

## October 2019 meeting review by Wendy Knaap

Following on from our AGM Meeting in October, Jay Nair started off the evening's presentations by showing a Video - taken by an American Lady Astro /Photographer in her ' back yard '! She showed us visuals that included photographic techniques and demonstrated the before and after 'stacking process'. - This was achieved by taking multiple shots and was finalised with very defined Awesome Images of the MOON and selected PLANETS!

Next on the Agenda was my Family's Images of the Recent 'HUNTERS' FULL MOON. Having just acquired a 'Celestron Sky Watcher MAC 127EQ3-2' Telescope, my Family and myself were excited about using it for the very FIRST TIME! - 3 Images were screened that evening, with Beautiful Shots of the Moon in detail..taken by my daughter and one photo of my little grandson peering through the Telescope!

It wasn't bad for a first attempt..in fact it was very good! ..even without stacking ! I was pleased to donate money to a charity that helps the homeless in order to obtain the scope ( plus accessories ) from a very kind man called Mr. Dennis Clarke, who parted with the Scope and did not ask for any money for himself but requested that a donation be given to The CHARITY of his choice - called 'Turning Tides'.

Next in Line with the main talk of the Night was Alex Vincent -

...Our Chairperson, who is an Author, Astrophotographer and is very knowledgeable concerning aspects of The Universe. Alex has a passion for chasing Comets ..and ECLIPSES! and after he has waited patiently - he captures the moment in a Photograph.

**SUBJECT: - Solar and Lunar Eclipses.**

**SPEAKER : -- Alex Vincent**

Alex was able to combine a succession of 3 related subjects into one presentation. -

### 1. BRITISH SOLAR ECLIPSES

A Solar Eclipse is an event in which The SUN is obscured by The MOON when the Moon passes in front of the sun - as opposed to a Lunar Eclipse when The EARTH aligns between the Sun and the Moon and blocks the Sun's Rays from directly reaching the Moon.

There are 3 main types of Solar Eclipses categorised as : - PARTIAL , ANNULAR and TOTAL.

The 1st recorded Solar Eclipse in Britain was a PARTIAL on 15th February 538 AD. (Approx. 65% of the shadow area appeared over LONDON.) - This was described in 'THE ANGLO-SAXON CHRONICLE' including details of the 1st recorded TOTAL Solar Eclipse on 1st May 664 AD. - And on 3rd May 1715 the LAST TOTAL Solar Eclipse to take place over The City of London itself became news. The next TOTAL sighting over The City will not occur until 5th May 2600. Prior to this date - on 14th June 2151 there will be TOTALITY, yet only in the Eastern parts of Greater London.

Visible from BRITAIN - TOTAL SOLAR ECLIPSES that took place in the LAST MILLENIUM ranged from the years 1023 to 1999. (There were 16 altogether ) and the others dated respectively as: - 1133, 1140, 1185, 1230, 1330, 1424, 1433, 1440, 1598, 1652, 1654, 1715, 1724 and 1927.

As mentioned above, the LAST TOTAL Eclipse was on 11th August 1999 and was seen in DEVON and CORNWALL, with a duration of 2 mins 06secs.

The NEXT will be on 23rd September 2090 to also be seen in The West Country including The South-East of England with an approximate duration of 2 mins. Half-an-hour BEFORE SUNSET it will be visible from The South Coast and BRIGHTON will see a duration of about 50 secs. Following on in succession up to to the year 2500, TOTALS to be seen will be: - 2133, 2135, 2142, ( 2151 - in June over The Eastern parts of Greater LONDON, as mentioned ), 2160, 2189, 2200, 2289, 2290, 2381, 2426 and 2442.

There were also NEAR MISSES! which occurred in 1851 1961 and 2015 - Instead LARGE PARTIALS of over 90% were seen. PARTIALS occur when only part of the Sun is covered by the Moon ...which can result in the appearance of the Moon taking a 'BITE' out of the Sun! ..(FUTURE near Misses will occur in 2026 and 2245 )

An ANNULAR Eclipse occurs when the Moon is further away from the Earth than when there is a Total Eclipse. This gives the impression of the Moon being smaller in the Sky and therefore the Moon no longer completely covers the Sun. - Instead, a ' RING OF FIRE ' remains as the Sun still emits direct light. The LAST ANNULAR Solar Eclipse took place on 31st May 2003 lasting 2mins 23 secs. At Sunrise it became

visible in NORTHERN SCOTLAND. - The NEXT Annular will take place on 23rd July 2093 in SOUTHERN SCOTLAND and NORTHERN ENGLAND duration time of about 3 mins.

In the LAST 1000 yrs the dates that the ANNULAR Eclipses occurred are as followed : - 1044, 1064, 1093, 1109, 1147, 1180, 1191, 1279, 1290, 1310, 1409, 1491, 1502, 1547 (annularity was visible from the WHOLE OF BRITAIN ), 1601,, 1621, 1737, 1748, 1764,1820, 1836, 1847, 1858, 1921 and of course 2003 as previously mentioned.

- The NEXT ANNULARS up to the year 2500 will be in 2093, 2173, 2220, 2294, 2391 (10th June 2393 over LONDON ), 2437 and 2491.

Austrian Astronomer and Mathematician THEODOR VON OPPOLZER born in 1841,- wrote many books on the subject of Eclipses of which there are several different types. One of his books - 'CANON of ECLIPSES ' - contains calculations of 8,000 Solar Eclipses and 5200 Lunar Eclipses from 1207 BC to 2163 AD.

Theodor refers to the ANNULAR -TOTAL Solar Eclipses and of the ring of 'BAILY'S BEADS' around the whole disc of the Moon, which is also known as a PEARLING ECLIPSE. This happens when the Eclipse is not quite Total or Annular. This LAST occurred in Britain in 143 AD, but will not happen again UNTIL about the year 6084 and then 9514 in WORTHING (if it has not been lost to the Sea long before that, ..as a consequence of Coastal Erosion.)

According to Theodor, he mentions there was an ANNULAR-TOTAL in 1039, 1339, and possibly on 15th March 1858 - which crossed CENTRAL ENGLAND and had a duration of 15 secs. (This is debatable because it was originally considered an Annular ) - In some cases an ANNULAR-TOTAL could ENTER BRITAIN as TOTAL and revert to ANNULAR, such as when the Pearling Eclipse took place. There is only 69 yrs between the ANNULAR-TOTALS in BRITAIN of 1630 and 1699 - the latter having taken place on 13th September in SCOTLAND ..There will be 846 yrs between those of 1699 and the NEXT one on April 12th 2,545!

Not too far into the Future, several other Eclipses are due to take place, but not in Britain!..These events will occur in Spain and Turkey. SPAIN will witness a TOTAL ECLIPSE on August 12th 2026 and August 2nd 2027. An ANNULAR ECLIPSE is scheduled for January 28th 2028, also in Spain. TURKEY can expect an ANNULAR ECLIPSE on June 1st 2030.

Alex paused to reflect on a selection of PHOTOGRAPHS he had taken himself over the years - of the various different SOLAR ECLIPSES. Many of them have been published. He showed us very striking Images of Eclipses from : -

● 20 July 1982 ● 4 Dec 1983 ● 30 May 1984 ● 10 May 1994 ● 12 Oct 1996 ● 11 Aug 1999 ● 3 Oct 2005 ● 29 March 2006

## 2. ISOLATED TOTAL LUNAR ECLIPSES (ITLEs)

When the Earth blocks the Sun's Rays from reaching the Moon - at the time the Moon is in alignment behind the Earth, a TOTAL LUNAR ECLIPSE occurs. Most of these Eclipses are normally grouped in twos, threes and fours consecutively. When there is a set of 4 Total Lunar Eclipses within 2 consecutive years they are known as a 'TETRAD'. Sometimes there are times when ONLY ONE occurs and are categorised as 'ISOLATED TOTAL LUNAR ECLIPSES' (ITLEs). This is where there is not a total lunar eclipse preceding it OR following it. - For example on March 24th 1997 there was a PARTIAL UMBRAL, September 16th 1997 - a TOTAL UMBRAL and March 13th 1998 a PARTIAL PENUMBRAL. The Umbra is a region of dark shadow, resulting from the obstruction of light. The Penumbral is the slightly lighter area of the shadow.

Between the years 0 AD and 4000 AD, there are only 63 ITLEs, but there will be 117 Tetrads. During this period, ITLEs occur in a sequence lasting between 250 and 300 years with between 7 and 11 ITLEs. In between, there are gaps lasting some 255 to 290 years where there are no ITLEs.

In OUR LIFETIME only 3 ITLES occur!.. It is a RARE event. ALEX was very fortunate to observe the ITLE of 16th September 1997, when it was visible from the UK. He - together with other members of W.A.S. and the public participated and watched from Worthing Pier. Alex displayed a WONDERFUL PHOTOGRAPH onto the screen, that he had taken of the ITLE that became published. The other two ITLEs not visible from the U.K. are dated 6th September 1979 (which has already passed) ...and yet to occur will be in the year 2021. During the 19th century there was an ITLE that took place in 1892. The NEXT ITLE shall be in 2108!

Sometimes there are DISCREPANCIES in the RESEARCH of ITLEs. A TOTAL Lunar Eclipse of September 28th 2015 was THOUGHT to have been an ITLE ..until there were further investigations. In that same year there was a Lunar Eclipse on April 4th, considered to be JUST TOTAL with a magnitude of 1.003. This information was contained in 'Bao Lin Liu's' Canon of Lunar Eclipses. The findings differentiate from 'Meeus's' in his Canon of Lunar Eclipses, which states that the magnitude was 0.998 and therefore NOT

QUITE TOTAL. However, after further studies the Eclipse of April 4th was determined as ONLY JUST TOTAL! - (with a magnitude of 1.0008) ... From this result it was established that the TOTAL LUNAR ECLIPSE of September 28th 2015 was NOT AN ITLE as previously believed!..

### **3. THREE TOTAL LUNAR ECLIPSES IN A YEAR**

The maximum number of TOTAL LUNAR Eclipses within 1 CALENDAR YEAR IS 3 - This can only occur at the beginning of the year, middle of the year, towards the end of June/early July and finally - the end of the year! The LAST TIME this occurred was in 1982 on 9th January, 6th July and 30th December. This shall not take place again UNTIL NEW YEAR'S DAY, 28th June and 21st. Dec 2485.

These events happen in threes, EVERY 65 YEARS such as: -

828, 893, 958 and then they changed to 1414, 1479, 1544 - and then again, much later on in the years 1917 and 1982 .. but on this occasion there was a SEQUENCE of TWO! ( instead of the usual group of three, which should have included the year 2047 ) This ruled out the expected and is because the 3rd TOTAL ECLIPSE takes place a few hours LATE in the early hours of NEW YEAR'S DAY 2048.

...and then there is NOTHING for SEVERAL CENTURIES until NEW YEAR'S DAY 2485 - followed by 2550 and 2615 and further ahead into the future in 3006, 3071 and 3136.

Alex began to explain to us that 3 TOTAL LUNAR ECLIPSES in 1 year is not really so rare after all! ...Neither is LESS than 3 Total Lunar Eclipses. Historically there have been calendar reforms, such as in 1582, CHANGING calculations that can result in 'delays' or 'speed up' dates of EVENTS. He mentions 3 dates of May 4th 1985, Oct 28th 1985 and April 24th 1986 as examples of 3 Total Eclipses in LESS than 365 days. Alex himself was witness to 3 other Total Lunar Eclipses which took place in cloudy conditions on Nov 9th 2003, May 4th 2004 and October 28th 2004 - again less than 365 days.

The NEXT case of these types of Lunar Eclipses will be those of March 14th 2025, September 7th 2025 and March 3rd 2026. LOOKING AHEAD - the next group to follow will all be VISIBLE from Britain on December 31st 2028, June 26th 2029 and December 20th 2029.

Alex ended his presentation with more Beautiful Images... This time the Three Total Lunar Eclipses in less than 365 days that he observed and photographed in 2003 and 2004.

A long standing member of The Astronomical Society, Alex has written many BOOKS which contain Illustrations and Photographs - of which Eclipses are one of his favourite subjects...with many PHOTOGRAPHS included that he has taken himself. We were very thankful to Alex for giving us all a very interesting talk and enjoyable evening.

### **Forthcoming meetings**

**December 18th 2019 Jay Nair – Jupiter and the Juno Mission**

**January 15th 2020 The WAS Social plus Bob Turner F.R.A.S. - “Astronomical Things That Could Happen in the Next Few Years”**

**February 19th 2020 William Joyce F.R.A.S. – “The Search for Life in the Solar System”**

**March 18th 2020 Steve Cross of the Gee-Archaeological Survey – “Pyramids, Temples and Sun Worship in Ancient Egypt”**

**May 20th 2020 James Fradgley F.R.A.S. – “Goldilocks Planets”, “Lagrange Points” and “The Maunder Minimum”**

**June 17th 2020 Dr Chris Pearson – “ARIEL and Alien Worlds”**

**July 15th 2020 David Pulley of the Local Group (Bexhill) – “How do we Know they are all Planets?”**