Society News

From the Chairman

At the observatory on Thursday evenings, we have been making use of the society's new toy – the Celestron Sky Scout.

Personally, I think it is great. You can point it at a star or a fuzzy blob, and not only will it tell you what you are looking at, but it can give you reams of data about it, from the origin of its name (or the constellation name), to how far away and how large it is. You can also use it to find a specific object. For example, you can tell it you want to find, say, Saturn, and by following the red light arrows in the view finder, it takes you to it. It works even if it is cloudy! Come and see for yourself, at the IOW Observatory, Watery Lane, Newchurch.

The noctilucent cloud season has started already. These electric-blue high-latitude "night shining" clouds first appeared in the 19th century mainly around Earth's poles. Since then, for reasons unknown, they have increased in number and range and can be seen from the Isle of Wight. So as the nights draw out and the opportunity for observing stars is limited, see if you can spot any – and if you can snap a picture of them or anything else slightly astronomical, send it in to the editor.

The AGM is drawing near, and so is the time to elect the honorary officers and members of the committee. If you would like to stand for any of the positions, or would consider becoming a member of the committee, please do fill in and return the form on page 7.

Clear Skies!
Dr Lucy Rogers
Chairman, Vectis Astronomical Society

New Members

A very warm welcome to 3 new members this month:
- S. McLinden
- A McLinden (Jnr) and
- A. Williams.

Tony Plucknett

Space Walks

Members may have seen the recent 'Walking Festival' programme, and found three walks entitled 'A Stroll around the Solar System'. These were organised by John Langley and raised a credible £67.54 for Society funds. Well done & many thanks John!

Graham Osborne

VAS Website: www.vectis-astro.org.uk

Submissions or letters to New Zenith are always welcome and should be sent to:

The Editor New Zenith
35 Forest Road
Winford
Sandown PO36 0JY

Tel: **01983 864303** or email: **brian@briancurd.com**

Material for the next issue by the 6th of the month please.

VAS Registered Office

Castle Haven Cottage, Castle Haven Lane, Niton Undercliff, Isle of Wight, PO38 2ND

The Vectis Astronomical Society and the Editor of the New Zenith accept no responsibility for advice, information or opinion expressed by contributors.

Registered Charity No 1046091

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VAS 2008 - Meeting Programme*

Jun 27th	The Cassini Mission - *Prof. Carl Murray*
Jul 25th	**TBA** - *Greg Smye-Rumsby*
Aug 22nd	Astrophotography - *Philip Perkins*
Sep 26th	Colours in the Sky, Oddball Theories *Members Night*
Oct 24th	Beyond the Eyepiece -*Peter Burgess*
Nov 28th	Historic Telescopes of Cambridge University - *Mark Hurn*
* Correct at time of publication	

A Lucky Escape?

Having developed a focusing/collimation problem and noticing some internal contamination, it was decided to return the main observatory telescope (300mm Meade) to BC & F for some expert attention. Bill arranged this for May 2nd and we duly delivered it to Tunbridge Wells.

Having removed the corrector, six edge chips adjacent to the retaining screws were immediately apparent and an alarming quantity of glass shards had to be vacuumed from inside the tube.

Fortunately, the corrector could be re-aligned and refitted, though should this happen again, we might not be so lucky as a full optical (and very expensive) replacement will be required.

Steve, BC & F's technician, adjudged the flaws on the optics to be superficial and elected to spot-clean the marks rather than totally dismantle the primary fitting for washing. Removing the primary to investigate the focusing problem, he noted that it had been forced beyond the 'stop' position but was able to reset the components with little adjustment.

Conclusion

The internal dirtying is almost unavoidable - dust ingress is an occupational hazard and fungal spores are known to thrive in closed tube environments when relative humidity exceeds about 70%. The focuser failure and the damage to the corrector (unbeknown to us beforehand) **were almost certainly caused by operator misuse**.

The telescope has now been returned to the observatory, reattached to its mount and tested in situ. I am very pleased to report that, from the limited tests performed so far, it is much improved.

Richard Flux

From the Observatory Director

I am sure that all members realise, the Meade 300mm telescope is a valuable but delicate astronomical instrument. It is essential that we all make sure the equipment is kept in the best possible condition and that adjustments and maintenance are only ever performed by knowledgeable and qualified persons.

*All users of the observatory must enter details of their visit in the log-book provided. If faulty equipment is found, please make a note of the problem in the book and, **under no circumstances**, attempt repairs yourself.*

Observatory Keys

As mentioned last month, the locks on the observatory will change on 1st June 2008. Old keys can be exchanged for new - contact me for details.

VAS Representative Needed

VAS needs a representative on the User's Group sub-committee of the Newchurch Parish Sports & Community Association. If you are interested in this position please contact me at the observatory or on 863914.

Roger Hayward
Observatory Director

This Month's Night Sky

Moon Phases

New	1st Qtr	Full	Last Qtr
3rd	10th	18th	25th

The summer solstice occurs on the 21st when at 00:59 the Sun halts its northerly motion in Gemini. This is the longest day of the year and the start of summer in the northern hemisphere.

Planets

After **MERCURY**'s brilliant performance last month in the evening sky it is at inferior conjunction on the 7th and won't be favourably placed for observers in the northern hemisphere until mid-October.

VENUS is at superior conjunction on the 9th and it too won't be visible until September onwards.

MARS sets before midnight at the end of the month and must now be regarded as an unfavourable object. It glows dimly in the constellation of Leo.

JUPITER is now very close to opposition and can be observed at its best right now as it crosses the meridian at around 02h. Its motion relative to the stars is now east to west and it is picking up speed.

SATURN sets at midnight at the end of the month and will soon be unfavourably placed. Its apparent diameter decreases from 17.7" at the start of June to 16.9" as the month ends, not a dramatic difference but it shows how quickly Saturn is moving away from us right now. The tilt of the rings is -8.6 degrees.

URANUS and **NEPTUNE** are becoming a little more favourable. Before the Sun's light starts to affect the colour of the sky too much - around 02h - look to the left of south and try to identify the constellations' brighter stars. Aquarius is quite a wide, non-descript shape but Capricornus is more easily identified. The use of a good star atlas will help to identify the region for the forthcoming favourable months for these two planets.

PLUTO is at opposition on the 19th in the constellation of Sagittarius.

Meteors

The only active shower this month has a double peak. The **Ophiuchids** reach maximum twice; on the 10th (which is fairly favourable) and on the 20th (which is unfavourable). Expect low rates though of around 5 per hour.

Occultations

There are no bright events this month.

Deep Sky

M4 The Cat's Eye, Globular Cluster R.A. 16h 24m Dec -26° 33' mag 7.5. At about 7200 light years this 10,000 million year old cluster may be the closest globular cluster to our solar system. This core of this cluster is rather looser than most globulars with a distinct chain of stars running across its centre.

M80 Globular Cluster R.A. 16h 17m Dec -22° 59' mag 8.5. In contrast to M4 this cluster is a much smaller with a very condensed core. In 1880 a nova was observed here, one of only two novae ever seen in a globular cluster.

M10 Globular Cluster R.A. 16h 58m Dec -4°7' mag 7.5. A classic globular cluster; a condensed core covered in what appears to be a dusting of sugar.

M12 The Gumball Cluster R.A 16h 48' Dec -1° 58' mag 8.0. Slightly larger than M10, another classic globular cluster.

Peter Burgess

June's Sky

Messier 12 (also known as M12, Globular Cluster M12 or NGC 6218) is a globular cluster in the constellation Ophiuchus. It was discovered by Charles Messier on May 30, 1764.

Located roughly 3° from the cluster M10, M12 is about 16,000 light-years distant and has a spatial diameter of ~75 light-years. The brightest stars of M12 are of 12th magnitude. It is rather loosely packed for a globular and M12 was once thought to be a tightly concentrated open cluster. Thirteen variable stars have been recorded in this cluster.

The Pioneer Anomaly and the Potter's Wheel

This well-known anomaly is an unexplained retardation in the motions of Pioneers 10 and 11 spacecraft. Launched in the early 1970s, after sling-shot encounters with Jupiter and one with Saturn, they free-wheeled into deep space in opposite directions near the plane of the ecliptic, continuing to emit their 8 watt signals towards Earth in an amazing feat of reliability, radio communications and navigational measurement. They will reach the stars in a few million years.

In a detailed article[1], many possible causes for the anomaly were ruled out. Solar radiation pressure and solar wind act the wrong way on the craft, axial rotation of the craft and nozzle directions and craft comparisons ruled out propellant leakage or helium expelled from the radioactive thermoelectric generators. The spacecraft didn't carry enough electric charge to experience magnetic field forces. Navigational errors arising from communications instability or propagation in solar plasma - no, and so on. In the end it was concluded that both the spacecraft have been subjected to an unexplained force equivalent to a deceleration of 8.74×10^{-10} m.s^{-2} within 15% margin of error. It seems to be a constant force, acting towards the Sun, over the range 20 A.U. to as far as 70 A.U. or so. (An A.U. or 'astronomical unit' = the distance of the Earth from the Sun.) What could be the origin of this force? Dark matter drag, variations in the properties of light or theories of gravity - there were no unambiguous explanations as late as 2005. So now we'll have a go!

Consequential to our studies of spiral galaxies (NZ April, May 2007), we gained computing and mathematical know-how concerning annuli. Fig.1(a) gives the radial gravitation (g) within the plane of an annulus with area matter density (s) inversely proportional to radius, as far as the annulus rim. The centre of the annulus is at O. All that matters here are the shapes of the curves. s is big in the

middle decreasing to the annulus rim, and g follows the same type of curve except for near the rim where it makes a 'hump'.

Fig.1(b) gives the gravitation computed for a 'polo mint' annulus of uniform density. Inside the hole, g acts radially outwards, registering negative on the graph. A null circle is reached where the annulus pulls equally inwards and outwards. Outside the null circle, gravity acts inwardly or positive on the graph, rising quickly towards the rim because of the absence of matter pulling from beyond the rim, and then g falls with further increase of radius, hence the 'hump'.

Question 1: Could we 'design' an annulus such that over a large range of radius, g is nearly constant? If a spacecraft flew through such an annulus in its plane, it would experience a constant gravitational retarding force which might explain the Pioneer anomaly.

Question 2: How much annular matter would be involved? Would it be so ridiculously large as to make a luminous streak across the night sky in the ecliptic plane or might it be sufficiently thin and diffuse that nobody so far has noticed such an annulus?

Answer 1: Yes! You tell us what gravitational characteristics you want, within reason, and we can probably design the annulus. The solution we seek, with constant g over a large range, lies between the falling g with radius of Fig.1(a) and the rising g with radius of Fig.1(b). A solution must exist. It would be nice to crack the maths and get the equation, so what do we get? Hypergeometric functions - in other words - trouble! If potters needed hypergeometric functions to make pots, would you know how to place your order? "Never mind the maths, just give us the clay, and we'll make you what you want", says the potter, so that's the attitude we adopt here - throwing our clay onto the wheel, and by careful shaping, we can fashion gravitation. It took us 38 'pot

Fig.1(a)

Fig.1(b)
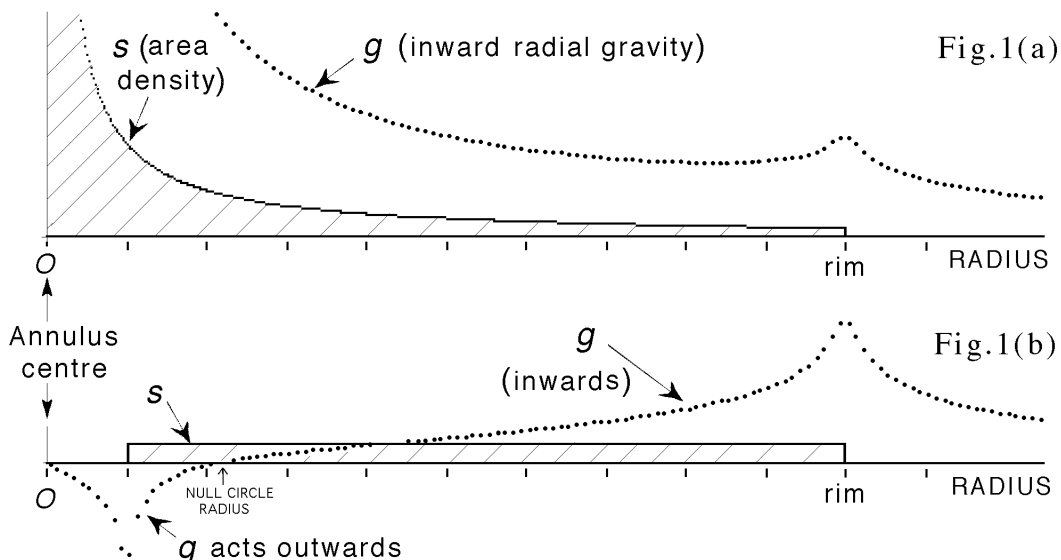
shots' to get a good solution with a nearly constant *g* over a large range of radius, see Fig.2, so what procedures did we follow?

Procedure 1: The equation for area mass density in Fig.1(a) is *s* = constant/radius. We needed more mass at bigger radii, so we tried $s = \text{constant}/(\text{radius})^n$. If *n* = 0.5 this gives the square root - not a bad result (no room to show you) but we'll tweak n to a better value shortly.

Procedure 2: We can't have an annulus with area density shooting up to infinity at radius zero, requiring a black hole in the middle of the Sun, or an annulus dense enough to upset the perihelion movement of Mercury which fits in with general relativity. Our annulus must have a central hole. We must multiply the function in Procedure 1 by something that is zero in the middle, and rises to unity within a short space, having little effect at bigger radii. Try exp(-*k*/radius) where *k* is another constant.

Procedure 3: Our annulus needs a knife edge rim, then we can maintain gravity nearly constant near the edge without a hump appearing. We want one equation for the whole curve, not different equations applying over different radii ranges. Avoiding polynomials, we plonk for a trig function - a quarter cycle of cosine will be convex. A quarter cycle of sine subtracted from unity will be 'hollow ground', but then we can't find a good value of *n*, so we go for the convex curve (convex very near the rim edge) but this function has too much influence further in. Since the square root of 0.8 is 0.9, we take the square root of the cosine function to give less effect further in. Multiply the lot together with a final tweak to n, gives empirically:

$$ s = \frac{200}{r^{0.6}} e^{(-40)/r} \sqrt{\cos\left(\frac{\pi}{2} \cdot \frac{r}{1000}\right)} $$

where *r* = radius in our 'program units' (10 such units = 1 A.U. here). This gives the *s*-curve in Fig.2 from 0 to 100 A.U. with *s* put equal to 0 at bigger radii. The computed *g*-curve is nearly constant from 20 A.U. to 100 A.U. Potters luck? - sometimes even potters cannot predict the colour of a pot after firing!

Answer 2: A few lines of computer code enables summing the masses of elemental rings. Putting in the value of Newton's gravitational constant, and 1.A.U. = 1.5×10^{11} metres, and scaling everything so the final value of *g* over the constant part of the *g*-curve equals the anomalous Pioneer acceleration, the total mass of the annulus comes to 1.5×10^{27} kg = 240 Earth masses.

Standing on our planet and looking edgewise out through such an annulus, the mass required to explain the Pioneer anomaly is less than one Earth mass per degree azimuth of ecliptic. The total mass of the annulus is one half the mass of all the planets, spread around a full circle in the ecliptic plane.

Perpendicularly to the ecliptic this matter could be spread over several degrees, depending on its 'temperature', scarcely affecting radial gravitation within the annulus. Such an annulus could be made of fine dust dynamically formed into an aerofoil density or thickness distribution by outrushing solar wind combined with spin - some physical explanation would be needed to drive the annulus to a condition of constant radial *g*. But we calculate it would take 40 billion years for the Sun to make such an annulus from stagnant solar wind, so if it exists, the annulus must be made largely from matter of a different origin. Perhaps the annulus we imagine is hidden behind the Kuiper belt, or might be thick enough to protrude but would be more diffuse.

We'd better let astrophysicists decide if the annulus we describe is a feasible explanation of the Pioneer anomaly! And a bar of chocolate to anyone in the VAS who first spots it!

Reference

1. Turyshev, S.G., Nieto, M.M., Anderson, J.D., *American J. of Physics*, 2005 vol.73,1033-1044.

Dr. Guy and Dr. Richard Moore

Fig.2
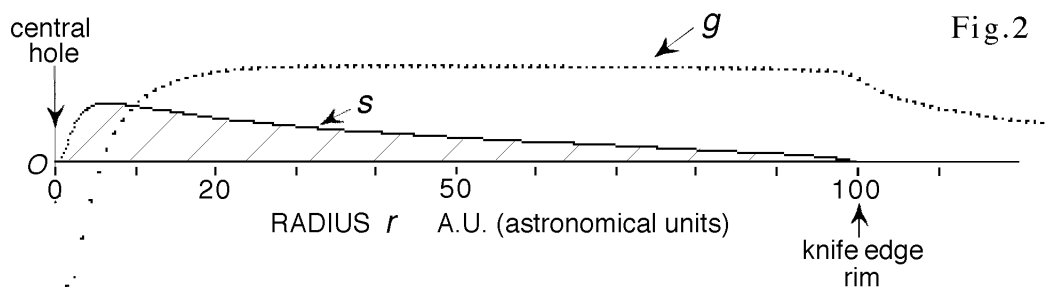
VAS - Officers and Committee

This list is published as an aid to anyone thinking of standing for election at the 2008 AGM and shows the positions and current incumbents.

- *Chairman* - Lucy Rogers
- *Secretary* - Sue Curd
- *Treasurer* - Graham Osborne
- *Other Committee Members* - John Langley, Roger Hayward, Bert Paice, Bert Buckett, Bill Johnston, Roger Young, Tony Plucknett, Brian Curd, Richard Flux.

If you are interested in any of the above posts or would like to nominate somebody else, please complete the form below and send it to:

The Secretary
Vectis Astronomical Society
35 Forest Road
Winford
Sandown
Isle of Wight
PO36 0JY

Nomination Form

Name: ....

Address: ....

....

....

....

Telephone: ....

Email:...

I would like to nominate: ....

For the post of: ....

Signature: ....

Date: ....

Please Note:

- Nominations must be received at least 7 days before the AGM on August 22nd 2008.
- When nominating anyone other than yourself, please check they are willing to accept a position.
- The current Officers and Committee members have agreed to stand for election in 2008.

Of course, in addition to these positions, there are many others who help with the day-to-day operation of your Society. If you feel you could spare a few hours each month to help, please contact a member of the Committee.

ESA Astronaut Recruitment Now Open - 19 May 2008

ESA has today opened applications for talented individuals wishing to become an astronaut in the European Astronaut Corps. There has not been a selection campaign since 1992, so this is a rare opportunity to be at the forefront of ESA's human spaceflight programmes including future missions to the ISS, the Moon and beyond.

Prospective candidates can now carry out the first step of the application procedure by filling in details online at www.esa.int/astronautselection.

Applicants will be asked to enter some personal information and contact details, and to upload a private-pilot medical examination certificate, from an Aviation Medical Examiner who has been certified by their national Aviation Medical Authority; or alternatively the ESA Medical Statement, approved by a physician. Then within 24 hours the candidate will receive login details to fill in a detailed application form.

The short-listed candidates will then go through a series of additional selection procedures. At the end of the process four candidates will be invited to become members of the European Astronaut Corps and begin basic training at the European Astronaut Centre in Cologne, Germany. The final appointments will be officially announced in 2009.

The selection procedure includes:

- two stages of psychological and professional aptitude evaluation, including behavioural and cognitive skills tests
- medical evaluation: including clinical examination by aero-medical physicians and clinical specialists, laboratory screening tests, and special procedures
- a formal interview: as potential ESA staff members, the astronaut candidates will go before an ESA selection board for further professional assessment

The ideal candidates should be competent in relevant scientific disciplines, such as life sciences, physics, chemistry and medicine and/or be an engineer or experimental test pilot, and should have demonstrated outstanding abilities in research, applications or the educational field, preferably including operational skills. A good memory and reasoning ability, concentration, aptitude for spatial orientation and manual dexterity are also prerequisites. Applicants should be fluent in English (Russian being an asset) and should have high motivation, flexibility, team competence, empathy with others and emotional stability.

SAGAS Summer Meeting

Hosts of the SAGAS Summer Meeting – Saturday July 19th 2008
Venue: Cliddesden Primary School – Basingstoke RG25 2QU
Transport from Basingstoke Railway Station available on request
Venue opens 1.00pm – Close by 7.00pm

Speakers

Dave Shave-Wall (retiring BAS chairman)
"An Amateur's Journey"
Peter Birtwhistle BAA (Great Shefford Observatory)
"Practical NEO Work Where Amateurs Can Still Make A Contribution"
Guy Hurst (Editor - The Astronomer)
"The Search for Novae and Supernovae – from Visual to Laptop"

Trade Stands
Aurora Books, True Technology, Venturescopes

Refreshments throughout the day
Buffet Tea

Limited numbers: Bookings for reservations to
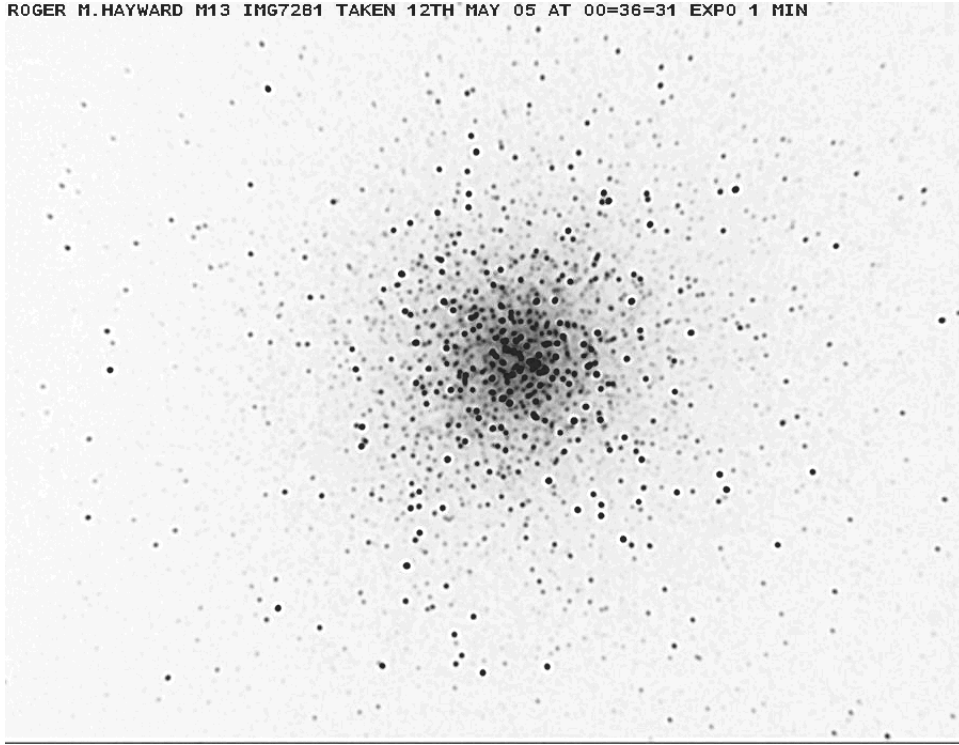**john.stapleton@tesco.net**

Charge £10

To cover room and facilities hire Speaker expenses, tea and refreshments

Member's Pictures

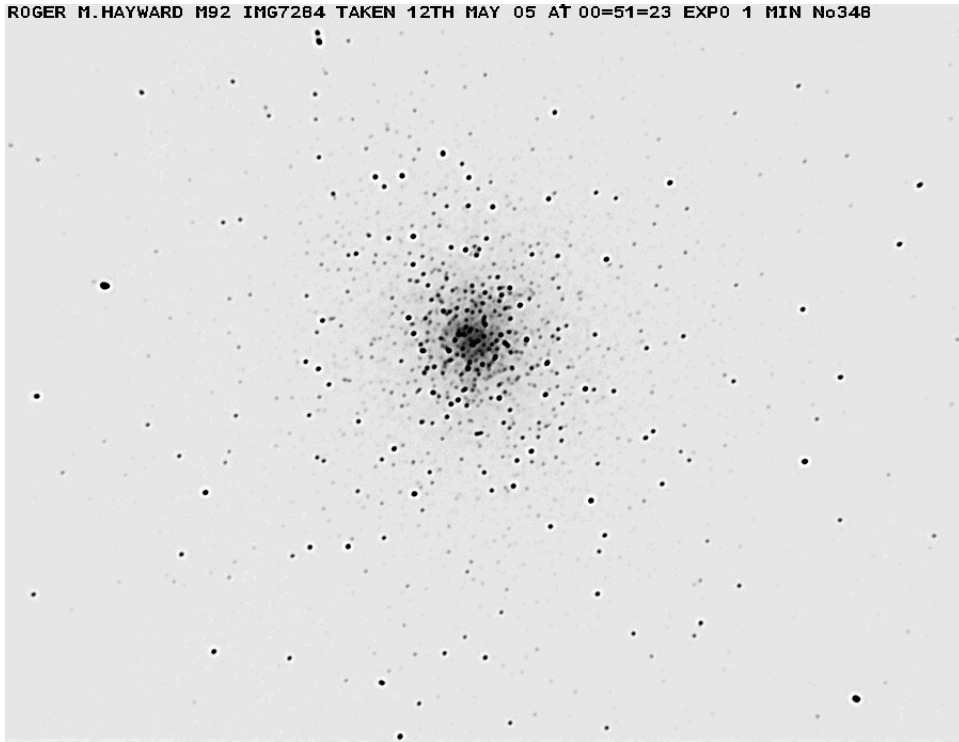## *M13+S2-05-Hercules a bright globular cluster*

ROGER M.HAYWARD M13 IMG7281 TAKEN 12TH MAY 05 AT 00=36=31 EXPO 1 MIN

M92+S2-05-Hercules globular cluster

ROGER M.HAYWARD M92 IMG7284 TAKEN 12TH MAY 05 AT 00=51=23 EXPO 1 MIN No348

Photos this month are from Roger Hayward.

The images are inverted colour to save on ink costs during printing!

THE BACK PAGE
LINKS, COMMENTS AND OBSERVATIONS

News From Around the Web

"I'll txt U..."

A University of Leicester space scientist has worked out that sending texts via mobile phones works out to be far more expensive than downloading data from the Hubble Space Telescope.

Dr Nigel Bannister's calculations were used for the Channel 4 Dispatches programme "The Mobile Phone Rip-Off".

He worked out the cost of obtaining a megabyte of data from Hubble – and compared that with the 5p cost of sending a text.

He said: "The bottom line is texting is at least 4 times more expensive than transmitting data from Hubble, and is likely to be substantially more than that.

"The maximum size for a text message is 160 characters, which takes 140 bytes because there are only 7 bits per character in the text messaging system, and we assume the average price for a text message is 5p. There are 1,048,576 bytes in a megabyte, so that's 1 million/140 = 7490 text messages to transmit one megabyte. At 5p each, that's £374.49 per MB - or about 4.4 times more expensive than the 'most pessimistic' estimate for Hubble Space Telescope transmission costs.

Dr Bannister said it had been difficult to work out exactly how much Hubble data transmission costs. So he contacted NASA who gave him a firm figure of £8.85 per megabyte (MB) for the transmission of data from HST to the Earth.

"This doesn't include the cost of the ground stations and the time of the personnel along the way, but it is an unambiguous number for that part of the process. So that's £8.85 to get each MB from Hubble, to the first point of contact on the ground, but no further. Hence we need to go a little bit further to estimate exactly how much it costs to transmit data from Hubble to the end user - i.e. to the data archive which scientists can access. This is difficult, so I had to make some conservative assumptions."

Dr Bannister estimated the cost of the data from Hubble could vary between £8.85 and £85 per MB- much cheaper than the £374.49 per MB cost of transmitting one MB of text.

He concludes: "Hubble is by no means a cheap mission – but the mobile phone text costs were pretty astronomical!"

Source: University of Leicester via http://www.physorg.com/

Worldwide Telescope

Microsoft have released an amazing piece of free software called "*WorldWide Telescope*". Essentially it's the night sky on your PC all controlled by a very slick interface - you can even use it to control your telescope.

You'll need a fairly "nippy" Windows PC to run the application:

- 2GHz Core 2 Duo
- 128Mb Video, 1024x768,
- 1Gb HD and 1Gb RAM
- .NET and DirectX 9.

The software is still in beta form so expect a few bugs, but it has the promise to become a "*must have*" application - shame there's no Mac version.

For details, and to download, visit http://www.worldwidetelescope.org.

2009 - International Year of Astronomy

We are arranging a year of events for 2009 - International Year of Astronomy. If you can suggest venues or can help organise events next year, please contact Brian Curd (*details on the front page*).

Quotations

Two possibilities exist: Either we are alone in the Universe or we are not. Both are equally terrifying.

- Arthur C. Clarke

The most incomprehensible thing about the universe is that it is comprehensible.

- Albert Einstein

Observatory

For your own safety when visiting the VAS observatory, please remember to bring a torch. Also, please make sure you close the car park gate if you are the last to leave.

Articles Needed

New Zenith welcomes letters, articles or pictures related to all aspects of astronomy.
Please send contributions to the Editor at the email or postal address on the front page.