Current Notes

The Journal of the Manchester Astronomical Society
September 2009

News and Views

Library

Peter Cook has very kindly donated the following books to the library.

First Steps in Astronomy without a Telescope by P. F. Burns - Ginn & Co. Ltd., Queen Square, London W.C. 1.

The Stars in their Courses by Sir James Jeans, Cambridge University Press, 1931.

Guide to the Stars by Patrick Moore, Scientific Book Club Edition, 1960.

Man and Space by Ralph E. Lapp, Scientific Book Club Edition, 1961.

The Planet Mercury by E. M. Antoniadi, Translated by Patrick Moore, Keith Reid Ltd., Shaldon, Devon, 1974, ISBN 0-904094-02.

Man's View of the Universe by R. A. Lyttleton, Scientific Book Club Edition, 1961.

*The Planet Ve*nus by Patrick Moore, Faber & Faber, 3rd Edition, 1960.

The Return of Halley's Comet by Patrick Moore & John Mason, Patrick Stevens, 1985, ISBN 0-85059-790-0.

Comets by Russell Ash & Ian Grant, Ash & Grant Ltd., 1973, ISBN 0-904069-00-1.

Exploration of the Moon by F. M. Branley, Scientific Book Club Edition, 1963.

Rockets & Space Flight by Hans K. Kaiser, Scientific Book Club Edition, 1961.

Satellites of the Solar System by Werner Sandner, Scientific Book Club Edition, 1965.

The Sky at Night by Patrick Moore, Scientific Book Club Edition, 1964.

The Expanding Universe by Sir Arthur Eddington, Pelican Books, 1941.

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On the 19th September I had the opportunity of visiting the Royal Astronomical Society headquarters, Burlington House. The main reason for the visit was to collect some journals that had been donated to the RAS from the library of Julian D. M. H. Henderson, 1928 - 2008.

The journals involved were copies of Sky & Telescope from about 1974 - 2008 and Astronomy from 2001. I also collected Scientific American which covers 1971 - 2008. Sky & Telescope is a valuable research tool and as such we should now have a continuous run from the early 50s to the present day.

Astronomy is also a valuable library resource and I hope to move everything to the shelves within the next few weeks. Of course this means that, in the case of Sky & Telescope, we will have a considerable number of duplicates. This will be an opportunity for members to fill in gaps in their own collection. Of course a small donation to the Society's funds would always be appreciated.

Exhibitions

There will be an exhibition at the Portico Library & Gallery featuring "Manchester Astronomical Society: Four Centuries of Astronomy on the Northwest", starting Monday 5th October 2009 and running until Thursday 29th October 2009. Details are appended.

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On Wednesday 29th October there is an astronomy-themed fun day being held at the Manchester museum on Oxford Road and which is part of Manchester Science Festival. The title is "Planets, stars and space rocks". MAS has agreed to take part and will be showing our display of the moon landings between 11:00 and 16:00, as previously seen at the Museum of Science & Industry (M.O.S.I.). If you feel you can help on the day then please have a word with a member of Council.

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If you fancy journeying to The Royal Observatory, Greenwich, then you will have the chance to view the winning entries to the Astronomy Photographer of the Year 2009. The exhibition is open until January 10th 2010. For further information go to www.nmm.ac.uk.

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The display boards that were used at M.O.S.I were loaned to Lostock library, in Trafford, at the beginning of September for a 2 week period. Response from the public and the local school was positive. It is hoped to offer the display boards to other libraries in the area.

Reminder - Membership fees are due from October 1st.

Members Subscription: £20.00 per annum

Student Membership (under 18 or in full time education): 50% of adult subscription (£10.00)

Barry Henshall, President

40th Anniversary of the Moon Landing

On July 20, 1969, man achieved one of his greatest achievements when astronauts Neil Armstrong and Edwin 'Buzz' Aldrin successfully landed and walked on the surface of the Moon.

This started a weeklong celebration at the Museum of Science and Industry (M.O.S.I.) with the arrival of a Shuttle Crew to meet excited schoolchildren, while sharing their adventures, of a ride into space.

Manchester Astronomical Society (M.A.S.), in keeping with its long connection with M.O.S.I., attended on the final Saturday to share with the visitors the activities of the society through its display of Lunar, and Planetary observations. It was supported by a looping video presentation of that historic journey to the Moon from archive footage. It was brought up to date with footage of the latest exploration of the planet Mars and with images from the Hubble Space Telescope.

Children were most excited by the table we set up, with printouts of spacecraft for them to colour in. Some amazing results were submitted from Green shuttles to Rainbow coloured ones. Some of the Mums and Dads could not resist having a go but fell short of the children's efforts.

During the day a steady stream of visitors (200 est.) stopped and admired the display and taxed our members with questions relating to our society images on display and especially the Moon images together with the telescope that was on display. This drew a lot of attention as it was positioned on a distant propeller on a static aircraft display. Two of our visitors on holiday from France were made to feel at home as Guy Duckworth came to the rescue and conversed with them in their native tongue.

In my position as Publicity Rep in the M.A.S., I had made contact with M.O.S.I. months ago and reported to council on the possibility of the M.A.S. attending to promote Astronomy. I am sure this event went off excellently, and all enjoyed a great day.

This could not have happened, without the support of members of the M.A.S. I would like to give special thanks to
Anthony Jennings, Marion Mills, Guy Duckworth (attended with a back injury) and Becky Elliott, for all their efforts on the day, in the setting up of the displays, and giving up their free time.

Anthony (Tony) W Cross

Jupiter Impact

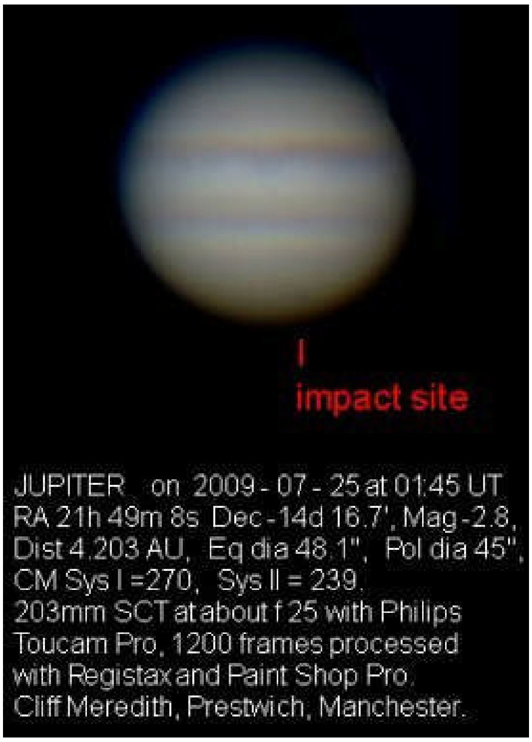
I had a minor epic on the night 24\25 August without the minor bit.
Set up my 203 mm SCT (butchered old LX200) on HEQ5 pro mount as darkness fell - late for me. Then waited for Jupiter to round the house and let the scope cool off.

Just as Jove was coming into view cloud started moving in. I hurriedly got a few trusty old Toucam Pro clips fumbling with the focus and nipping in and out to view the PC monitor.
Image clips looked poor. Then clouded out.
Ordinarily I might have gone to bed but in the exceptional circumstances of the impact on Jove possibly being on view I decided to sit it out a while.

At last an hour or so later there was a gap in the cloud. I took more Toucam clips but seeing was still very mediocre. After rush processed one or two of the video clips.
I got to bed feeling disappointed about 3:50 am.

It was only next day when I got round to registaxing all my Jove Toucam clips. I found I had managed to image the impact site - though only a very mediocre picture .

My friend Tony O'Sullivan of Salford AS managed to get a very nice picture a bit earlier than me. His shows the GRS towards the preceding side and the impact towards the other.
I hope others got views of this interesting event.

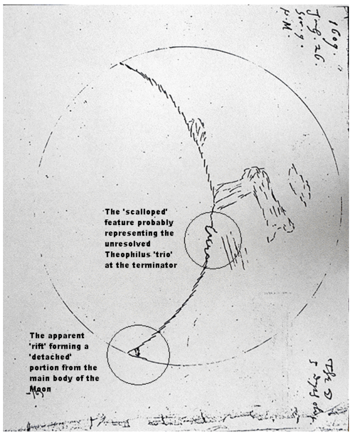


Cliff Meredith

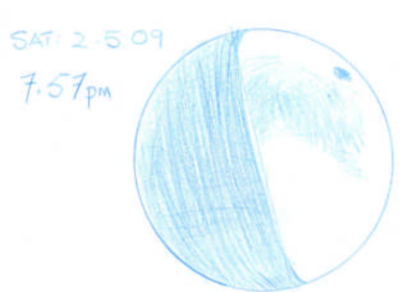
A note on the first telescopic depiction of the Moon by Thomas Harriot (1560-1621).

It is often Galileo who is credited as being the first to turn a telescope towards the heavens, and it is true that his ‘Sidereus Nuncius’ represents the first published results of systematic astronomical observations using these new instruments. However as the 400th anniversary of Galileo’s observations has arrived it is an Englishman who has emerged to be credited with being the first to depict a telescopic impression of an astronomical body, namely the Moon. That man is Thomas Harriot, ‘… the First Telescopic Astronomer’ as Alan Chapman referred to him in JBAA 2008 December.

Thomas Harriot’s first drawing of the crescent Moon is dated 1609 July 26th, 9.00 p.m. which according to John Shirley in ‘Thomas Harriot - A Biography’ is accompanied by a note reading ‘The Moon. 5 days old’., is the first astronomical drawing made with the benefit of a telescope to extend the capabilities of the human eye’.



Via e-mail dated 2009 May 3rd Jerry Grover communicated a rather interesting query relating to Harriot’s drawing raised during discussions at the previous Thursday evening meeting with Joan Sills. Both Jerry and Joan wondered if <u>‘this first telescopic-aided drawing is better than one which could be achieved with the naked eye’?</u>



Joan Sills naked eye drawing of the moon

It is true that in most respects Harriot’s first drawing is somewhat crude; it was certainly surpassed by his later efforts, which are believed to have been influenced by Galileo's drawings published in Sidereus Nuncius in 1610, which was certainly available in England within a few months of its publication in Italy. In fact, according to Terrie F. Bloom in ‘Borrowed Perceptions; Harriot’s maps of the Moon’, Harriot was ‘spreading the word about Sidereus Nuncius by June of 1610’, about a month before his second telescopic rendition of the Moon. There is an apparent ‘gap’ of around 12 months between Harriot’s first drawing of the Moon and his later more ‘regular’ observations. This may have been the result of some of his papers being lost when they were in the possession of Baron von Zach in the late 18th Century. Whether Harriot was influenced by Galileo or not Jerry Grover raises an interesting point, namely, is there anything which sets Harriot’s drawing apart from a view of the Moon made with the unaided eye and therefore makes it recognisable as an eyepiece impression?

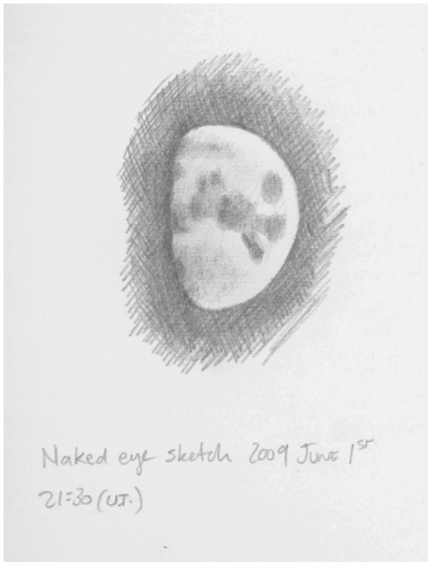
Whilst the Moon was depicted by various ancient tribes in a ritualistic context, it was not until Leonardo da Vinci drew the Moon in his notebooks between 1505 and 1514 that we can say the Moon was observed in a ‘scientific’ manner. William Gilbert’s pre-telescopic map of around 1600 is probably the first real attempt to accurately map the moon’s visible surface to the naked eye. However Gilbert’s drawing suggests he was probably more concerned with naming the various regions rather than attempting any sort of realistic representation of the Moon. Gilbert’s map was later surpassed by Harriot’s own map of the Moon of six inches in diameter and probably made between 1610 and 1613. Scott L. Montgomery discusses artistic renditions of the Moon which predate da Vinci’s representations in his paper ‘The first naturalistic drawings of the Moon; Jan Van Eyck and the art of observation’. These early lunar impressions were contained on three religious paintings by the Flemish artist made between 1420 and 1437, and these are generally regarded as the first attempts to portray the Moon in a naturalistic manner. Whilst small in size, and part of a much larger canvas Van Eyke represents the Moon against a light afternoon sky yet depicts certain lunar ‘seas’ with ‘overwhelming naturalism’.

Unfortunately such flattering comments cannot be applied to Harriot’s telescopic depiction, in an artistic sense Harriot’s drawing was surpassed in paintings nearly 200 years before he pressed his eye against the lens of his ‘perspective glass’ or telescope. Therefore we might concede that Harriot’s drawing is no better than one that could be achieved by the naked eye, the trained eye of the artist clearly has the ability to portray the Moon in a more naturalistic form, even if the rendition is somewhat small compared to Harriot's drawing of the crescent Moon.

Harriot's astronomical observations, which were certainly not restricted to the Moon, were carried out using instruments similar to Galileo's, at the time according to Alan Chapman 'a fairly simple instrument to make ... all that one needed was a convex object glass of 10, 20 or 30 inches focal length, and a concave eyepiece of one or two negative power'. With instruments of this type giving powers ranging from x6 to x50; those most commonly mentioned being around x10 or x20, Harriot made his observations. We must remember these were fixed eyepiece instruments, so he would have possessed several 'tubes' giving the magnifications noted on his observations. His first drawing of the Moon was made using an instrument giving a magnification of x6, a 'terrestrial glass' as the outline and location of the lunar seas indicates the image was not inverted. According to John North in John Shirley's 'Thomas Harriot Renaissance Scientist' Harriot never mentions this instrument again in connection with his astronomical observations and we might surmise its quality perhaps fell short of the standard of his later instruments. Alan Chapman writes in 'A new perceived reality: Thomas Harriot's Moon maps', 'Harriot's telescopes-like Galileo's- were getting more powerful between 1609 and 1612'.

On 2009 May 29th I was observing the Moon with my Borg 100 mm achromat under relatively good seeing conditions, the phase being comparable with Harriot's drawing. After studying the Moon for a while in the eyepiece of the main instrument, and following a brief look at Saturn, I lingered a little longer over the view through the 6x30 finder when I re-centred the telescope onto the Moon. Whilst the magnification of my finder scope was comparable with Harriot's instrument I suspect, even taking account of the small size of the finder, my modern telescope was of better quality, certainly the field of view would have been much better than that which was presented to Harriot. According to experiments carried out using replica 'Galilean telescopes' it is recognised that these early instruments exhibit somewhat restricted fields of view and can not encompass the whole of the lunar disc in the eyepiece. Two things immediately struck me on viewing the image in the finder, firstly that the trio of craters forming the Theophilus 'chain' namely Cyrillus, Catherina and Theophilus itself were situated on the terminator and just emerging from the shadows. Under these conditions of illumination, taking the aperture of the finder into account, these craters could not be resolved, and their appearance of the terminator was of a 'scalloped' region comprising somewhat elliptical 'loops' difficult to distinguish. Secondly shadow filled features on the southern tip of the crescent gave the appearance that there was a 'rift' separating a brightly illuminated 'triangular' shaped area from the main body of the Moon. Stepping back from the telescope and taking an unaided view of the Moon indicated that these features were impossible to resolve without optical aid.

I had the distinct impression that these were the two features Harriot attempted to depict on his drawing of 1609 July 26th, I have ringed these two areas on the attached illustration of Harriot's drawing, and I concluded that it is these two features alone, however crudely depicted by Harriot, which sets his depiction apart from everything that had gone before and establishes his drawing as the first made of the Moon with the aid of an optical device, depicting as it does features which could not have been seen with the unaided eye. Therefore perhaps Harriot's drawing can be upheld as being 'better than one which could be achieved with the naked eye' simply because it records features beyond the reach of the unaided eye, irrespective of what we might think of the artistic merits or general accuracy of his depiction.



Nigel Longshaw.

The Kielder Observatory

In April as a birthday treat we were invited by my son to a secret location for the weekend. It turned out to be Kielder Water which is the biggest man-made reservoir in Europe and was opened in 1982. A further surprise was a trip to the Kielder Observatory which is about 1½ miles as the crow flies from the northern tip of the reservoir, less than a mile from Scottish border and about a mile from Kielder village which is England's most remote village. We stayed at Leaplish Waterside Park, a holiday village of cabins on the shore of Kielder Water.

With almost no light pollution from surrounding settlements the Kielder Observatory is situated in a remote part of the vast Kielder Water and Forest Park in Northumberland with the darkest skies in England. The angular timber observatory structure was opened in Spring 2008. The aim was to provide an observatory to promote and facilitate astronomy amongst amateurs and the general public and was the brain child of Gary Fildes.

The Kielder Observatory Astronomical Society has been formed and its members voluntarily run all the events at the observatory including the evening I was attending. The members tend to come from a wide catchment area, the volunteer guide who showed us round lives in Newcastle 50 miles away.

The evening started with a lecture by the Professor of Experimental Philosopy at the Institute of Astronomy at Cambridge University, Gerry Gilmour (not be confused with Jamie Gilmour from Manchester). His lecture on the origins and destiny of the universe was wide ranging, thought provoking and sometimes downright scary. It was a masterly example of how to present a complex subject to an audience of the general public without reducing it to a lowest common denominator. The only problem was that the lecture room had a very low ceiling so that the screen was almost floor to ceiling and as a result only the people on the front row could see more than the top half of the screen. It struck me that as the building has a roof which sweeps up at one end, the design could have been utilised to accommodate a screen at a higher level, instead of which it is merely the entrance.

Following the lecture we were divided into three groups of 20 for a guided tour. Despite the daylight ending with a clear sky, thin cloud rolled in and made observations impossible. The telescopes in separate timber domes are both mounted on pillars of solid concrete with which the timber superstructure has no contact.

The first is a 14" inch Meade Schmidt Cassegrain with full goto capacity. As a contrast the second is a commercially manufactured 20" classical Newtonian which is hand operated although equatorially mounted. One feature which impressed me was that the secondary mirror and eyepiece were mounted on movable ring which could be rotated to a convenient position for observation. This has to be very precisely engineered in order to maintain collimation as it rotates and indeed they have experienced difficulties with the alignment which has now apparently been fixed by the manufacturer (Pulsar).

Then there was tea and coffee and during which there was the obligatory rolling slide show of astrophotographs to make up for he lack of actual observations. Because our party included my 2 month old grandson we had to leave at this point though I understand the sky cleared later for those who stayed on.

On balance I would think that most of our members would not benefit hugely from attending such an event, particularly because it is so far away. With 60 people present there would not be a great opportunity to make use of the telescopes and although the lecture was excellent it was marred by the poor visibility of the screen.

However the Kielder Star Camp has a much longer history as I believe this October will be the seventh one. This is organised by Richard Darn and held at the Kielder campsite (nearer to Kielder village than the observatory) with daytime events taking place at nearby Kielder castle. Now that the Kielder Observatory exists close by I understand that participants will be offered the chance to join observing sessions there which would seem a more rewarding way to visit,

Kielder Star Camp
www.richarddarn.demon.co.uk/starcamp
Kielder Observatory and KOAS
www.kielderobservatory.org

Janet Maresh

Warp Factor Three

Warp Factor Three
The beginning of the end?

Following on from the explanations discussed in Warp Factors One and Two, we can ask the question:
Is it possible, theoretically as of yet, to travel through time?

The challenge is to find some way to make the past and future light cones of some event bend around or overlap. Let's say that we have two points in space 186,000 miles apart (for convenience, mathematically)

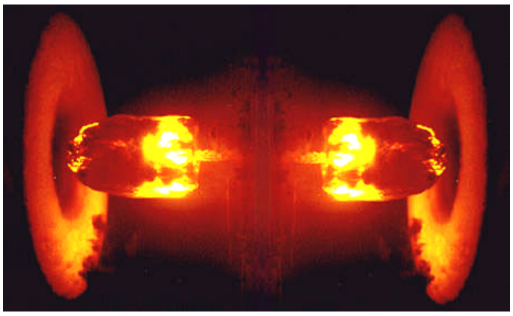
Now we know that it will take 1 second for a laser pulse to travel this distance. These two points are obviously separated both in a timelike manner and a spacelike manner. The secret might be to bend space-time so that they became closer together.

Suppose we have the person holding the laser device accelerate up to the speed of light? Not a good idea, physiologically...... Let's assume that the human body can perhaps withstand an acceleration of 10 g (10 times the force of earth gravity - fighter pilots regularly experience forces of 6 to 7 g) for a period of time. It would take nearly a year (about 355 days) to reach the speed of light - the human body could not withstand this acceleration for this length of time. (At 1 g acceleration, it would take nearly 10 years) So that idea is not workable, then......
How about just sending the laser device? This might work; if we could find some way of sending it (the energy required is enormous).

But wait a minute...... objects approaching the speed of light increase their mass (Einstein). **Mass** has gravity. **Gravity** bends space-time. The more massive the more space-time bends. At the speed of light, an object has infinite mass. That should be enough to warp space-time sufficiently to wrap around on itself! So we now have an **infinite mass** at a **single point in space-time.**

Hmmm... That sounds familiar...
Isn't that what we had at the Big Bang?
An infinite mass at a single point in space-time?

Perhaps we never will travel in time without destroying the universe......



What do you think?

Matters of gravity

Apart from rare and generally regrettable moments of free-fall, we spend our entire lives under the influence of the Earth's gravity, yet rarely, if ever, do we experience the *universal* nature of gravitation.

It's a tremendous philosophical leap from "stuff falls" to "everything in the universe attracts everything else". That leap, made by Isaac Newton in the 17th century, not only allowed understanding of the motion of the Moon and the planets, but inoculated in Western culture the idea that the universe as a whole was governed by laws humans could discover. This realisation fuelled the Enlightenment and the subsequent development of science and technology.

But, if gravitation is ubiquitous, why was it not discovered millennia before Newton's 1687 *Philosophiæ naturalis principia mathematica*? The reason lies in the extraordinary *weakness* of the gravitational force.

Now you might say, "What do you mean, weak! I fell down a flight of stairs a couple of years ago, and gravity sure didn't feel weak to me!" And yet, of the four forces of nature known to physics, gravitation is the weakest, by the mind boggling factor of 4.17×10^{42} (4.17 followed by

42 zeroes) times weaker than the electromagnetic force.

The stark difference in the strength of the electromagnetic and gravitational forces is evident in the picture to the left. The bright square in the jaws of the pliers is a 4 mm cubical magnet. It is lifting a spherical steel pétanque ball which weighs 550 grams. Consider this picture in the following way: we're pitting our valiant little magnet, with a volume of 0.064 cubic centimetres, weighing less than one gram, pulling **up** with the electromagnetic force, against the entire Earth, pulling **down** with gravity. And the winner is... **the magnet.**

A 0.064cc, one gram magnet, out-pulls the Earth which weighs 5.9736×10^{27} grams and has a volume of more than 10^{27} cubic centimetres.

The gravitational force between two masses *m* and *m'* whose centres of gravity are separated by a distance *r* is given by:

$$F = G\frac{mm'}{r^2}$$

where *G* is the *gravitational constant* .

Measuring tiny gravitational forces would be easy if we were in deep space, far from any massive bodies. The only forces on objects in our space laboratory, then, would be those entirely under our control. As long as we made sure none of the objects we were experimenting with were magnetic or electrically charged (easily arranged, assuming they are conductive, simply by bringing them into contact so all excess charges equilibrate), the only force remaining between objects would be gravity, so however weak it is, we need only be sufficiently patient to observe its effects.

What we'd like to do, then, is ***cancel*** the Earth's gravity so that the much smaller gravitational forces between objects that fit in say, the Godlee Observatory, become evident. Fortunately, we don't need a 25th century Warp Man to accomplish this, only a modest helping of 18th century technology.

One of the great all-purpose sledgehammers in the toolbox of physicists and engineers is *differential measurement*; in other words, don't worry about the absolute value of something, but only the *difference* between things you can measure.

What we're looking for, then, is a device which responds only to differences in gravitational attraction, cancelling out the much stronger constant gravitational attraction of the Earth. We need look no further than a slightly modified version of the same device Henry Cavendish used in 1798 to first measure the gravitational constant, *G:* the Torsion Balance.

Ever since, the *torsion balance* has been the primary tool used both for measuring the gravitational constant and testing the *equivalence principle*, which states that all bodies experience the same gravitational force regardless of composition; Einstein's General Relativity showed this to be a fundamental consequence of the structure of space and time. State of the art torsion balances have measured the gravitational constant to better than one part per million and confirmed the equivalence principle to more than 11 decimal places. This requires extraordinarily refined and delicate laboratory apparatus and experimental design, in which a multitude of subtle effects must be compensated for or cancelled out.

We, however, aren't going to *measure* anything--we're only interested in *observing* universal gravitation. This allows simplifying the torsion balance to something we can set up in the Godlee Observatory.

The principle of the torsion balance is extremely simple. Suspend a horizontal *balance arm* from a vertical elastic fibre. At each end of the balance arm are masses, much denser than material of the arm, which respond to the gravitational force. Once the suspending fibre, balance arm, and weights are set up and brought into balance, the downward force of gravitation acts equally on every component. The balance arm is then free to rotate without any hindrance from the Earth's gravity.

It is constrained only by air friction and the *torsional strength* of the support fibre--its resistance to being twisted. We can then place *test masses* near the ends of the balance arm and observe whether the gravitational attraction between them and the masses on the arm causes the balance arm to move. When measuring the gravitational constant one must precisely calibrate the torsion strength of the fibre, but to simply observe gravitation we need only make sure the fibre is sufficiently limp to allow the gravitational force to overcome its resistance to twisting.

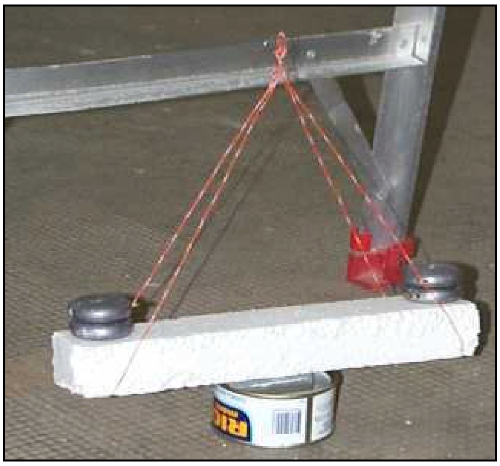
In practice, the balance arm is *so* free to move that once any force sets it into motion, it oscillates for a long period, spinning round and round if free or bouncing back and forth off the stops if constrained. To avoid this we need to *damp* the system so kinetic energy acquired by the bar is more rapidly dissipated. Well, nothing's damper than water, so we add a *water brake* to the arm which turns in a fixed reservoir. The resulting drag as the balance arm moves is much greater than air resistance and frictional losses in the fibre, and reduces the oscillations to a tolerable degree.

So here's the sophisticated, high-tech, big science apparatus we'll use to observe the subtle curvature of space-time.

An aluminium ladder (or wooden easel) serves as the support from which the balance arm is suspended.

Nylon monofilament fishing line is knotted to the middle cross-beam at the back of the ladder or to the easel. Using a ladder or similar movable support frame allows setting up the balance in the middle of the room.

The balance arm is a 10 × 5 × 40 cm hollow bar of polystyrene foam. The bar is suspended in a cradle made of insulated telephone wire and is held in its cradle by friction and the indentation made in the soft plastic foam due to the weights at either end of the bar.



The height of the beam is important because of the need for it to fit properly with the water brake. If the beam is allowed to swing freely, it will be terribly under damped--once it starts to swing, only air friction and the minuscule losses in the fibre will act to stop it.

This causes the beam to bounce around incessantly, masking the steady influence of gravitation. The water brake dissipates the energy of these unwanted oscillations precisely as an automotive shock absorber does. The flap's motion does work on viscous fluid, water in this case, and deposits energy in heating it. The water brake consists of an aluminium flap which projects downward from the balance arm, fixed with glue into a slot cut into the bottom of the balance beam.

The following time-lapse movie frames (originally about 30 seconds per frame in the movie) show the torsion balance responding to the gravitational field generated by two 740 gram competition pétanque balls. The picture shows the camera angle employed in both movies. In each, the movie begins with the bar stationary, in contact with one of the balls or the foam supporting it. The balls are then shifted to the opposite corners, where they attract the

lead weights on the ends of the bar. The bar bounces when it hits the stop on the other end, and finally, after a series of smaller and smaller bounces as the water brake dissipates its kinetic energy, comes to rest in contact with the closer ball or support. This is the lowest energy state, at which the bar will always arrive at the end of the experiment. As you can see from the time stamps, the experiment lasted almost one and a half hours.

Graham Hodson

(Adapted from a PowerPoint presentation delivered at the Godlee Observatory)

With grateful acknowledgement to Patricia Schwarz (Cal. Tech.) and John Walker (www.fourmilab.ch) for some of the information.

Manchester Astronomical Society:
Four Centuries of Astronomy in the Northwest

To celebrate the International Year of Astronomy 2009 Manchester Astronomical Society will take you on a scientific journey of discovery spanning over 400 years. You will have the opportunity to view the archives of M.A.S. from Log books and Minute books to Scrap books. You will also see early telescopes, a brass lantern projector with a selection of early astronomical glass slides and a rare star atlas which was discovered at the Godlee Observatory. There will be more modern equipment on display, of course, and observations made by members of the M.A.S.

Kevin J Kilburn F.R.A.S. will be giving a talk about M.A.S. and its fascinating history. He has been a member for 40 years and a former president of Manchester Astronomical Society. He is also the Secretary of the Society for the History of Astronomy.

Exhibition opens: Monday 5th October 2009
Continues: Tuesday 6th ~ Thursday 29th October 2009

Open Monday - Friday
9.30am - 4.30pm

Evening talk by Kevin J. Kilburn F.R.A.S.
Tuesday 13th October 6.30pm

Pre-booking essential

Talk and buffet £16.50
Talk only £5.00

Note: A special edition of Current Notes has been printed especially for this exhibition and can only be obtained from the Portico Library during exhibition opening times.

Manchester Astronomical Society
Officers and Council, 2009–2010

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Contributions to Current Notes

MANY THANKS to all the members that have contributed to this issue of Current Notes. Contributions are welcomed from all members of the Society, and can cover any area of astronomy, from beginners' initial experiences, to more advanced and specialized aspects. Remember, this is your forum for letting other members know who you are and what you're up to.

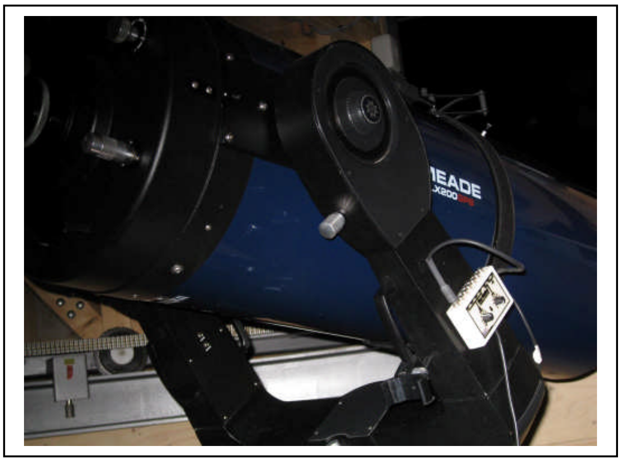
Distribution of Current Notes

Current Notes is available in two formats: paper copy and website version. The paper copies are made available to members at Thursday evening meetings at the Godlee. Paper copies are also mailed free of charge to members unable to attend the meetings. The website version is a digitized version of the paper copy and can be accessed via the Member's Section on the Society's website (www.manastro.co.uk).

Guidelines for Submissions

In the absence of an editor for Current Notes please submit a copy of any contribution on floppy disk or as e-mail attachment to president@manastro.co.uk in either MS Word format, or as plain text file. If possible, please also submit a hard (printed) copy. Hand-written or typed contributions are also welcome, although to limit the editorial workload, these should ideally be kept short in length. Finally, any data submissions (e.g. statistics, observations, measurements) should be submitted either in a suitable digitized format (e.g. Excel spreadsheet, completed graphs) or with clear instructions as to how the data should be presented in Current Notes. If in doubt, please contact the editor.

Views of the Kielder observatory with Kielder reservoir in the background.



Meade LX200 14 inch Schmidt-Cassegrain with built in GPS and motor drives. Mounted equatorially and wired for computer connection in a warm room

Pulsar optical 20 inch Split-ring Equatorial F4 telescope. Fully manual with potential for camera mount and motor drives for remote operation.

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