South-West Herts Astronomical Society Newsletter Jan. 2021

Notes of our online meeting Nov. 27th

By Richard Westwood

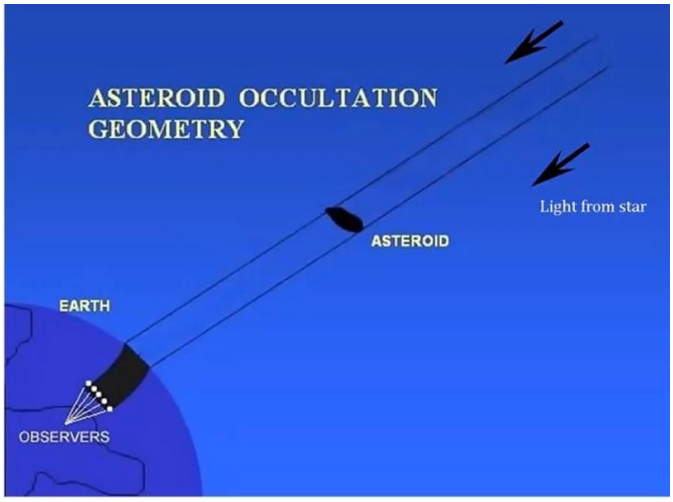
Astro-news presented by Len Mann

Len's subject for this evening was the 'Drake Equation'; created by astronomer Frank Drake in the 1960's this was an attempt to deduce the number of sentient beings in our galaxy. Of course, at the time this was little more than guesswork; almost all the factors were not known: however, now we do have some real data in three areas. The type of stars needed; not too hot; not to cool and stable for very long timescales. The planet needs to be in a 'Goldilocks' orbit, not too hot, not too cold. We also now have an idea of how many of planet-hosting stars exist.

$$N = R_* \cdot f_\mathrm{p} \cdot n_\mathrm{e} \cdot f_\mathrm{l} \cdot f_\mathrm{i} \cdot f_\mathrm{c} \cdot L$$

In the 1990's the first crude detections were made by ground based and orbiting telescopes. The method used was to measure the amount of the back-and-forth movement made by a star caused by smaller objects in orbit around it – proper motion measurements were used as well as doppler shift for radial motion. At first, only 'hot Jupiters' showed up, due to this very course method of observation.
With the launch of Kepler, which used a transit system, noting the very slight dimming of a stars' light as the smaller body passes in front of it; smaller, earth like planets could be detected. In, quite a little area of sky, near Vega.
Len pointed out that this, when multiplied by the number of Sun-like stars in our galaxy, showed that the chances of sentient, intelligent civilisations in our galaxy were much higher than thought. He added that that made him feel optimistic, that *We Are Not Alone*.
Just a thought – I'm sure I'm not the only one to suggest that the number might be higher still: remember that Kepler only could measure stars in which the planets were in line-of-sight to us!
Thanks Len!

Simon Kidd – Asteroid Occultations



It was J E Bode that started it. In 1772 he published a book containing a paper by J D Titius about a relationship between the radius of planetary orbits and a set of numbers. All the planets roughly conformed to the allotted number; and even when Herschel discovered Uranus the planet was close to the value noted by Bodes Law (as it became known).
But there was the great void between Mars and Jupiter. The 'law' predicted that a body should orbit in that vast space.
In 1799 Xavier von Zach(!) a prominent astronomer, decided to form a group of like-minded astronomers to set up a search group, each one allotted a portion of the ecliptic to

observe. A meeting was convened at Lilienthal in Germany; home of Johann Schroter, as he was the foremost lunar and planetary observer of the time and there were several keen observers in that area. As with all large endeavours, it took time to get going (no internet then!)

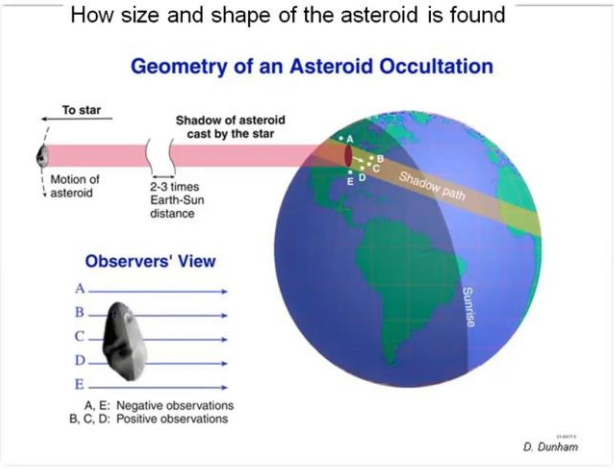
In the meantime, the astronomer Giuseppe Piazzi at the Palermo observatory had found a starlike object on the first day of the Nineteenth century, January 1st, 1801. After several observations, this new addition to the solar system was confirmed as a new planet at the expected distance. Piazzi named it Ceres, after the patron goddess of Sicily. However, it was very small, too small to be a planet. Eventually other observers found many more objects orbiting between Mars and Jupiter. William Herschel coined the word 'asteroid'

When astronomical photography took over from drawing at the telescope, astronomers found thousands of these small bodies – in fact one astronomer called them 'these vermin of the skies'; because once imaged they had to be plotted and an orbit calculated – a job for computers to do (people, mostly women!)

Only when it was realised that the Earth was vulnerable (for example the asteroid Icarus passes quite close to the Earth as it orbits the Sun) came the suspicion that they could be a threat to the earth.

In the 1970's there was a move to refine asteroid orbits by using transits of stars. By that time star positions were known with great accuracy. A pioneer of this technique was David Dunham, Founder of IOTA.

Our speaker this evening was one of the amateur astronomers that had heeded the call to pursue this observing challenge. Formerly a planetary imager, he decided to try something different. As he put it 'At that time there were no planets to image'



He started by explaining what an asteroid is; a large piece of planetary debris, now known to be the result of Jupiter's gravity preventing the forming of a major planet in that gap between Mars and the giant planet. He also pointed out that asteroids could be found at the Lagrangian points of Jupiters orbit – known as the 'Trojans'. Also, beyond the orbit of Neptune exists the 'Trans-Neptunian Objects' (TNO's)

To observe asteroid transits is a much-needed pro-am activity. Your observatory needs to be recognised and accredited: member Iain Melville spoke on his experience in a previous meeting.

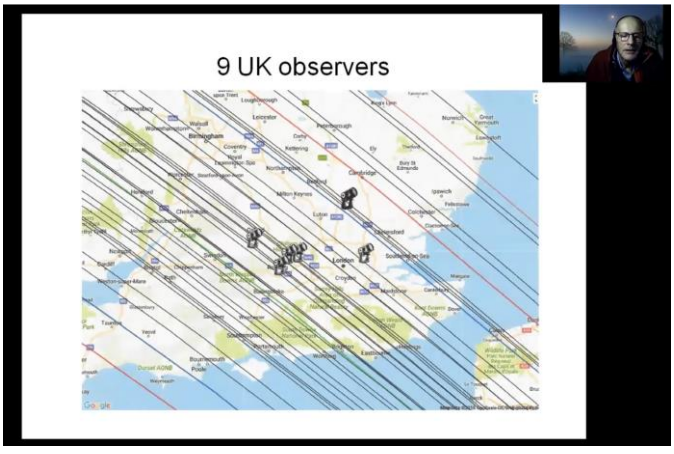
Simon uses a 14" Celestron Schmidt-Cassegrain scope fitted to a Losmandy equatorial mount. He did admit that the focal length is rather long, even with a focal reducer, but it does give good results.

The technique for obtaining transit timings is to use a video feed from the scope and each exposure is time stamped. This has to be very accurate – the old method of using a stop watch is obsolete!

Simon not only has a GPS signal fed to the PC; but also, to the recording camera. As an extra check he made a device to expose, using a red LED, on the image itself: this identifies accurate seconds.

Originally, transits were used to check the position of the asteroid for changes in its orbit; but David Dunham found that by combining many tracks of transits, estimates of size were possible; and even the asteroids shape could be determined. From this it was discovered, as theory predicted, other than the very large minor planets, like Ceres, were far from being spherical. Some even had moons, or were attached to another asteroid!

Simon revealed how this was done by showing the recorded plots from several observers, including himself. The point at which each of the tracks ends outlines the shape.



He pointed out that the computer modelling used by professional astronomers (called DAMMIT) fills

out the 3D shape. This process is very much a guarded secret!

Simon gave a very good talk on something that the well-equipped amateur could try – and – as we are aware of the threat of impact – of great importance.

Observer's Corner

I hope most of us saw the conjunction of Jupiter and Saturn. I managed to get a very good view on Sunday 20th December and also 24th December, using my 90mm refractor. What a sight! The two largest planets in the Solar System in the same x90 field. I wonder if at the last such event, anyone was able to use a telescope? If not, then this was a first sighting.

However, now in January, we only have Venus in the morning sky. Mars is still with us but the planet is now very distant: I looked at it on the 24th December; and although I could see a disc with markings, it was too small to record anything.

In the New Year, Canis Major is well placed, east of Orion. Sirius, the white A type star shines at -1.24 – the brightest star in the night sky. However, this is only because it's a neighbour; at just over 8 light years; it's not nearly as bright as Rigel in Orion in real terms, or 'absolute magnitude'. Few things in the sky are as they seem!

Below Sirius lies Messier 41: actually, it was discovered by the Rev John Flamsteed in 1702; but was seen as early as c325BCE by Aristotle!

Although I have viewed it many times in the past, I had a good observation of it with my 90mm refractor last winter. It's a loose cluster, with bright stars and a red ruby nestled in the centre.

Above Sirius is the constellation of Monoceros the unicorn, naturally, as a unicorn, it's hard to find: the best way to locate it is to use Sirius, Procyon and Betelgeuse. Monoceros is located in that triangle. Here we find M50, another cluster with a red component and NGC2264, the Christmas Tree cluster; so-called due to its appearance in inverting telescopes; here is also the Cone Nebula, with Hubble's Variable Nebula close by. The star β Mon is a fine white triple; one of Sir William Herschel's favourite objects.

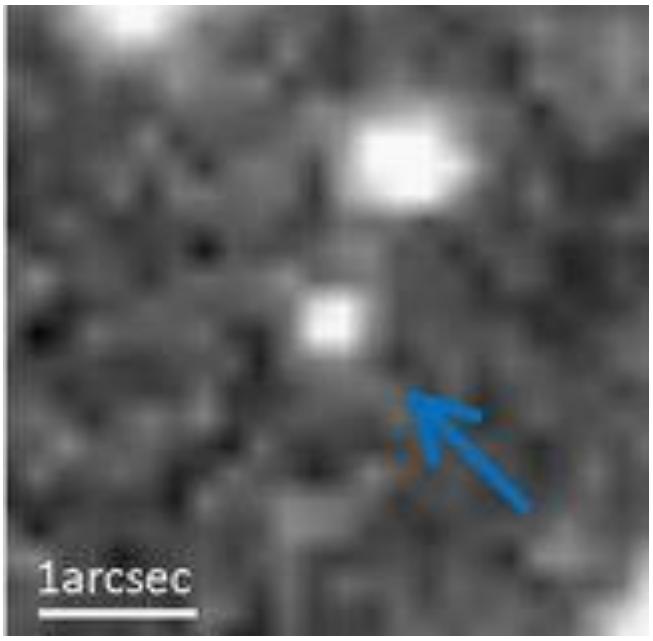
After looking in these dim regions, you might like to 'warm up' by moving your scope away from the horizon to M35, the brilliant cluster in Gemini and then south to the Orion Nebula to close the session – good hunting

As an aside, the group that rent the ground floor of the house net door have decorated the garden with coloured lights that flash – very good – however, they are bright and they leave them on all night. Fortunately our garage blocks the light in the garden – but our bathroom, toilet and landing our bathed in this auroral light all night!

More next time!

Happy New Year!

Is this the Most Distant Galaxy?
By Graham Marett

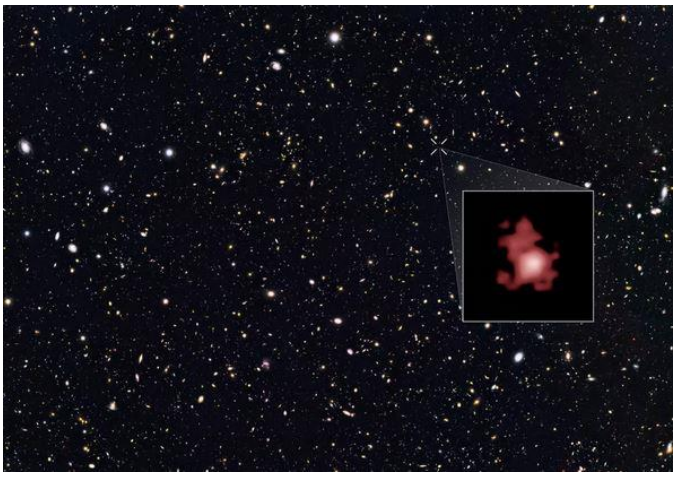


Astronomers believe that they have discovered the most distant galaxy ever observed. A team from Tokyo University led by Nobunari Kashikawa made a study of the most distant galaxies in order to learn about their formation and origins.

Their research used data from the Hubble Space Telescope and the ground-based Keck telescope in Hawaii, and studied in particular the galaxy GN-z11 in the constellation Ursa Major. The name of the galaxy is derived from a particular grouping of Hubble galaxies known as GOODS-North, and its very high red shift.

The galaxy was first discovered from a Hubble survey in 2016, and studies of its red shift showed it to be very remote, at the limit of what the Hubble is able to observe. Red shift is a 'stretching' of the wavelength of light, towards the red end of the spectrum, caused by the expansion of the universe. The more distant a galaxy is the greater is its rate of increasing distance from us (Hubble's

law), and the greater its red shift. The observed red shift can then be used to measure the distance of the galaxy.



There are limits to the spectroscopic details which the Hubble telescope can resolve, which is why the Tokyo team turned to the Keck observatory. In particular, they needed to study ultraviolet emission lines from the galaxy, and the Keck is equipped with a spectrograph called MOSFIRE which is able to do this with great precision.

This enabled them to improve the accuracy of the galaxy's red shift value by a factor of 100, and confirm that this is the most distant and oldest galaxy yet observed in the universe. The team's results were published in Nature Astronomy in December. The smaller image is from the Hubble survey; it is superimposed on a larger image of the GOODS-North region.

Graham

Society Notices

All Meetings at The Royal Masonic School are suspended until further notice.

Our next meeting will be on line, using Zoom.

Next Meeting - 8pm on Friday 29th Jan. 2021.

Meeting protocols

We will allow access to the meeting approximately 10 minutes before the start time of 8pm. This will allow members to "chat" beforehand if they wish to do so.

Once the meeting commences, all mics will be muted to avoid extraneous noises.

You can ask questions at any time throughout the presentation by using the chat function, but to avoid disruption, these questions will be not be answered until the end of the presentation.

The meeting will be recorded and made available to members on our YouTube channel afterwards.

The main presentation will be :

"ASTRONOMICAL INSTRUMENTATION BEFORE THE TELESCOPE" by MIKE LEGGETT

How did astronomers observe before optical instruments were invented ?

After a brief historical introduction, Dr Mike Leggett will discuss some of the instruments available to astronomers, prior to the invention of the telescope. Find out about this and more at our January meeting.

A Zoom meeting link for the event will be sent out to all members two days before the meeting, but if you would like to put a placeholder or reminder on your calendars now, the meeting will take place **on Zoom.**

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