though they needed their equally impressive 275mm refractor to see it. Others across the pond claim to have split it with lesser instruments. Hopefully a challenge for the future!

As a little aside to this visit to Windy Hill, I noticed that the Moon was rising so I decided to wait awhile but it rose behind the only tree in sight. Typical I suppose. However, not one car passed along that road during the two hours I was there, but then it was almost three in the morning when I left!

One October evening in 2005 I tried to cheat by using the society's 200mm Meade reflector at Wynyard Woodland Park but conditions were so poor that I could not even find my target.

For my 64th birthday I treated myself to Redshift 5.1 but this immediately produced consternation with regard to 525. This programme suggests that the faint companion is almost 180 degrees opposite the position I saw it in. So either Redshift is wrong or I must have imagined what I saw on October 7th 2003. I think I am correct as I found my old drawing instruments and laid the angles out on a sheet of paper. The pair came out exactly as I saw then that October evening.

Through much of the last summer I observed 525 when weather and my health allowed but I could not see any sign of the dim companion in any position. On the evening of September 21st Dave Blenkinsop, Steve Sawdon, and myself met at Wynyard but I had to leave early due to muscular aches. Back at Acklam it looked quite clear so I observed with my refractor for ninety minutes. Neat views of the close binary, S 3050, augured well for a try at 525 but Lyrae was by then sinking into the northwest and was in haze.

It rained for most of the following day but then miraculously cleared at 22.00 hours so I set my refractor up at home. The net result was dewed optics!

I also tried on the night of Monday, October 9th. It was a beautiful sunset so I met Dave Blenkinsop and Colin Granger at Wynyard Woodland Park, though as I had just had a medical appointment, my knees ached and I soon had to retire. When I arrived home the region around Vega looked clear though by the time I was ready to observe, no Vega. But I persevered in Andromedae and Pegasus until aches once more stopped proceedings. I then retired indoors to a late supper of oven chips but fell asleep in a chair and did not wake until six on Tuesday morning. Perhaps the chips were a bit overcooked but I ate them all the same.

Though I did not realise it then, my last observing session with my own refractor this side of quite a long, long time.

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## Andromeda Galaxy Five Time Bigger Than Thought

from Ker Than

The discovery of several large, metal-poor stars located far from the centre of the Andromeda galaxy suggests our nearest galactic neighbor might be up to five times larger than previously thought.

The newfound stars are massive, bloated stars known as red giants. Although found far beyond the most visible portion of Andromeda—its swirling disk—the stars are still gravitationally bound to the galaxy and make up part of its extended "halo."

"We're typically used to thinking of Andromeda as this tiny speck of light, but the actual size of the halo…extends to a very large radius and it actually fills a substantial portion of the night sky," said study team member Jason Kalirai of the University of California, Santa Cruz.

The finding suggests Andromeda is at least one million light-years across and could help settle a discrepancy between Andromeda and the Milky Way that has long puzzled astronomers.

### Andromeda

Also known as M31, Andromeda is located only about 2.5 million light-years from Earth, making it our nearest galactic neighbor.

Like our own Milky Way, Andromeda is a classic spiral galaxy, which typically consists of three main parts: a flattened disk, a bright central bulge of densely packed stars and an extended spherical halo where stars are more sparsely distributed.

Using the Mayall Telescope at Kitt Peak and the DEIMOS spectrograph on the the Keck II Telescope in Hawaii, the researchers found previously unseen red giant stars out to a distance of at least 500,000 light years from Andromeda's center.

The researchers picked out Andromeda's faint halo stars using a technique developed by Karoline Gilbert, a UCSC graduate student, which distinguishes the halo stars from the more numerous foreground stars in our Milky Way.

A dim foreground star and a bright star located much farther away—whose light can be diminished by interstellar gas—can be hard to tell apart because they appear to have similar luminosities as stars in our own galaxy. The researchers liken the effect to distinguishing between the light of a firefly 10 feet away and that of a powerful beacon in the distance.

"In this case, the fireflies are dwarf stars in our own galaxy and the beacons are the red giant stars in Andromeda," said study team member Puraga Guhathakurta, also from UCSC.

### Metal-poor halos

According to current galactic formation theories, the halo is the first part of a galaxy that forms. Stars in the halo are predicted to be metal poor because they formed during a time when the universe had much less heavy metal content than it does now. Heavy metals are created as stars evolve and then spewed out into interstellar space when ancient stars either explode as supernovas or shed their outer layers to become white dwarfs.

"The first stars are expected to be chemically deficient, and as these other components such as the disk of the galaxy form later, it is contaminated by the products of those first stars, so those stars are more metal rich," Kalirai said.

However, instead of being metal-poor, previous studies have found that Andromeda's halo stars were actually 10 times richer in metals than halo stars in our galaxy. This finding puzzled astronomers because both Andromeda and the Milky Way should have similar formation histories.

The new findings could solve this discrepancy because the red giant stars are anemic, as is expected from galaxy formation theories and what is known about the Milky Way.

"If you plot the metalicity as a function of radius, you see a very nice trend where the inner parts of the galaxy are metal rich, and the outer parts of the galaxy are dominated by stars that are metal-poor," Kalirai said.

"We now believe that previous groups have been mistakenly identifying the outer parts of the Andromeda bulge as its halo," Guhathakurta said.

Paul Hodge, an expert on the Andromeda galaxy from Washington University who was not involved in the study, said the new finding paints a very different picture of our galactic neighbor than was available only a few years ago. "It's a new galaxy," Hodge said. "The outer parts of this galaxy are finally being revealed and its turning out to be much more interesting and beautiful than when could have imagined."

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## Comet McNaught (C/2006 P1)

from Bob Mullen, with material also from Joe Rau of Space.com

Comet McNaught was the brightest comet to appear in our skies in more than 30 years, producing a spectacular show in the eastern sky at dawn and the western sky at dusk in early January.

The Internet was flooded with a considerable number of images and some of our own Society members sent in their own images, some of them extremely attractive in an arty sort of way.

**above** : from the Gargett twins,

taken with a Canon D10 300mm

lens 1sec.exposure 800 ISO.

The comet was also a source of frustration for many skywatchers, because of its very low altitude. More often than not, the comet was hidden either by clouds near the horizon, or nearby trees or buildings.

The comet was discovered by astronomer Robert H. McNaught Aug. 7 at Siding Spring Observatory, near Coonabarabran, New South Wales, Australia. McNaught discovered this comet when it was a few degrees east of the "head" of Scorpius, on CCD images obtained with the observatory's Uppsala Schmidt telescope. The images had been obtained as part of the Siding Spring Survey, whose mission is to contribute to the inventory of potentially hazardous asteroids (PHAs) and comets (PHOs) that may pose a threat of impact and thus harm to civilization.

McNaught described the comet—the 31st to bear his name—as magnitude 17.3, or about 25,000 times dimmer than the faintest object that human eyes can perceive without any optical aid.

When Brian Marsden at the Smithsonian Observatory in Cambridge, Massachusetts first calculated the orbit of Comet McNaught (now catalogued as C/2006 P1) on Aug. 8, it was based on only a handful of observations. As a result, this first computation suggested that the comet would come closest to the Sun (called "perihelion") in June 2007, and then not get much closer than about 145 million miles (233 million kilometers), or about the distance of the planet Mars.

As more observations of the comet arrived, however, Marsden refined its orbit, and on Aug. 11, he announced that it was likely to pass well within the Earth's orbit—a distance of just 15.9 million miles (25.6 million kilometers). That's well within the orbit of Mercury. This would make the comet much brighter than most, but as a caveat, also potentially hide it in the Sun's glare.

### McNaught blossoms

From August into early November the comet steadily increased in brightness, but not enough to prevent it becoming lost in the evening twilight by mid-November.

Although still brightening, it appeared that the comet could be totally lost from view until it reappeared for Southern Hemisphere observers in the evening twilight skies late in January. In addition, there was the opinion of several respected amateur and professional astronomers that the comet would completely disintegrate around the time of perihelion.

The comet went unobserved for nearly six weeks but was successfully recovered in the twilight toward the end of December.

The comet continued to grow impressively in brightness. Just after the start of the New Year it was becoming clear that Comet McNaught would conceivably be a dazzling object when closest to the Sun in mid-January

Observers around the Northern Hemisphere reported the comet shining as brightly as magnitude -3.0 [images], or more than four times brighter than Sirius, the brightest star in the sky.

This places Comet McNaught near the top of the list of the brightest comets that have appeared since 1935.

### Dusty farewell

Due to the proliferation of dust in the comet, it was anticipated that there would be a brightness enhancement caused by the comet being located between us and the Sun. This brightening, called "forward scatter," increased the brightness of the comet by as much as two magnitudes, so an impressive—albeit short-lived—surge in brightness resulted from January 12-14.

There was also still the possibility—albeit small—that the comet would split apart or fragment into several pieces as it approached the Sun. Such a scenario would have made Comet McNaught appear substantially brighter.

This fragmentation did not occur.

Because it appeared to move rapidly southward after perihelion, Comet McNaught quickly passed out of sight for viewers in the Northern Hemisphere, and ultimately emerged into the evening sky for observers south of the equator during the second half of January.

Unfortunately, the comet is expected to fade quickly as it recedes from both the Sun and Earth.

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We live in a universe whose age we can't quite compute, surrounded by stars whose distances we don't altogether know, filled with matter we can't identify, operating in conformance with physical laws whose properties we truly don't understand.

*- Bill Bryson, "*A Short History of Nearly Everything*" – a brilliant book.*

The meek shall inherit the Earth. And the rest of us will go to the stars.

*- Omni Magazine*

The earth is simply too small and fragile a basket for the human race to keep all its eggs in.

- *Arthur C. Clarke*

# Doom for Hubble's Iconic pillars

by Paul Rincon, BBC News


The three iconic columns of gas and dust pictured in space by the Hubble Telescope in 1995 may have met their end, the US space agency says.

Hubble's image, dubbed the "pillars of creation", has featured in countless papers, magazines and posters.

Now, new data shows the pillars being scorched by an exploding star - and a shockwave has probably torn them apart.

But because of the time taken for light to reach Earth, we will not see their final destruction for 1,000 years.

"In the Hubble pictures, the pillars seem to be compact and solid; but in fact they are not," said Nicolas Flagey, from France's Institut d'Astrophysique Spatiale.

"Only the top of the pillars and some parts within are dense enough to resist the shock. But the rest is going to be blown away by the shockwave," he told BBC News.

## Hubble inspiration

The pillars are actually dark columns of cool interstellar hydrogen gas and dust that serve as incubators for new stars.

They are part of the Eagle Nebula (also called M16), a star-forming region 6,500 light-years from Earth in the constellation Serpens.

Mr Flagey, a PhD student who helped make the latest discovery, presented his findings here at a meeting of the American Astronomical Society.

He says he was inspired to study astrophysics after seeing Hubble's image of the pillars on the cover of a French magazine more than a decade ago.

So he was surprised to be offered the chance to work on the Eagle Nebula during a six-month attachment to the Spitzer Science Center in California.

The centre operates Nasa's Spitzer Space Telescope, which took new infrared pictures of a shell-shaped cloud of hot dust close to the pillars. The shell is being heated by an exploding star.

Using the telescope data, Dr Flagey and colleagues were able to measure the temperature of the dust and match it to a supernova (exploding star) event.

## Back in time

"Something else besides starlight is heating this dust," said Dr Alberto Noriega-Crespo, Dr Flagey's advisor at the Spitzer Science Center.

Astronomers had long predicted that a supernova blast would spell the end for the popular pillars.

"We know that there are some massive stars inside the Eagle Nebula. The fate of these stars is to explode as supernovas," Dr Flagey told BBC News.

"So it was not completely unexpected that one of these has already exploded and has produced the shockwave that is heating the gas and dust."

The star is thought to have exploded around 8,000-9,000 years ago.

Since light from the Eagle Nebula takes 7,000 years to reach us, the stellar explosion would have appeared as an oddly bright star in our skies about 1,000 to 2,000 years ago.

The astronomers estimate that the blast would have spread outward and toppled the three pillars around 6,000 years ago. This means that we will not be able to see the destruction for another 1,000 years.

When the mighty pillars are seen to crumble, gas and dust will be blown away, exposing newborn stars forming inside. A new generation of stars might spring up from the dusty wreckage.

Despite being inspired to pursue his current career by Hubble's iconic picture of the structures, Dr Flagey said he was not disappointed to discover that they are - in all likelihood - already gone.

"I will not be here to see it destroyed," he said, "there are plenty of other regions like this. So I'm not sad."

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## Transit Tailpieces

Transit Adverts : If you wish to let members know what you want to sell or what you are looking for, please send an advert for the magazine.

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CaDAS Website : Don't forget to visit our very own website at www.**wynyard-planetarium**.net.

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

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Keith Johnson : 07 January
Mintron 12V1-EX CCD video
camera using a 75mm C-mount type
video camera lens and a 450mm
Pentax M42 type thread camera lens.

Ed Restall. : 10 Jan. Meade 10"
SCT (LX200) using a Meade 3.3
focal reducer

Rod Cuff : Birk Brow : 10 Jan
Olympus C-4000 camera at
3X zoom

Rod Cuff : Birk Brow : 10 Jan
Olympus C-4000 camera
through an Opticron birding
scope at 16x

**Society portfolio of Comet McNaught**