

# SPACEWATCH

the newsletter of the Abingdon Astronomical Society

**Next Talk**  
**13<sup>th</sup> January 2020**  
**Dark Matter**  
**Professor Justin Read**  
**University of Surrey**

## EDITORIAL

Welcome to the last Spacewatch for 2019, and indeed the last Spacewatch for the decade. I hope you enjoyed this year's program and we are starting the planning for the 2020/21 program shortly so if there are any topics that you might like to see covered then please contact one of the committee. We have some sad news as Christopher Jenkins a long-term member of the society died last month and has donated his instrument collection to the society to dispose of. All monies raised will go to the society.

## THE NIGHT SKY FOR NOVEMBER 2019

By Steve Creasey & Cristina Garcia Pozuelo Sanchez

Unfortunately, for many reasons, I have not been able to do any imaging this last month, mainly the cloud, but also the rain, sometimes the fog and mist, and quite frequently the wind! Surely we are due a few weeks of decent clear weather soon?

If the cloud does clear out of the way, there are some spectacular things to see in the December sky, The Pleiades star cluster, The constellations of Taurus and Orion, the Orion Nebula and one of the best meteor showers of the year, the Geminids. Fingers crossed for December!

The earliest sunset of the year is on the 12<sup>th</sup> and the latest sunrise is on the 31<sup>st</sup>, between them lies the winter solstice, which this year takes place on the 22<sup>nd</sup> at 04:21. The Earth-sun distance at this time is 147,160,039 km and the Earth's north pole is tilted as far away as it can be from the sun. This is the official start of winter, a season which lasts 88.98 days in the northern hemisphere, and is of course summer in the southern hemisphere.

## The Planets

**Mercury** - At the beginning of December Mercury rises just after 06:00, a couple of hours before the sun rises, this will be the best time to see this elusive planet. Look very low down in the SE sky around 08:00, the planet will only be a couple of degrees above the horizon but beware of the sun which rises shortly afterwards. For the rest of December, the planet is too close to the sun to be observed.

**Venus** - May be seen shining brightly low in the SW as evening twilight fades. The planet is moving eastwards from Sagittarius to Capricornus. It is in conjunction with Saturn on the 11<sup>th</sup>, and is 1 degree south of Pluto on the 15<sup>th</sup>.

When Venus shines brightly as the 'Evening Star' in December, people wonder whether they are seeing the 'Star of Bethlehem' as of old. During the evening of the 28<sup>th</sup>, the thin waxing crescent Moon with earthshine, may be seen approaching Venus, when at 17h, the Moon lies 5° to the lower right of the planet within 10° of the horizon in the SW. The next night the two objects are 6° apart but the Moon lies to the east (left) of Venus. This encounter takes place in the faint constellation of Capricornus and will be a pretty sight to behold if the weather behaves itself!

**Mars** - is a morning object in Libra throughout the month. During December it rises some three hours before the Sun. The planet is at a great distance from the Earth, and so is not the brightest of planets at this time. Indeed, its visual magnitude is +1.6, which is the same magnitude as the star El Nath (beta Tauri), the star marking the northern horn of the Bull. At 07h on the morning of the 23<sup>rd</sup> Mars and the waning crescent Moon with earthshine, lie 4° apart in the SE sky, at an altitude of 12°; both are parallel with the horizon. Below them the first few stars of Scorpius are making their appearance

**Jupiter** - Jupiter is lost in the evening twilight throughout December and is in conjunction with the Sun on the 27<sup>th</sup>.

**Saturn** - sets two hours after the Sun on the 1<sup>st</sup>, and only one hour after it on New Year's Eve. The planet is low in the constellation of Sagittarius, and you must scan low in the SW at around 17h to spot it. Saturn is not excessively bright; its magnitude this month is around +0.6, which is a little fainter than

the star Procyon in the constellation of Canis Minor (the Little Dog). Use binoculars to scan for Saturn. On the evening of the 27th the hairline waxing crescent Moon and Saturn lie  $3^\circ$  apart, low in the SW,  $5^\circ$  above the horizon at 16h in the twilight, and should look good in the same binocular field.

**Uranus** - culminates (crosses the S horizon). The planet lies in Aries, near to this constellation's border with Cetus and Pisces. It culminates at around 20h during this month. It lies some  $8^\circ$  below Sheratan (beta Arietis). Uranus is on the threshold of naked eye visibility at visual magnitude +5.72.

**Neptune** - culminates (crosses the S meridian) at around 17h mid-month. It lies in the constellation of Aquarius and has a current magnitude of +7.9. The planet lies  $1^\circ$  to the west (right) of the 4th magnitude star phi Aquarii.

### Meteor showers

Geminids - The maximum of the Geminid meteors takes place on the 14th at 14h00. Geminids may be seen from the 4th to the 17th, and this year, the time of Maximum is unfavourable because of the proximity of the Full Moon. This 'Shooting Star Shower' is the richest of the annual showers. (Weather permitting of course!) The bright shooting stars are associated with asteroid (dwarf planet) 3200, Phaethon, the remains of a spent comet. Geminids tend to be most numerous around 02h00 when Gemini, their point of origin, is almost overhead. On good nights it is possible to see up to 100 meteors an hour. This shower produces a good proportion of bright events.

Ursids - Peaking overnight on the 22nd/23rd and 23rd/24th is the Ursid meteor shower (fragments of comet Tuttle), which produces about 10 meteors an hour, with occasional outbursts resulting in a greater number. Conditions this year are very favourable as the Moon is a waning crescent giving little light. The radiant (point of origin) of the meteors is in Ursa Minor, The Little Bear, some  $12^\circ$  from the celestial North pole.

### Comets

C/2017 T2 (PanSTARRS) – Mag 9.5 and brightening, perfectly placed and visible all through December. Crossing three constellations in December on its path across the Northern sky.

At the start of December, it lies just 4 degrees west of the bright star Capella in Auriga. From this position it will be passing within one degree of NGC1528 part of a double open cluster with NGC1545 in Perseus, between the 14<sup>th</sup> and 17<sup>th</sup>.

It will then pass into Camelopardalis on the 21<sup>st</sup> until the 30<sup>th</sup> and then return into Perseus on New Year's eve.

C/2018 N2 (ASASSN) – Mag 11.7 and still visible through December.

### Deep Sky Objects

December deep sky objects

M109 Spiral galaxy in Ursa Major

M42 Orion Nebula

NGC1528 Open Cluster in Perseus (especially between 14<sup>th</sup> and 17<sup>th</sup> for the comet Panstarrs)

NGC1545 Open Cluster in Perseus, part of a double cluster with above.

NGC1496 Open cluster in Perseus (another opportunity to see the comet close to a DSO.

M79 Globular cluster in Lepus

NGC969 and NGC884 The double cluster, also in Perseus

M35 Open cluster in Gemini

NGC1647 in Taurus

NGC1407 Elliptical galaxy in Eridanus, tricky one with it being so low in the southern sky.

## LAST MONTHS TALK

### November's talk

Ian Heywood of Oxford University, MeerKAT

The MeerKAT radio telescope array is already a massive and working network, and is part of the SKA (Square Kilometre Array), still under construction.

Those of you who attended our April 2017 talk would have heard a similar intro to the history of radio astronomy, but Dr Heywood was far more polite in describing the early records of Cambridge University's radio observations.

Karl Jansky detected a radio hiss coming from our galactic centre in 1933. Grote Reber built his own 9 metre radio dish in 1937 and was able to create basic radio maps of the Milky Way. He located the supernova remnant Cassiopeia A and the radio galaxy Cygnus A. There was a lot of post-war radio equipment going spare so this was used in setting up the Jodrell Bank and Cambridge University sites from 1945 onwards. Prof Martin Hardcastle (April 2017's speaker) described the first two Cambridge catalogues politely as 'full of spurious readings'. He didn't mention any names,

but it did explain why we never hear of 1C and 2C. Dr Heywood simply called the survey results published in 1956 rubbish ('instrumental effects').

Interferometry has enabled us to pool results from lots of small dishes combined. The Very Large Array in New Mexico has a resolution of 1.5 arc seconds when set to its largest size. The Event Horizon network gets to a 20 micro arc seconds which was why it was able to produce such a wonderful doughnut picture of the event horizon around the black hole in M87 early this year. (In comparison, the large Jodrell Bank dish has a 10' resolution on its own.)

The SKA is hopefully to be completed in ten years, and the MeerKAT array is about a quarter of the finished article. This is the dish component in the Northern Cape province of South Africa. At \$300 million it is the single largest scientific project in the whole of Africa. The land is isolated, hot and dry with 64 dishes built on site. The Karoo Array processor building has three of its four floors underground so that it doesn't leak radiation. It has also provided bursaries for 1,100 postgraduates to study. The SKA headquarters is at Jodrell Bank in Cheshire.

There is a low frequency component of the SKA due in Australia, comprising fields of antennae on stalks, looking like trees. They will be working on the frequency range 15 to 350 megahertz.

This is in Western Australia, set in an area called Murchison Shire, which is the size of the Netherlands and has no towns because its population is 120 people. The 64 MeerKAT dishes are 13.5 m in diameter. They are in permanent positions within a circle and are set out in a Gaussian distribution of dishes which means that 70% of them are within 1km of the centre and the others are scattered out to 4km from the centre. Each dish is paired with another.

They are kept very cold, and have been found to work better than expected by a factor of 1.7. They work in three different wavelengths (0.9 to 10 gigahertz in total). A small (relatively!) 0.6m optical telescope follows what the radio telescopes are following, a fully robotic backup.

The 64 came on line in April 2018 with a full inauguration in June 2018. MeerKAT has some offshoot surveys using the equipment:

LSP, Large Survey Project for wide field surveys.  
ThunderKAT, for accretion disc observations around X-ray binaries and transient things like gamma ray bursts.  
MIGHTEE which will make very deep observations in order to look at galaxy evolution.

MeerKAT made observations of the galactic centre in the middle of 2018 and saw infalling material spiralling into the galactic centre black hole Sagittarius A\*. Along with observations made with the two Keck scopes it has been revealed that the Sag A\* has a mass of four million tons and a simulation has been made of nearby stars orbiting it. They orbit very rapidly over a period of only 25 years, thereby giving away the fact that the central black hole is so massive.

Their offset Gregorian designs mean the secondary and the collector units don't affect the light path as much as a Cassegrain layout.

The MeerKat observations have revealed highly magnetised filaments like threads coming from the centres of active galaxies. We are used to seeing radio jets from the poles of active galaxies but the better equipment has now been picking up rounded clouds of stuff which came out of our black hole 8 billion years ago. These are Fermi bubbles. Cygnus A looks tiny, being so far away, but it has two huge Fermi bubbles. Results published in 2017 shows it has two black holes in the centre, hence the high activity.

Please look for pictures on the www; they are amazing, with the chaotic threads inside. Much more is yet to come.

I would like to add that from the start of the 2020-21 season I shall be running around for speakers. If you have a topic which you would like to hear more about I am sure we could find an expert to indulge you. Also, if you meet someone who would be willing to give us a talk, please do get some details over to me.

#### **DATES FOR YOUR DIARY**

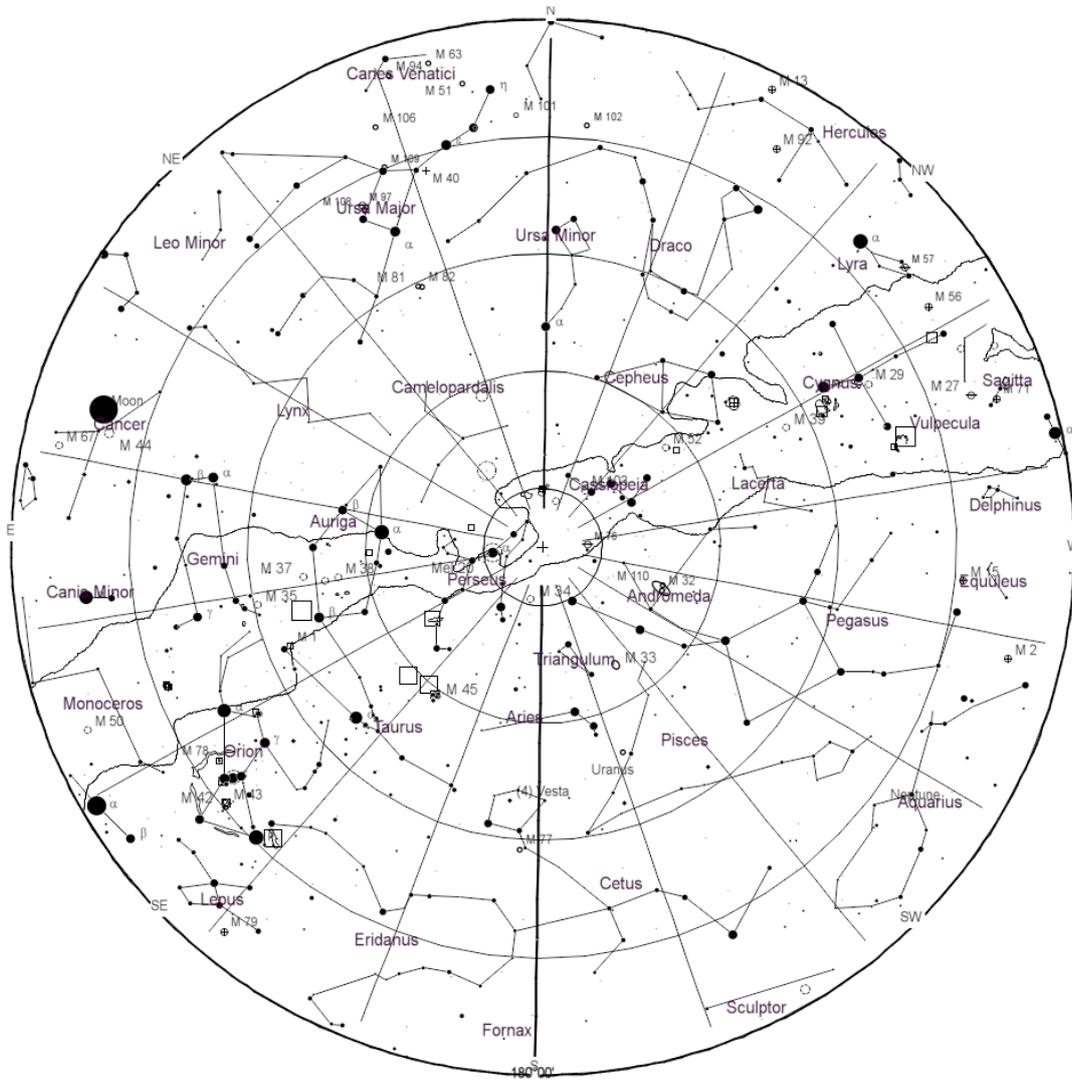
**Next Beginners meeting is Monday 16<sup>th</sup> December at the usual venue. Talks will include Women in Astronomy Part ii, White dwarfs, and Double stars, although talks subject to change.**

**Observing evening: There is no observing session in December as this is Christmas. The next observing session will be Jan 27<sup>th</sup> -29<sup>th</sup> 2020.**

**Astrofest 2020 30<sup>th</sup> Jan, 1<sup>st</sup> Feb Kensington Town Hall. Details at <https://europeanastrofest.com/>**

# STAR CHART

The night sky at 21:00 (GMT) Sunday 15<sup>th</sup> December 2019



## MOON PHASES: 2019

