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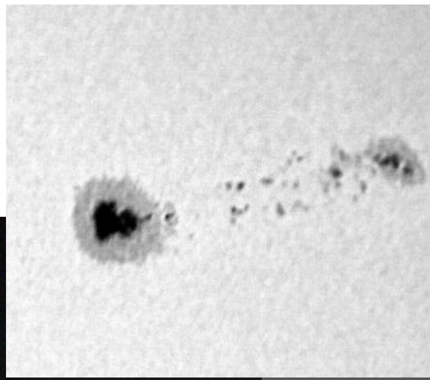
The Sun and Moon

This image of the Moon was taken by Daphne Chippendale, she used the parfocal method with a simple digital camera held on a 150mm Newtonian pointing into the eyepiece.
The sunspot CCD image was taken by Geoffrey Johnstone with a webcam at f6.3 using a 200mm Meade LX200, on 2000 April 6th (The night of the aurora).
Each images is a combination of 5 120 second integrations.



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This MIRA is the first that I have produced since upgrading my computer system late last year. So sorry folks for the delay in getting this MIRA out; but it was quite a jump in computing power and technology from my old machine that I have used for 11, that’s right, 11 years! to the new one. I’ve still got my old Acorn RISC PC with its StrongArm 233 MHz processor, 64 MB RAM and 3GB hard drive with a 17” monitor. It wasn’t like that when new, I upgraded it three or four times in memory and operating system updates. But now: I am now up to a 2 GHz processor 250 GB hard drive 1.5 GB RAM and 20” monitor! All rolled up into a G5 iMAC! Very nice it is too, all white and shiny. I bet it will not last as long as the last one with the speed of computer technology today.

It’s nice to have a nice new machine to play on and the internet to surf and learn about, but the hardest thing is having to learn how to operate the new software and programs correctly. Like this DTP (Desk Top Publishing) one for the page layout and production of MIRA. On my old RISC PC I ended up for the last 4 to 5 years using a program called Ovation Pro. This one to produce this issue is a totally different animal and it works in a totally different way. Not only that, but most of the names of the operations are changed — so a different way to work and a lot of new ways to do things. There is a helpful PDF file with the program, which has ***600+*** pages of help. Phew. It was on page 147 I discovered how to make the text flow around a picture and not all over it. So if some bits of this issue aren’t as good as they should be, maybe next time. . . .

One point I must make is that now I’ve upgraded, things ain’t wot they us’d be! I can’t now use floppy discs as the iMAC only has a CD / DVD drive built in. So in future could any one sending in material submit it on a CD or E-mail it to me at the address `ivorlclarke@hotmail.com`

Most of the stories sent in are off PC’s, but don’t worry I CAN read them OK and transfer them onto my Mac’s DTP program so that I can format them for an issue. If you have sent in a story over the last year or so don’t worry as I will try to get the next issue out sooner.

This upgrading lark applies to most things today, even us astro folk. No sooner than we have got to grips with a new gadget, telescope, program, computer, printer, camera, iPOD, eyepiece, whatever, then a new one is unveiled with more bells and whistles than ours! So we start saving up the next day so WE can have the latest soon. But is it a good idea to keep right up-to-date? Well with some things like computer programs, yes. A lot of computers these days need constant upgrading of the security files almost every day, some programs will let you upgrade to newer versions for set periods. If you can and if its free, its a no-brainer.

But do you need to change things like your telescope and eyepieces or binoculars? No-way. If you have a telescope and you use it regularly (not like me, hardly ever) you get used to setting it up and can quickly make adjustments to it. You get to know how to use it, which way to turn the focuser for best image, which lead plugs into which socket. Get to know it so it works for you and not against you. Observing should be a pleasure not a chore. Only if your interest changes from say, observing the Moon and planets to say, deep sky fuzzy blobs or the other way need you think about changing your ‘scope.

Most folk buy a decent pair of binoculars and keep then for life as they are so useful. You can’t say that about most other items you buy! If you get a pair of 10x50 they can be used for star clusters, the moon, deep sky (if it’s dark enough) and all the other things in the sky as well as daytime use. A small pair of 8x20 or 10x25’s are great for holidays when sightseeing but hopeless for anything but the moon at night..

Ivor Clarke ”

PHYSICS CONCERNS

by Dennis Spratley

“Physics will die out in schools unless urgent action is taken to tackle a shortage of teachers,” a report says.

The number of pupils taking physics A-level has plummeted by 38% since 1990, the University of Buckingham centre of educational research found. At the same time, the number of special physics teachers has fallen sharply, and the shortage is set to worsen as older staff retires.

Scientists and engineers have expressed deep concern and called on the Government to act after a study showed lack of specialist physics teachers. Professor Alan Smithers and Dr. Pamela Robinson, who conducted the survey, warned that the subject may die out. They said ‘ Physics in schools and colleges is at risk through science redefinition and lack of teachers with expertise in the subject.’

Scientists and academics have voiced their concerns after new research showed a marked decline in the number of pupils studying physics at schools. The poll, which covered 432 schools and colleges in England and Wales, found that one in 10 state schools with 6th forms does not offer A-level physics. And nearly 40% of schools had 5 students or fewer taking the subject at A-level, the research showed.

Half of all physics teachers in state schools did not study the subject at university, new research shows. The supply of physics teachers is ‘not renewing itself’, with nearly twice as many aged over 50 than 30 or younger. Another threat to physics is the ‘redefinition’ of science subjects to ‘general science’, the University of Buckingham centre for education and employment research study found.

The pattern is different in independent schools, which in general have more specialised physics teachers. Many lecturers in further education colleges are qualified in physics but are struggling to recruit students, who see the subject as ‘too difficult’.

The research recommended that the number of specialised trainee physics teachers should be nearly doubled from the current 450 a year to 750 a year to cope with staff retiring.

Lord May of Oxford, president of the Royal Society, has warned of ‘profound problems in science education.”

ITV Teletext “Factfile” 21st November 2005

Whilst I have been working is Serbia, I've been doing the Remote Learning course on *"Great Astronomers in History"* given by the University of Central Lancashire. My first assignment, a book review of Allan Chapman's *"Gods in the Sky"*, appeared in MIRA 70. It received the comment "Good... but does seem to over-pursue tangential ideas" - not an unreasonable assessment, I suspect.

My second assignment was a role-playing exercise. Again, I was limited by being away from my books and opportunities to research. However, one of the options was well within my capacity - to imagine a letter from Jeremiah Horrocks to John Worthington, discussing Horrocks' observation of the transit of Venus. In reality, Horrocks never corresponded with his old friend from Emmanuel College after they had left Cambridge University. However, when Horrocks' work came to light some years after his premature death, Worthington was responsible for collecting together the papers of his erstwhile friend.

I took a couple of useful books with me to Serbia - Paul Marston's booklet on Jeremiah Horrocks (to which I contributed some material on Emmanuel College) and Peter Aughton's excellent biography of Horrocks. I was also able to down load a translation of *"Venus in Sole Visa"*, Horrocks' account of the transit, from the UCL web site. Watch out for a couple of "borrowed" quotes.

Letter from Jeremiah Horrocks to John Worthington

By Mike Frost

Much Hoole, July 1640-41

My dearest John,

What a pleasure to hear from an old and esteemed colleague - how fondly I remember our days as students in Emmanuel College. Thank you also for enquiring after my family. My father is especially hearty since I made some new looking glasses for him. He says that they are most agreeable spectacles.

I am delighted that you have heard of the marvellous sight seen by myself and my good friend Mr. William Crabtree, just seven months ago. I take issue with you, however, when you speak of our good fortune in viewing Venus in Sole. The Good Lord blessed us with a view of the Sun last November 24th, I will grant you that. But I am sure that he cleared the clouds for the pompous Belgian, Landberg (if he be still alive); for Galileo Galilei, for Fr. Gassendi in Paris. But did they see the Transit? No, of course not - because they did not know to look for it. God granted me the wisdom to calculate the path of fair Venus, and the patience to check the calculations of others. Surely he cannot have intended me to miss witnessing the fruits of these labours?

You ask me what I have learnt from my observations, and I am delighted to tell you. First, we now know the longitude of the node of the orbit of Venus to great accuracy, as we can estimate the time at which Venus crossed the Solar equator to within minutes; whereas before it was only known to within hours. This has enabled me to produce much more accurate predictions of the orbit of the planet.

Second, Venus on the solar disk was a black spot, perfectly circular, with a sharp boundary. It was not a permanent spot, persisting through several days' Solar rotation, such as Fr. Scheiner discovered; for I checked how many such spots were present shortly before the Transit began (and moreover, close to the limb of the Sun, these spots are elongated not circular). This must mean that Venus cannot shine by its own light, and must be illuminated solely by the Sun. This confirms the findings of illustrious Galileo, who observed that Aphrodite showed phases like our own Moon.

Third - and I have to say I was taken aback by this - the size of Venus was much smaller than I had expected. Fr. Gassendi was not exaggerating, I dare say, when he said that Mercury was tiny when seen on the Sun, despite all the learned scholars who claimed that this must have been a trick played on his eyes. Could it be, Mr. Worthington, that the Solar system is bigger than any of us had previously thought? That the Sun is much larger than any of its retinue?

I have spent much time thinking about how we can measure the scale of our universe. A scheme occurs to me, that perhaps you might like to comment on the viability of. Perhaps each planet subtends the same angle, as seen from the Sun.

Why do I think this to be true? Well, we know that Mercury is closest to the Sun, followed by Venus. And we know from the observed Transits that Venus is larger by far than Mercury, as seen from Earth. I have attached calculations which show that, if we are to trust Gassendi's figures (and I think we should), both Mercury and Venus subtend twenty-eight seconds of arc, as seen from the Sun.

This is my hypothesis - that the angle subtended at the Sun holds true for all the planets. Our own world is therefore greater in size than Mercury or Venus, but smaller than Mars, and much smaller than Jupiter or Saturn. I am not unhappy with this prospect; for Jove, as we observe, shines bright despite its distance from the Sun. Saturn is fainter, and appears to show a smaller disk, I admit. But wait, does it not also show mysterious protrusions, as seen by Galileo? Perhaps we have misinterpreted these protrusions - perhaps they indicate that Saturn is in reality larger than it appears, but we do not see all of the outer portion of the disk, just those parts along the equator. Mars, I admit, does not show a large disk, but perhaps this planet too is larger than it appears to us.

And I must tell you, Mr. Worthington, that I have further evidence that Jupiter and Saturn are substantial worlds. For they do not precisely follow the law of velocity espoused by the late Mr. Kepler. To my knowledge, I am the only person to have measured this anomaly. It appears that Jupiter is moving slightly faster in its orbit than Mr. Kepler's theories predict, and Saturn slightly slower.

I do not yet understand why this should be - I have not observed this effect in any of the other planetary orbits. But perhaps it is only seen with Jupiter and Saturn because, if my theory is correct, these two are the largest planets in the Solar retinue. Jupiter and Saturn are now approaching conjunction, and I intend to make further observations as the two planets approach closest to each other, and then draw apart once more.

If we make my assumption that each planet does indeed subtend twenty-eight seconds of arc, it is easy to show that the distance from the Earth to the Sun is sixty million miles. For in the case of the Earth, the twenty-eight seconds of arc corresponds to the Earth's diameter, and the three hundred and sixty degrees to a circle with the radius of the Solar distance. Sixty million miles is more than three times as much as estimated by Mr. Kepler, and truly an extraordinary distance. But I feel sure, that if he had been privileged to see the sight of the Transit, as Mr. Crabtree and I were, he too would be willing to admit that our universe is bigger than ever he dreamed. I have been reading Mr. Kepler's speculative work Somnium, in which he postulates that the Moon harbours intelligent life! Surely a few more million miles distance to the Sun would not have troubled him!

You can see, Mr. Worthington, that my task is by no means complete. Much painstaking work remains to be done, many more years of careful observation. I am greatly excited by recent correspondence with Mr. Gascoigne of Leeds, who tells me that he has invented a means of introducing an adjustable cross hair into the field of view of the telescope. If Mr. Gascoigne's invention functions as well he claims (and I have made preliminary experiments that indicate that it does), we will in future be able to make much more accurate measurements of planetary positions. Perhaps then the influence of Mars on Earth, or Venus on Mercury, if such things exist, will become apparent to us.

But I must close now, as I have been called away to business of the highest importance, which I cannot for these ornamental pursuits neglect. I am to open the batting for the Much Hoole cricket team...

I am, sir, your obedient servant,

Jeremy Horrox

Sources:

[1] *"Jeremiah Horrocks, young genius & first Venus transit observer"*, Paul Marston (UCL, 2004)

[2] *"The Brief, Brilliant Life of Jeremiah Horrocks, Father of British Astronomy"*, Peter Aughton (Weidenfeld & Nicolson, 2004)

[3] *"Venus in Sole Visa"*, Jeremiah Horrocks (1640), trans. Revd. A.B. Whatton (1859)

What happened to Jupiter?

By Mark Edwards

I have always admired the artist JMW Turner, especially his remarkable ability to produce light out of a plain canvas. So when I heard that there was an exhibition of his works at Tate Britain in London, I just had to go.

As I entered the gallery an early painting of Turner's immediately caught my eye. Not because of its large size, in fact it must have been the smallest in the exhibition, nor because of its colour, as it was a very dark picture. No, what particularly interested me was a very small dot of white paint on it.

The Tate's postcard of *"Moonlight, a Study at Millbank"*
Just showing the full Moon and no Jupiter

The picture in question was called *"Moonlight, a Study at Millbank"* and it showed a full Moon just above the buildings and chimneys of London reflecting off the waters of the Thames. On the Thames were a couple of sailing boats with a rowing boat in the foreground. Most of the picture was very dark making the full Moon positively glow in comparison and there, just above and to right of the Moon, was a spot of white paint representing the planet Jupiter.

At least that was what I thought at the time, for Turner to have painted in just one star seemed unlikely and to be visible not only close to the horizon but close to the full Moon it had to be Jupiter. The plaque next to the picture did not enlighten the mystery, in fact it made it deeper. Rather than giving the date it was painted, it just said "exhibited 1797".

Liking a good puzzle, I thought that given the position of the Moon and Jupiter it should be possible, using a planetarium program, to work out precisely when it was painted. It would also help to confirm that indeed the spot of white paint was a representation of the planet. All I needed was a copy of the picture to make a few measurements.

That would be easy as the gallery shop sells postcards of the pictures. Leaving the exhibition I made my way to the shop, sure enough there was a postcard of the picture, showing the full Moon in all its glory, but wait a minute what happened to Jupiter? It was nowhere to be seen!

Not even a blemish on the picture where I was sure I had seen it. It was definitely a blob of very bright white paint, so there was no reason for it to be missing from the postcard.

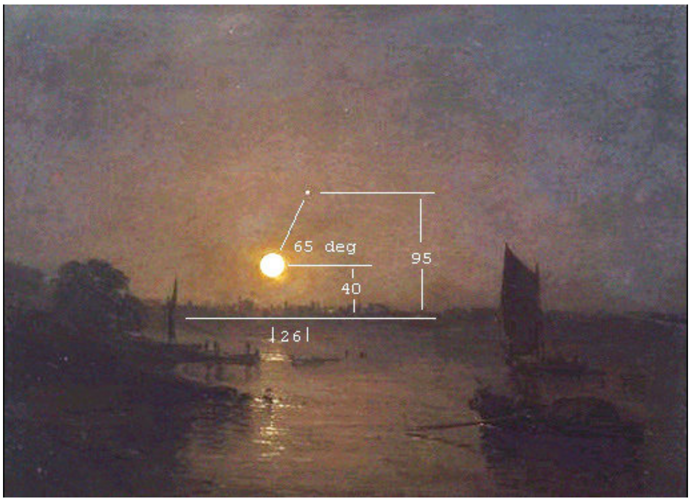
Puzzled, I then tried looking at the exhibition catalogue. Sure enough, there was the painting, there was the Moon, but again, no Jupiter! Perhaps the book of the exhibition would show it, but again Jupiter was missing.

That night when I arrived home, I tried the Tate's web site, but with the same result. Perhaps I had imagined it and what I though was Jupiter was in fact a speck of dust. Undaunted after a lot of searching on the web I finally tracked down a copy of the painting on an Italian web site (`utenti.lycos.it/astrogabriele/arte.htm`) and lo and behold, Jupiter had reappeared, exactly in the place I had seen it. I had not imagined it after all, but why was it missing from all the copies at the Tate? Had they air brushed it out as a blemish?

Now that I had final got Jupiter back in the picture I could set about my original task of finding the date of its painting.

First it was necessary to take a few measurements.

The Italian website's version of the painting
Showing the full Moon and the missing Jupiter (My marks Ed.)



The measurements used for the search

Skyglobe's predicted time for the painting

However, which measurements should I take? The obvious one of taking the diameter of the Moon as being 0.5 degree and using that to measure the altitude of the Moon and Jupiter above the horizon, was probably not going to produce a good result. This was due to the optical illusion produced when the Moon is seen close to the horizon. It always appears to be much larger than its true size when seen near familiar objects, such as buildings in the far distance.

In the end I decided that the relative positions of the Moon and Jupiter above the horizon would be the best measure, on the grounds that Turner had placed Jupiter in an odd place and so most likely painted it to represent its actual position. Also taking the angle that the Moon - Jupiter line made with the horizon would give a good cross-reference in case my estimate of the horizon position was incorrect.

The results of the measurements were:-

Altitude of Moon = 40 pixels
Altitude of Jupiter = 95 pixels
Altitude difference = 55 pixels
Azimuth difference = 26 pixels

Angle of Moon-Jupiter line to the horizon = atn($^{55}/_{26}$) = 65 degrees.

Together with these measurements was the constraint that Jupiter was near the full Moon and so must have been close to opposition at the time.

The art historians tell us that Turner did not start painting in oils until 1796 and the painting was exhibited in 1797. So all that I needed to do was to use the Skyglobe planetarium program to look for the occasions when the full Moon coincided with the oppositions of Jupiter, between 1st January 1796 and 31st December 1797.

There were two oppositions: 31st August 1796 and 7th October 1797. During these the Moon was full on 19th August 1796, 17th September 1796 and 5th October 1797.

Of course I did not know whether the Moon in the picture was rising or setting, but of the possible dates only moon rise on 19th August 1796 gave a good match. Working through the times after moon rise to match the relative altitudes of the Moon and Jupiter gave a best match at 8:35 pm GMT.

The angle of the Moon-Jupiter line to the horizon was 70 degrees which differed by only 5 degrees to that in the picture.

Besides predicting that Turner placed his blob of paint representing Jupiter at 8:35pm GMT on 19th August 1796 I could now say that he was looking at an azimuth of 115 degrees from Millbank across the Thames. This is roughly in the direction from Tate Britain towards Kennington park

Also, comparing the diameter of the Moon as painted (17 pixels) with its altitude (40 pixels = 3.7 degrees) gives a diameter of 1.5 degrees, which as suspected, is exactly three times its true diameter.

Could astronomy help to date other paintings more precisely? I am sure that it could.

One possible candidate is *"Cornfield by Moonlight with the Evening Star"* by Samuel Palmer. It shows Venus to the right of a crescent Moon and was painted around 1830. Trying to match the angle of the crescent relative to the horizon with the position of Venus gives one or two possible dates, but with no close matches. Looking at the composition as a whole it is more "artistic" than Turner's painting and so might not to be an accurate representation of the heavens.


Cornfield by Moonlight with the Evening Star
by Samuel Palmer (c. 1830)

Happy Holiviking – A Martian Calendar

By Mark Edwards

Anyone who observes Mars regularly at the same time each night can not fail to notice that its appearance does not change much from day to day. The surface features that were visible on one night seem to be in nearly the same position on the following night. At first glance it would appear that Mars is rotating very slowly backwards compared to the Earth, whereas in fact it is rotating in the same direction but taking about 40 minutes longer to complete one rotation.

This difference does not seem to be very much, so when the two Martian rovers, Spirit and Opportunity, landed recently on Mars their controllers tried to organise their day according to Martian time rather than Earth time. However, after a while they found that it was increasingly difficult to work at times that gradually drifted out of step with the day on Earth. They were constantly fighting against their biological clocks and their families. Eventually they abandoned the idea and worked shifts according to Earth time instead.

In the future, with the first manned missions to Mars, this situation could well be reversed. Any astronauts working on the Martian surface would want to plan their activities according to the hours of daylight on Mars without any reference to the time on Earth. They would want the change from one day to another to take place at their midnight and not at some arbitrary time during their day. What they would really need is their own Martian calendar!

Constructing a Martian calendar

On Earth our calendars are based around two main measurements:-

i) The length of the mean solar day = 24 hours.
ii) The length of the mean tropical year = 365.24219 days.

Looking at the equivalent figures for Mars reveals:-

i) The length of the mean Martian solar day = 1 sol = 24.65979 hours or 24 hours 39 mins 35.244 secs.
ii) The length of the mean Martian tropical year = 686.9726 days = 668.5921 sols.

The Martian day

As the length of the Martian day (called a sol) is so close to that of an Earth day (2.7% longer) it would seem reasonable to equip Martian astronauts with Earth-type watches, but make them run 2.7% slower than normal. These watches would then display the time in Martian hours, minutes and seconds. Where:-

1 Martian second =	1.02749125 secs
1 Martian minute =	60 Martian seconds
1 Martian hour =	60 Martian minutes
1 sol =	24 Martian hours

Although for easy comparison (and to avoid conversion errors), any scientific observations would have to be made using the standard Earth based values.

The Martian year

Originally, the year in our Earthly calendar started with the Vernal Equinox (before certain Roman emperors started to tinker with it) so it would be nice to start the Martian year at the Martian Equinox.

The numbering of the years would naturally start with the date of the first manned landing, this year becoming year 0. Prior years could be known as BL (before landing) and subsequent years as AL (after landing).

As with the Earth, the length of the mean Martian tropical year (668.5921 sols) is not an exact number of sols, so our Martian calendar will have to contain leap years. The difference from a whole sol though is over twice that of the Earth: 0.5921 sol as opposed to 0.24219 days, so the frequency of leap years will have to be at least twice that on Earth.

If we introduce a leap year every other year, the mean year length would equal $668 + {}^{1}/_{2}$ = 668.5 sols. This would leave us 0.0921 sol short. Making every 10^{th} year a leap year as well would add 0.1 sol, which is too large, but this could be avoided by making century years a normal year instead, resulting in 9 leap sols every century or an average of 0.09 sol per year. This leaves a deficit of 0.0021 sol, which could be reduced to just 0.0001 sol by making every 500 years a leap year.

The above arguments give the following rules for determining whether a Martian year is a leap year:-

i) If the year number is odd the year is a leap year.
ii) If the year number is divisible by 10 the year is a leap year, unless:-
iii) If the year is divisible by 100 the year is not a leap year, unless:-
iv) If the year is divisible by 500 the year is a leap year

The Martian month

As we have seen, a Martian year consists of 668 sols or 669 sols in a leap year. How can we divide up such a long year into more manageable pieces?

Here we have a piece of luck. As the Martian year is a nearly twice the length of an Earth year, we can try dividing it up into twice the number of months, ie. 24 instead of 12.

Now ${}^{668}/_{24}$ = 27.8333 sols

Which is so close to a Martian month length of 28 sols that it could not have been better planned! Using a Martian month of 28 sols means that it can be conveniently divided into 4 Martian weeks of 7 sols each. This leaves the slight problem that 24 x 28 sols = 672 sols or 4 days longer than a Martian year.

All is not lost though as we can make the last month of the year a short month of 24 sols, to which the leap sol is added.

To keep the start of the Martian week synchronised to the start of the Martian year (and to give everyone a holiday at the end of the year) we could make the last Martian month only 3 Martian weeks long but follow it by 3 holidays (or "holisols") in a normal year and 4 holisols in a leap year.

In summary:-

1 Martian week = 7 sols
1 Martian month = 4 Martian weeks (or 3 Martian weeks for the last month of the year)
1 Martian year = 23 (4 week) Martian months + 1 (3 week) Martian month + 3 holisols + [1 leap holisol]

The names of the Martian months

The months of the Martian year are difficult to name as there are 24 of them to remember in sequence. As the English word "month" is derived from the word "moon" and Mars has two moons (Phobos and Deimos), we could split the Martian year into two halves of 12 months each and name the months in each half after each moon. To make it easy to remember their order we could just use the number of the month in the corresponding half-year. Shortening Phobos to the suffix "phob" and Deimos to "dem" would give the following names for the Martian months:-

Phobos months	Deimos months
1 Onephob	13 Onedem
2 Twophob	14 Twodem
3 Threephob	15 Threedem
4 Fourphob	16 Fourdem
5 Fivephob	17 Fivedem
6 Sixphob	18 Sixdem
7 Sevenphob	19 Sevendem
8 Eightphob	20 Eightdem
9 Ninephob	21 Ninedem
10 Tenphob	22 Tendem
11 Elevenphob	23 Elevendem
12 Twelvephob	24 Twelvedem

The names of the Martian days of the week

The names assigned to the days of an Earth week are derived from the names of the Sun, the Moon and the visible planets:-

Sunday = The day of the Sun
Monday = The day of the Moon
Tuesday = The day of Mars
Wednesday = The day of Mercury
Thursday = The day of Jupiter
Friday = The day of Venus
Saturday = The day of Saturn

We could use the same scheme for naming the sols of a Martian week, but replacing Mars with the Earth as one of the visible planets and "day" with "sol" to give:-

Sunsol = The sol of the Sun
Monsol = The sol of the Moons
Earsol = The sol of the Earth
Mersol = The sol of Mercury
Jupsol = The sol of Jupiter
Vensol = The sol of Venus
Satsol = The sol of Saturn

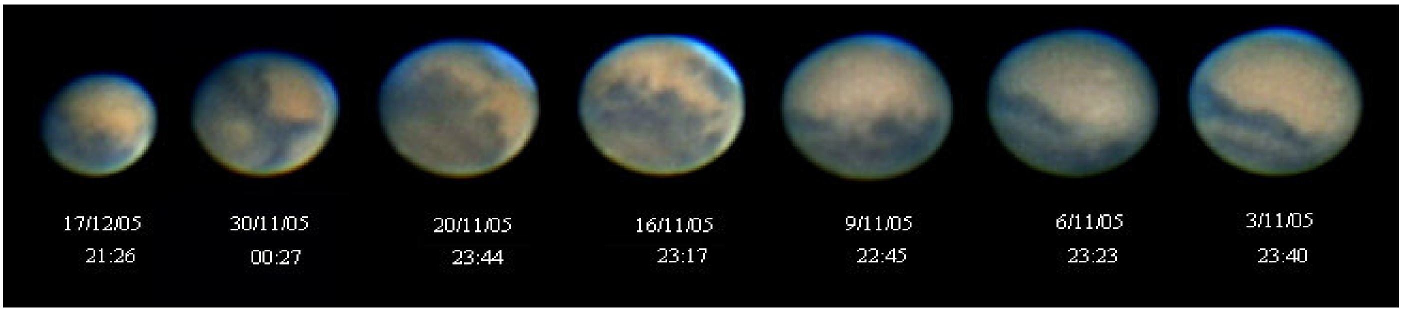
This just leaves the naming of the 4 holisols. We could call them Holimars, Holiphobos and Holidiemos to celebrate Mars and its satellites, the leapsol could then be reserved to celebrate the first Mars lander and called Holiviking.

Some examples

The date of the second manned landing on Mars might appear as: Mersol 18th Fivedem 10 AL and the first New Year's day as: Sunsol 1st Onephob 1 AL

Interestingly, a leap year holiday would always be on Holiviking 25th Twelvedem - a Martian Christmas day?

A few of Marks shots of Mars during last years approach



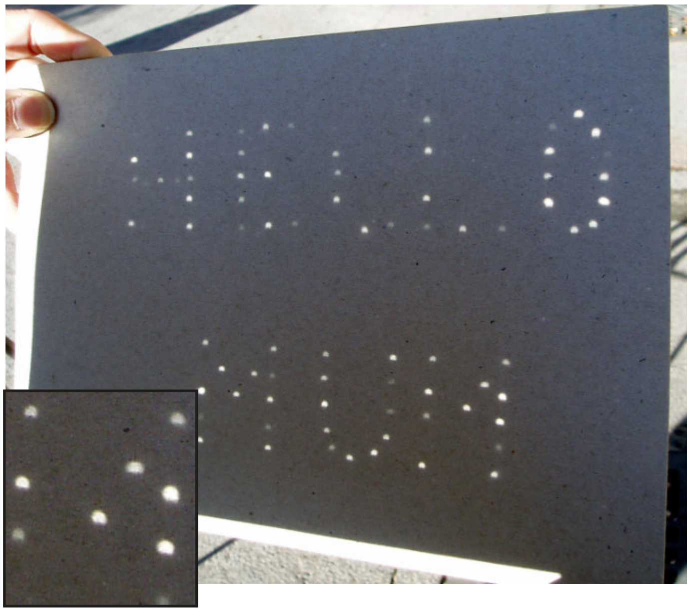
Mark comments "All of the Mars pics were taken on my 10" Meade LX200 SCT with a x2 Barlow and a Philips ToUcam web camera. The pictures were made from 100 stacked video frames using Registax and were taken at 25 frames/s with an exposure of $^{1}/_{25}$s for each frame."

Eclipse Madrileno

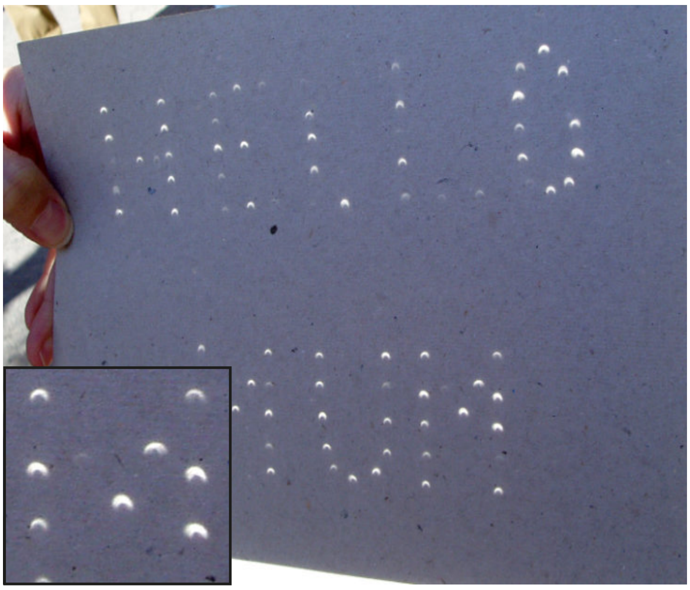
By Mike Frost

The annular eclipse of October 3rd 2005 began in the northern Atlantic Ocean, sweeping over the Iberian Peninsula and the western Mediterranean before tracking across northwestern Africa, and crossing into the Indian Ocean at the Kenyan coast. Several Spanish cities lay in the path of annularity - I chose the Spanish capital Madrid.

My choice was a good one; Madrid is a great city. I visited the imposing royal palace and the cathedral and took the guided tour of the Santiago Bernebeu stadium, home to Real Madrid (I sat in the dugout, in seats graced by the backsides of Messrs. Beckham, Zidane, Ronaldo and Owen). The art museums of Madrid are world-class. The Prado contains masterpieces by Velazquez, El Greco, Breughel and Hieronymous Bosch, among many others. There are 115 works by Goya, ranging from seductive nudes to the "dark paintings" of the artist's final descent into madness. By contrast, the Sofia Reine museum of modern art contains many works by Salvador Dali and Pablo Picasso, with Picasso's Guernica the outstanding attraction, whilst the Thyssen museum has a "Greatest Hits" approach to art, with at least one painting by almost everyone you've ever heard of.

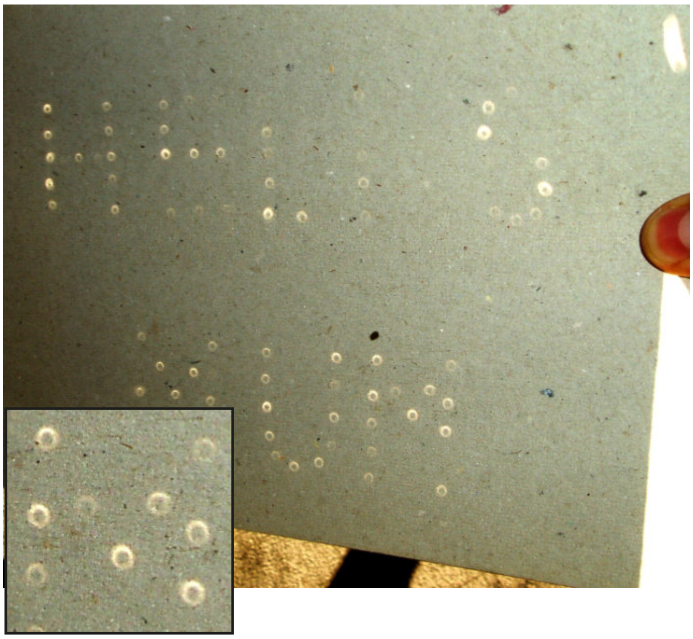


Mike's pinhole experiment; a cardboard screen with the words "HELLO MUM" at the start of the eclipse. See enlargment in LH corner.



HELLO MUM shadows with the moon half way across the sun

So a long weekend passed very quickly. Then it was Monday morning, and time for the eclipse. Unfortunately I had to be in Pittsburgh by Tuesday evening, necessitating a quick exit from Madrid at mid-day, before the eclipse had even finished. This ruled out the plans of one set of my friends, who planned observing from the Retiro Park, east of the city-centre. The Madrid planetarium planned a musical concert during the eclipse, featuring a violin solo during the annularity - an imaginative idea but not one for the serious astronomer! So I joined in with another set of friends who had a penthouse apartment near the Plaza de Santa Ana, in the centre of the city.



The moon sitting on top of the solar disk, leaving a bright ring or annulus round the outside.

The start of the eclipse wasn't visible from the apartment balcony, so we agreed to meet up in the Plaza for the first stages of the eclipse. I arrived at 9:45am Pam and David Forshaw of Liverpool AS, who rented the apartment, had already set up a tripod and camera. Anne Piggott and Dave Underwood (who donated books to our society earlier this year) were also setting up their equipment. Conditions

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could hardly have been better. The skies were cloudless and fairly haze-free; it was a bright warm autumnal morning.

There were two other astronomers in the plaza, a couple with a triangular solar scope, and perhaps half a dozen curious locals and tourists. Between us we also had perhaps half a dozen eclipse glasses, various binoculars with solar filters, and a camera. David Forshaw had brought a glitter ball, which he hung from his tripod, casting solar images around the square. And I had a pinhole experiment; a cardboard screen with the words “HELLO MUM” marked out in pinholes.

Shortly before 10 o’clock the Moon crossed the upper threshold of the solar disk. Over the course of the next hour we watched it make its way across. The trees in the square provided lots of natural pinholes, showing a bite in the Sun, and then a crescent. The square gradually filled up with people; workmen in overalls taking a break from their employment; curious tourists unaware that an eclipse was taking place; a mother and her young son, wide eyed with excitement. The eclipse glasses were passed around the throng and we kept an eye open for anyone attempting to observe through sunglasses or other ineffectual filters. The temperature dropped slowly but noticeably. As annularity approached shadows took on extraordinary shapes, illuminated by wide crescents. Crossed fingers showed very sharp shadows in one direction; hugely blurred at ninety degrees- because of the geometry of annularity, this effect was more marked than in previous total eclipses I have viewed. I tried covering the Sun and observing the trailing edge of the Moon to see if I could spot the solar corona, but the sky was far too bright.

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Finally at six minutes to eleven the trailing edge of the Moon crossed the edge of the solar disk and the annular phase of the eclipse commenced. The Moon, too far from Earth in its orbit to cover the Sun completely, instead sat on top of the solar disk, leaving a bright ring or annulus round the outside. The Sun was still far too bright to look at directly, so everyone watched through filters or by projection. Every pinhole was a ring; a slight breeze caused an astonishing shimmer of rings in the shadows of the bushes

All too briefly the annular phase was over. There wasn’t the sudden “diamond ring” which so spectacularly marks the end of a total eclipse; instead the sky gradually began a return to normality, and the crowds drifted away. We retired to the Forshaws’ apartment to drink a glass of cheap champagne (purchased by me - the second cheapest in the shop), take some more pictures of the glitterball crescents, finish off the contents of the fridge, and congratulate ourselves on another successful eclipse. It wasn’t an emotional high to compare with the extremes of a total solar eclipse; but it was an extraordinary sight. And the atmosphere in the Plaza de Santa Ana, surrounded by a happy, excited crowd of Madrilenos and visitors, was one I shall remember with affection for a long time to come.