

Wadhurst Astronomical Society Newsletter April 2013

COMMITTEE MEETING

The Committee are respectfully reminded that there is a meeting of the Committee on Monday, 8th of April. It starts at 1930 at Phil Berry's house.

As always, any member of the Society is welcome to come along, but please let Phil know beforehand.

MEETINGS

MARCH MEETING

The March meeting was introduced by Phil Berry, telling members that the Society had received a Certificate of Appreciation from NASA for our contribution in promoting NASA through the SpacePlace programme we carry in the Newsletter.

He then introduced Doctor David Mannion, thanking him for coming all the way from Whitstable. David is Head of Science at CATS College in Canterbury and runs a website at: www.worldofastronomy.org.uk

Phil then said that David is taking part this week in the British Weightlifting Championships.

He last spoke to the Society in 2011 when his talk was about Galileo and 400 Years of Telescopic Astronomy. Tonight's talk is called "Cosmology Revealed".

Cosmology Revealed

Dr. David Mannion

David began by saying that back in the 1950s; the general ideas of how the Universe began were divided between the Steady State theory and the Big Bang theory. At the time Professor Fred Hoyle, a prominent astronomer, thought the idea of a Big Bang was highly unlikely although today that is the theory generally considered to be the right one.

It is now thought that there are something like 100 billion stars in our galaxy and we were told that there are something like 100 billion galaxies in the Universe so that there are something like 10^{22} stars altogether which is more than the number of grains of sand on all the beaches in the world! (not including the deserts though)

At one time it was believed that the Universe was infinite, but then that suggested there would be an infinite number of stars and Olber's Paradox posed that if that was the case, there would be light from every part of the sky and it should be bright, but in fact it is dark at night.

As David went on to say, we are part of the Milky Way galaxy, and The Great Andromeda Nebula is another not far away. As telescopes got better it was discovered that there were many more. But it was in 1923 that Edwin Hubble discovered that the more distant the stars and galaxies were, the greater the red shift, meaning that they were speeding away from us and so the Universe must be expanding. The limit is now calculated to be over 13 billion light years away.

We now considered where galaxies would have been in the past and any two galaxies could be traced through their movement to have been closer together. David said that 13.7 billion years ago, they would all have come to one point; a

singularity. Incredible though this might seem, physicists have estimated that it must have been smaller than an atom!

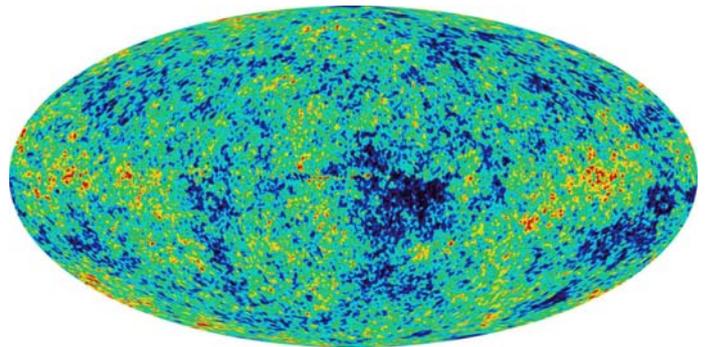
The furthest physicists can calculate back is within 10^{-43} of a second. Then, the temperature would have been an unbelievable 10^{32} Kelvin! Following this the Universe expanded and cooled.

In 1948, George Gamow wrote a paper proposing that there must now be a background radiation of about 5 Kelvin but it was not until 1965 that two scientists in the USA using a very sensitive microwave receiver, and having checked for any possible source of earth-generated radiation, detected faint microwave radiation from every direction in the sky and this they believed was the background microwave radiation.

Scientists have worked out that in the first few minutes of fusion after the Big Bang, 24% helium would have been created and David also said that in those first few minutes, Lithium would have been produced as well.

We then looked at how the amount of red shift in an object's spectrum can be measured by looking at the spectral lines to reveal the velocity at which it is receding from us. We were told that this velocity is due to space itself being pulled apart, rather like a rubber sheet being stretched.

Next David explained how a Black Body absorbs radiation but as it is heated it begins to radiate and the colour represents the temperature, the Sun peaking in the yellow part of the spectrum with a temperature of about 6,000 Kelvin. The Microwave Background Radiation found in any direction we look in space is 2.728 Kelvin; just above absolute zero and cooling very slowly over billions of years. But just after the Big Bang, it took until the temperature had dropped to about 3,000 K before atoms began to form.



*Microwave background radiation today
Image from the European Space Agency*

We were shown the Timeline of the Big Bang and at 10^{-33} seconds Inflation is the size of an orange. At less than 1 second, matter and anti-matter annihilate each other leaving enough matter to form the Universe. After 500 million years there were still no stars. The first stars began to be formed in the "lumpiness" of the "soup" that made up the Universe between 600 and 1000 million years. Then, galaxies began to form.

It is estimated that 9.1 billion years after the Big Bang, the Sun and the Solar system formed. At 9.9 billion years, life began on Earth and then at 13.1 billion years creatures began to appear on land on the Earth.

As a demonstration of the life of Man, David used a scale of 13 metres to represent 13 billion years and against this scale he

held up a piece of paper, saying that if primates were on one side, Einstein would be just on the other side; a hundred thousand years!

We looked at the future of the Universe over the next trillion years or so. After 100 trillion years, all stars would be dead and the Universe, dark.

In 1933 a Swiss astronomer named Fritz Zwicky calculated that the mass of the Universe was much greater than expected and thought the extra mass could not be seen so he called it Dark Matter. In 1998 it was discovered that the Universe was not only expanding but that expansion was accelerating and the search was on for the reason why. Dark Energy is now believed to be the cause although it is still not known what it is.

If the Universe was eventually to collapse David said it would have been known as the Big Crunch. Now, everything will be torn apart and he said this is sometimes known as The Big Rip! Looking even further into the future, the temperature would reach Absolute Zero and at that point all atoms and particles would stop moving and there would be nothing. It might be that on the way there, Black Holes might pop into existence and pop out again.

At one point during his talk, David said he was once asked where the centre of the Universe is and he said it was right here because it all started from one singularity, so that would be 'right here' for everywhere in the Universe... Needs thinking about!

The talk generated a lot of discussion which continued well into the pub after the meeting.

Brian Mills' talk for beginners Venus

Brian Mills, our Director of Observations

Brian Mills continued his series of talks for beginners by taking Venus as his subject.

Venus is our nearest neighbour in the Solar System; the orbit only being 1/3 of an Astronomical Unit (AU) from us; an AU being the distance of the Earth from the Sun; 93 million miles. (see more accurate definition later in the Sky Notes)

Seen from the Earth, Venus can only reach a maximum angle (elongation) from the Sun of 47.8°. We looked at a series of images of Venus from nearly full but small because it was on the far side of the Sun in its orbit. The size increased as the orbit brought Venus to our side of the Sun but the phase reduces. It is brightest as seen from Earth in the crescent phase.



Comparing the sizes of the inner planets: Mercury, Venus, Earth and Mars

Comparing the sizes of the inner planets we could see that Venus is only very slightly smaller than the Earth, with Mars and Mercury very much smaller.



Facts about the planet Venus

One amazing fact Brian pointed out was that a year on Venus is 225 Earth days but a day is 243 Earth days. This is because Venus is axially retrograde, that is, rotating in the opposite direction to the Earth. The reason for that is that the axial tilt of Venus is 177° compared with the Earth's 23°. Only one other planet has a large axial tilt and that is Uranus with a tilt of 97°.

Because of Venus's atmospheric pressure and content, it is pretty well the same temperature all over. The atmosphere is 96.5% carbon dioxide, 3.5% nitrogen and very small amounts of sulphur dioxide, Argon, neon, helium, carbon monoxide and water vapour. Chemically this produces droplets of sulphuric acid in the clouds which are about 75% reflective as seen from space.

Venus has a semi-liquid metallic core surrounded by a rocky mantle 3,000 km thick and topped by the crust which is 50 km thick.

Because of the thickness of the atmosphere, Brian said the only images from space we have of the surface were made using radar, but these reveal that there are very few impact craters to be found.

Brian then gave the Sky Notes for April that follow later in this Newsletter.

APRIL MEETING

Wednesday 17th April 2013 – "The Sky at Night", a talk about the programme given by the BBC producer.

Meetings begin at 1930 although members are invited to arrive anytime after 1900 as this is a good time to exchange ideas and discuss problems and also relax before the meeting.

The venue as always is held in the Upper Room of the Methodist Church at the east end of Wadhurst Lower High Street, opposite the entrance to Uplands College. (For those with SatNav – the post code is TN5 6AT)

Anyone is welcome but non-members are asked if they wouldn't mind contributing £2 towards costs.

FUTURE MEETINGS

Wednesday 15th May 2013 – Professor Louise Harra will be speaking about the Sun. "Solar Activity – Are we at a Maximum?"

Wednesday 19th June 2013 – Open Evening. An evening to look at and talk about telescopes.

Wednesday 17th July 2013 – John Vale-Taylor gives a useful talk; "Astrophotography on a Shoestring".

OTHER NOTES AND INFORMATION

ANNUAL SUBSCRIPTIONS

We are now into the Society's new session, and again, the subscriptions remain the same as in previous years. Membership for the year is still £15.00 and £20 for two members within the same family at the same address. Children and students under 17 are free and always welcome.

Subscriptions can be made at the meetings, preferably by cheque payable to "Wadhurst Astronomical Society" or can be posted to our Treasurer, Michael Wyles at:

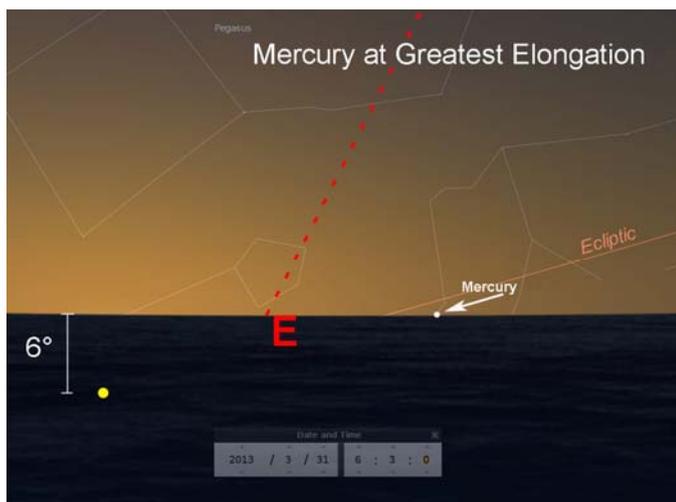
31 Rowan Tree Road
Tunbridge Wells
Kent
TN2 5PZ

Visitors to meetings are asked to donate £2 as a contribution towards costs.

SKY NOTES FOR APRIL

Planets

Mercury is a morning object, and reached greatest western elongation on the last day of March although sadly it will not be visible from the UK at this apparition. The ecliptic in the mornings at this time of year makes a very shallow angle with the horizon meaning that any inner planets are bound to be very low in the sky and will therefore rise a short time before the Sun. The diagram below shows the situation when Mercury was at greatest western elongation with the Sun 6° below the horizon and the planet just rising. Observation would be nearly impossible with the sky continuing to brighten and the inherent dangers posed by the Sun if you are sweeping with binoculars. The red dotted line indicates the angle the ecliptic would make with the horizon six months later and shows that a planet at the same angular distance from the Sun as Mercury is currently would be at a much greater altitude and therefore far easier to locate.

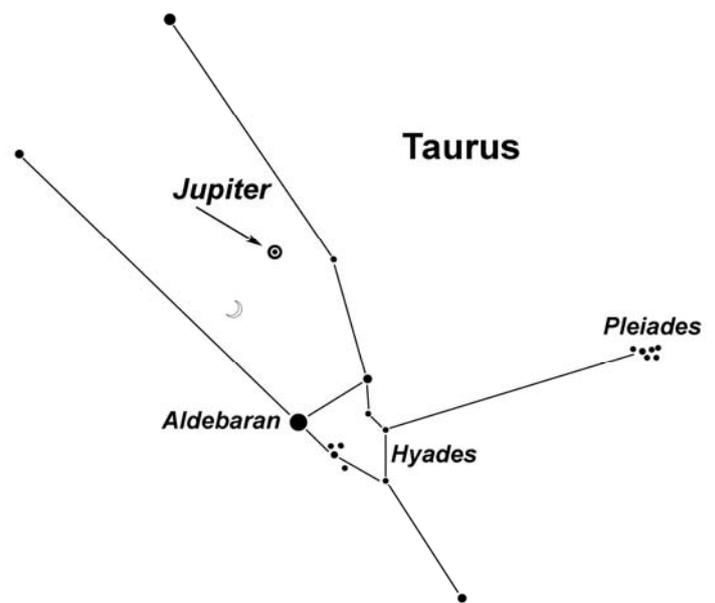


Venus suffered a superior conjunction on March 28th and is not visible this month.

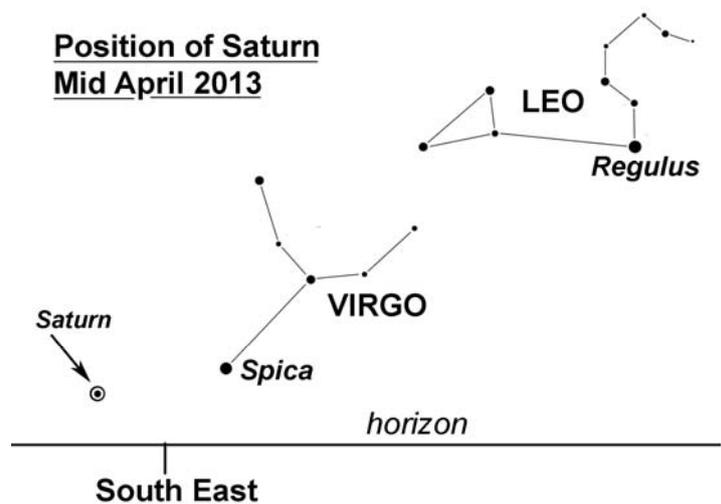
Mars will be in conjunction with the Sun on April 18th and is therefore not currently visible.

Jupiter is still a striking evening object in Taurus at magnitude -2.0, although it's period of visibility is gradually decreasing. By the end of this month it will have set before midnight (BST). If

you have binoculars, look for the four Galilean moons- Io, Europa, Ganymede and Callisto. The map shows the position of the planet during April, plus the crescent Moon as it passes nearby on the 14th.



Saturn is becoming better placed, rising as it does by 22.00 (BST) at the start of the month. By the end of the month this has become 20.00, although with opposition occurring on the 28th the Sun will quite naturally be setting as Saturn rises, so the planet will be visible throughout the night. Its distance from Earth at this time is approximately 8.25 AU* (astronomical units).



At magnitude +0.2, it is moving retrograde in Libra, crossing into neighbouring Virgo later in the year before returning to Libra in early September. The planet is a beautiful object even in a small or moderate telescope, with the rings currently tilted at just over 18° as seen from Earth, although this will have increased to over 22° by the end of the year.

*The length of the astronomical unit (AU) was redefined by the International Astronomical Union (IAU) in 2012 to be 149,597,870,700m. It can be more simply (though less accurately) be defined as the average Earth to Sun distance.

Lunar Occultations

In the table below I've listed events for stars down to around magnitude 7.0 that occur before midnight although there are many others that are either of fainter stars or occur at more unsociable hours. DD = disappearance at the dark limb.

The column headed "mm" (millimetres) shows the minimum aperture telescope required for each event. A diagram is included to show the point of disappearance for the brightest event on the 14th. **Times are in BST.**

Please remember that the Society has telescopes that members can borrow, all of which are suitable for the following events.

| Apr | Time | Star | Mag | Ph | Alt ° | % illu | mm |
|------------------|-------|----------|-----|----|-------|--------|----|
| 14 th | 21.53 | ZC736 | 6.4 | DD | 20 | 18 | 40 |
| 17 th | 20.50 | SAO96848 | 7.1 | DD | 47 | 43 | 60 |
| 18 th | 20.35 | ZC1237 | 6.5 | DD | 50 | 53 | 50 |

14th April 2013
21.53 BST



Phases of the Moon for April

| Last ¼ | New | First ¼ | Full |
|-----------------|------------------|------------------|------------------|
| 3 rd | 10 th | 18 th | 25 th |

ISS

Below are details of passes of the International Space Station (ISS) that occur before midnight and are brighter than magnitude -2.0. The details of all passes, including those visible from other areas, can be found at:

www.heavens-above.com

Please remember that the times and directions shown below are for when the ISS is at its **maximum** elevation, so you should go out and look five minutes beforehand. **Times are in BST.**

| Apr. | Mag | Time | Alt° | Az. |
|------------------|------|-------|------|-----|
| 9 th | -2.6 | 21.06 | 33 | SSE |
| 10 th | -3.5 | 21.52 | 75 | SSE |
| 11 th | -3.2 | 21.02 | 57 | SSE |
| 12 th | -3.4 | 21.49 | 83 | N |
| 13 th | -3.4 | 20.58 | 85 | SSE |
| 13 th | -2.5 | 22.34 | 49 | WNW |
| 14 th | -3.3 | 21.45 | 78 | N |
| 15 th | -3.2 | 20.55 | 79 | N |
| 15 th | -2.7 | 22.31 | 52 | W |
| 16 th | -3.4 | 21.41 | 90 | SSW |
| 17 th | -3.3 | 20.51 | 81 | N |
| 17 th | -2.5 | 22.27 | 40 | WSW |
| 18 th | -3.2 | 21.38 | 63 | SSW |
| 19 th | -3.3 | 20.47 | 81 | SSW |
| 20 th | -2.4 | 21.34 | 37 | SSW |
| 21 st | -2.8 | 20.44 | 52 | SSW |

Iridium Flares

The flares that I've listed are magnitude -2 or brighter although there are a lot more that are fainter or occur after midnight. If you wish to see a complete list, or obtain timings for somewhere other than Wadhurst, go to:

www.heavens-above.com

Remember that when one of these events is due it is sometimes possible to see the satellite before and after the "flare", although of course it will be much fainter at those times. **Times are in BST.**

| Apr | Time | Mag | Alt° | Az° |
|------------------|-------|------|------|-----------|
| 3 rd | 19.58 | -6.5 | 69 | 141 (SE) |
| 15 th | 21.33 | -2.2 | 17 | 353 (N) |
| 19 th | 23.42 | -6.9 | 23 | 244 (WSW) |
| 22 nd | 23.34 | -2.7 | 21 | 251 (WSW) |
| 23 rd | 23.27 | -6.8 | 22 | 253 (WSW) |
| 24 th | 20.30 | -5.9 | 34 | 347 (NNW) |
| 25 th | 23.24 | -2.6 | 20 | 258 (WSW) |
| 26 th | 23.19 | -6.7 | 21 | 259 (W) |
| 27 th | 23.13 | -2.3 | 21 | 262 (W) |
| 28 th | 23.16 | -3.2 | 19 | 264 (W) |
| 29 th | 23.10 | -6.3 | 19 | 267 (W) |

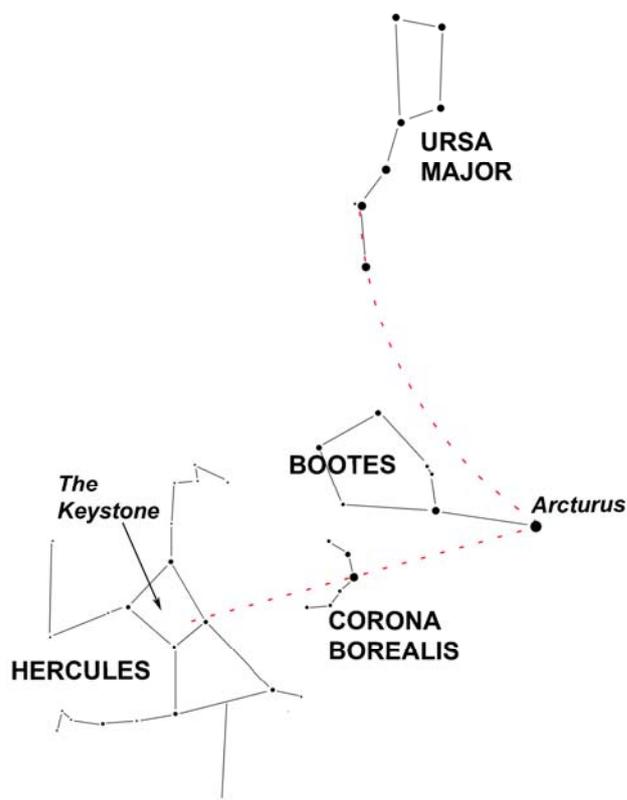
The Night Sky in April (Written for 22.00hrs BST mid month)

In the east Boötes has risen along with the other summer constellations of Corona Borealis and Hercules. The brightest star in Boötes (Arcturus) can be used as a pointer to the other two groups of stars.

Looking south we see Leo riding high on the meridian, and below it Hydra (the water snake). The ecliptic is well marked by bright constellations at this time with Saturn indicating its position at the eastern horizon. It then passes through Virgo, close to the bright star Spica, and on into Leo, Cancer, Gemini and finally Taurus which is setting on the western horizon.

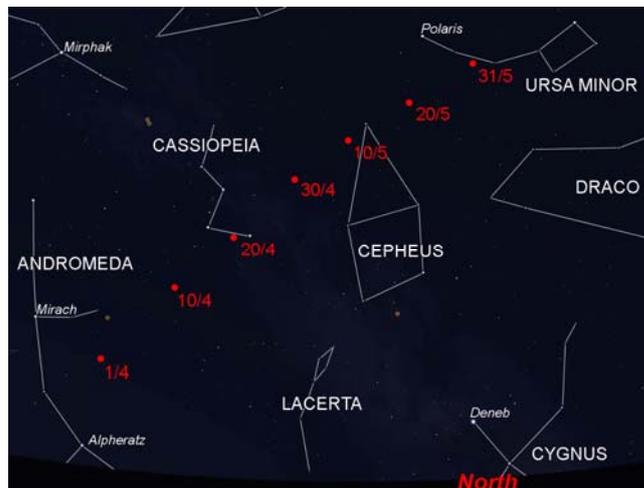
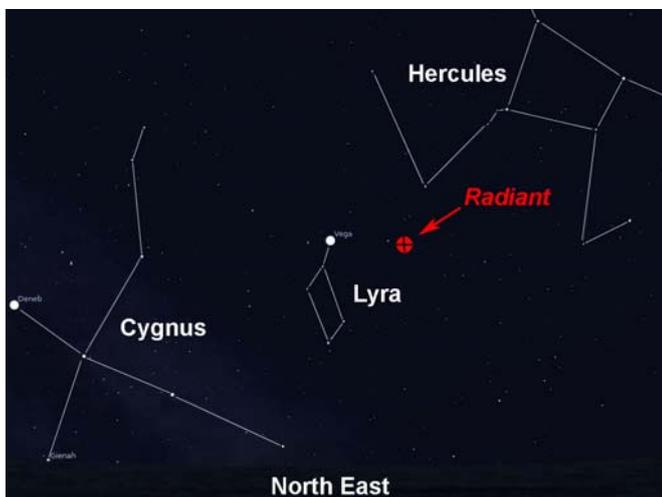
Towards the west Orion and Canis Major are also disappearing although Jupiter is still at an altitude of around 20°.

In the north the plough is almost overhead which means that on the opposite side of the pole Cepheus and Cassiopeia are at their lowest. Two of the stars in the summer triangle, Deneb and Vega are beginning to climb away from the horizon.



Meteors

The Lyrids are active from April 18th to the 25th with maximum occurring around midday on the 22nd. This means that some activity may be seen on the nights of 21st/22nd and 22nd/23rd. At maximum and in ideal conditions something in the order of 10 meteors per hour are possible. At 22.00hrs BST the radiant lies in the south east at an elevation of 15°, although a waxing gibbous Moon in the south will make observations more difficult.



Comets

Comet C/2011 L4 Pan-STARRS

Like many comets before it, Pan-STARRS hasn't really lived up to its hype although it wasn't helped by making its first appearance to UK observers in bright twilight skies very close to the horizon. However, I have photographed it on two occasions although at neither time was I able to find it visually, even with binoculars. One of the images, which is shown below, was possibly only the second image of the comet taken from the UK. Sadly, it is far from imposing.



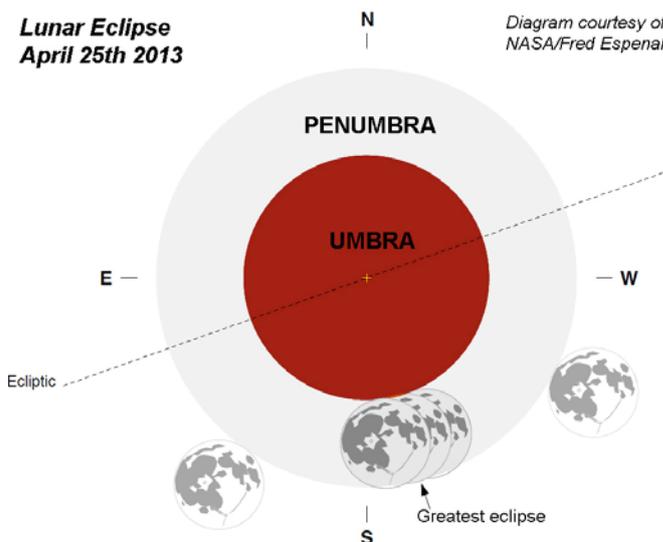
The comet is now fading in brightness although it is moving northwards out of the twilight which should help a little to locate it. Its position during April and May is shown on the map below.

Partial Lunar Eclipse

A partial eclipse of the Moon occurs on April 25th. This takes place as the Moon rises, and at maximum, only 1.5% of the Moon is immersed in the umbral shadow so it will be far from obvious although it may be possible to see some reddening around the area of eclipse. The Moon rises at 20.15 when it is already well inside the penumbral shadow and makes first contact with the umbra at 20.54. Maximum eclipse occurs at 21.08 with last umbral contact at 21.21 when the Moon is only 8° high. All times are BST.

Lunar Eclipse April 25th 2013

Diagram courtesy of NASA/Fred Espenak



Brian Mills

NASA SPACE PLACE

Your Daily Dose of Astonishment

By Diane K. Fisher

As a person vitally interested in astronomy, you probably have the Astronomy Picture of the Day website at apod.nasa.gov set as favourite link. APOD has been around since practically the beginning of the web. The first APOD appeared unannounced on June 16, 1995. It got 15 hits. The next picture appeared June 20, 1995, and the site has not taken a day off since. Now daily traffic is more like one million hits.

Obviously, someone is responsible for picking, posting, and writing the detailed descriptions for these images. Is it a whole team of people? No. Surprisingly, it is only two men, the same ones who started it and have been doing it ever since.

Robert Nemiroff and Jerry Bonnell shared an office at NASA's Goddard Space Flight Centre in the early-90s, when

the term "World Wide Web" was unknown, but a software program called Mosaic could connect to and display specially coded content on other computers. The office mates thought "we should do something with this."

Thus was conceived the Astronomy Picture of the Day. Now, in addition to the wildly popular English version, over 25 mirror websites in other languages are maintained independently by volunteers. (See :

http://apod.nasa.gov/apod/lib/about_apod.html
for links).

An archive of every APOD ever published is at:

<http://apod.nasa.gov/apod/archivepix.html>

Dr. Nemiroff also maintains a discussion website at:

<http://asterisk.apod.com/>.

But how does it get done? Do these guys even have day jobs?

Dr. Nemiroff has since moved to Michigan Technological University in Houghton, Michigan, where he is professor of astrophysics, both teaching and doing research. Dr. Bonnell is still with NASA, an astrophysicist with the Compton Gamma Ray Observatory Science Support Centre at Goddard. APOD is only a very small part of their responsibilities. They do not collaborate, but rather divide up the calendar, and each picks the image, writes the description, and includes the links for the days on his own list. The files are queued up for posting by a "robot" each day.

They use the same tools they used at the beginning: Raw HTML code written using the vi text editor in Linux. This simple format has now become such a part of the brand that they would upset all the people and websites and mobile apps that link to their feed if they were to change anything at this point.

Where do they find the images? Candidates are volunteered from large and small observatories, space telescopes (like the Hubble and Spitzer), and independent astronomers and astro-photographers. The good doctors receive ten images for every one they publish on APOD. But, as Dr. Nemiroff emphasizes, being picked or not picked is no reflection on the value of the image. Some of the selections are picked for their quirkiness. Some are videos instead of images. Some have nothing to do with astronomy at all, like the astonishing August 21, 2012, video of a replicating DNA molecule.

Among the many mobile apps taking advantage of the APOD feed is Space Place Prime, a NASA magazine that updates daily with the best of NASA. It's available free (in iOS only at this time) at the Apple Store.

at the bottom of the sea aboard a Greek ship that sank in 80 BCE. It is an Antikythera mechanism, a mechanical computer of an accuracy thought impossible for that era. Its wheels and gears create a portable orrery of the sky that predicts star and planet locations as well as lunar and solar eclipses.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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www.wadhurstastro.co.uk

SAGAS web-site

www.sagasonline.org.uk

Any material for inclusion in the May 2013 Newsletter should be with the Editor by April 28th 2013



Caption:

The January 20, 2013, Astronomy Picture of the Day is one that might fall into the "quirky" category. The object was found