The Messenger
Mexborough & Swinton Astronomical Society
Christmas 2016

Urania's Mirror

These were a set of 32 astronomical Star chart cards published in November 1824. The illustrations were based on an earlier star atlas "The Celestial Atlas" produced by Alexander Jamieson in 1822. In fact the drawings of the constellations upon which Urania's Mirror was based were a direct plagiarism.
The author of Urania's Mirror remained anonymous for some 170 years, only being referred to as being



Celestial Atlas



Urania's Mirror

designed to a "Young Lady" or "Lady" in its many advertisements. It was thought that it may have been the work of Caroline Herschel or Mary Sommerville. Then in 1994, while archiving early election certificates used to propose people to be admitted to the Royal Astronomical Society, one was found for the Reverend Richard Rouse Bloxam and naming him as "Author of Urania's Mirror". He has no other known publications, his main distinction being to have served as assistant master at Rugby School for 38 years.

It was originally sold for £1 8s "plain" or £1 14s "fully coloured"

Uranography is the branch of astronomy concerned with the description and mapping of the heavens, and especially of the fixed stars

CHRISTMAS PRESENTS.

ASTRONOMY FAMILIARIZED FOR YOUNG PERSONS.

Just published, fitted up in an elegant Box,
Price £1. 8s. plain, or £1. 14s. beautifully coloured,
A New Edition, considerably enlarged, of

URANIA'S MIRROR;

OR, A VIEW OF THE HEAVENS:

On a Plan perfectly Original. Designed by A LADY.

THE Work consists of Thirty-two large Cards, on which are represented all the Constellations visible in Great Britain. Each Constellation is drawn with the Figure ascribed to it by the Ancients; and the Stars are perforated, according to their relative magnitudes, so as to exhibit, when held up to the light, their natural Appearance in the Heavens. The Cards are accompanied with a Familiar Treatise on Astronomy, written expressly for this purpose, by J. ASPIN, and illustrated with Plates.

Among the many ingenious and beautiful inventions to promote the study of science, and render it as delightful as it is valuable, we have never seen any thing to surpass this admirable production.—*Literary Gazette.*

The Thoughts of Chairman Les

This is your chairman speaking.

We were unable to attend and take part in this year's 'Yorkshire Astromind' due to other work that needed doing. This was disappointing as we haven't missed one for years and from the bit of feedback we got it wasn't such a success as it used to be.

To enlighten you on our plans for and extension to the observatory we have had some forward movement from YW towards us purchasing the site. We are finding it difficult to gain any funds from the larger of the funding bodies but we are still trying.

We have been busy with our PVE's and the last two of the year take place December 9th & 10th and there are a few places left. We haven't got any set dates for 2017 but we are working on it. We do 12 nights a year which are on Friday and Saturday nights a month from January to March and September to December. If you feel that you might be able to help in any way just let us know.

Recently we have had some very interesting guest speakers, our member speakers are very good too and fill a meeting night very well indeed. You may have noticed that it does seem to be the same speakers regularly and there's nothing wrong with that. I would like to ask the members that haven't given a talk yet to give it a try; it's an exercise that gives you a good feeling after a couple of times. We will give you as much support that you feel you need as the first time is nerve raking enough but once you get into your stride I'm sure you will enjoy the experience soon enough and will be able to join in when a member speaker is asked for. Your subject can be anything you want and your favourite topic.



I wish you clear skies, a Merry Christmas and a successful New Year

Les Marsden

December & January Guest Speakers

Thursday, 1st December 2016

"Images of Space: Art or Science?" - Paul Money



I am an English Amateur Astronomer who has had a love for the night sky since I was 'knee high to a grasshopper' (or so the saying goes!). As far back as I can recall I used to look up at the night sky and just gaze in wonderment at all the twinkling points of light without really understanding or even wanting to understand what they actually were. That would come later as I began to read any 'space' related book or magazine I found either at home or at school. I can just about remember the days of Apollo and for most of my early years the interest was more in becoming an Astronaut rather than exploring the Universe with a Telescope.

Thursday, 15th December



Dr. Susan Cartwright

Dr Susan Cartwright graduated from Glasgow University with a BSc in Astronomy and Natural Philosophy (Physics, to most people - but if Natural Philosophy was good enough for Newton it was good enough for Glasgow!).

She then did a PhD in particle physics, also at Glasgow, and worked in Hamburg, Germany and San Francisco before arriving in Sheffield in 1989. She is currently working on neutrino oscillations with the T2K experiment in Japan (which, incidentally, doesn't have any evidence that neutrinos travel faster than light - though it does have evidence that accelerators don't much like earthquakes).

Thursday 5th January



Dr Chris Arridge

Dr Chris Arridge is a Royal Society Research Fellow and Lecturer in the Space Plasma Environment and Radio Science Group at Lancaster's Department of Physics. His research focusses on particles and magnetic fields at planets throughout our Solar System and beyond.

SOLSTICE DINNER - FRIDAY JUNE 23rd 2017

This will be held next year at Rotherham Golf Club, Thryberg. 7.00pm for 7:45pm meal: Bar available to midnight.

The Menu is as follows:-

Starters

Risotto: beetroot and mascarpone, mushroom, butternut squash or tomato.
Homemade ham hock and parsley terrine.
Grilled goats cheese, homemade focaccia, fruit chutney and dressed leaves
Homemade fishcake, tomato and basil sauce.
Roasted Mediterranean vegetable tart, dressed leaves and pesto

Mains

Braised beef, herb mash and roasted roots
Lamb shoulder, fondant potato, cauliflower puree, wilted greens
Roast belly pork, roast kohlrabi, burnt apple puree and dauphinoise potatoes
Roast market fish, fondant potatoes, fennel and pan juices
Sage roasted chicken, sautéed cabbage crushed potato cake
Baked salmon, Green beans, creamed potato lemon beurre blanc.
Pie chips and peas

Vegetarian

Risotto — Tomato or Mediterranean Vegetable or Wild Mushroom
Or any starter can be taken as a main

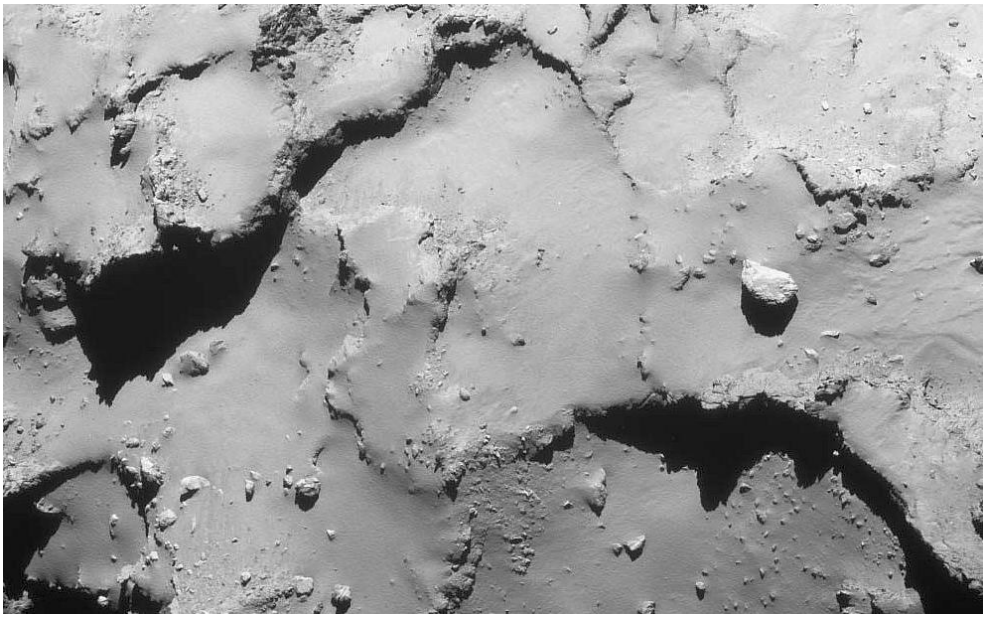
Desserts

Homemade Chocolate Brownie
Lemon tart
Sticky date and Guinness sponge, Crème Anglaise.
Apple Tart Tatin with Chantilly cream.

We hope to have our Honorary President, Alan Chapman FRAS as our after dinner speaker
The important bit is that it will cost £25 per head, and at some stage I'll be asking for a £5 deposit (after Christmas)



Comet 67P/Churyumov-Gerasimenko taken by Rosetta just before impact





From creative commons site xkcd.com



Comet C/2015 V2 (Johnson)

Predicted to reach magnitude 6 in July 2017, it currently (end of November) is around magnitude 10.
It will become unobservable from our latitudes from the end of July.

The chart below gives some brief observing information. Comets are unpredictable beasts – so the predicted magnitudes may well be different from the observed ones – but it is hoped that it may get bright enough for small telescopes or binoculars. Unfortunately its brightest time coincides with British summer, so the "dark" nights are limited. Its perihelion is due on June 12th 2017, some 1.6AU from the sun – which is actually a bit further out from the Sun than Mars, so it may not be all that spectacular. It's not thought to be a large body but no size information yet exists. The comet is currently still beyond Jupiter from the sun some 5.6AU out.
On 5th June 2017 the comet will be at it's closest to Earth a mere 0.81AU away.

Date	Predicted Magnitude	RA	Dec	Notes
Dec 1st 2016	10.2	13h 25m 53s	+44° 35' 43"	Circumpolar
Dec 15th	9.9	13h 56m 34s	+44° 08' 35"	Circumpolar
Jan 1st 2017	9.5	14h 33m 15s	+43° 54' 16"	Circumpolar
Jan 15th	9.1	15h 02m 16s	+43° 59' 36"	Circumpolar
Feb 1st	8.7	15h 34m 48s	+44° 27' 24"	Circumpolar
Feb 15th	8.3	15h 58m 01s	+45° 06' 09"	Circumpolar
Mar 1st	7.9	16h 16m 31s	+45° 55' 01"	Circumpolar
Mar 15th	7.5	16h 28m 25s	+46° 45' 01"	Circumpolar
Apr 1st	7.0	16h 30m 53s	+47° 21' 45"	Circumpolar
Apr 15th	6.6	16h 20m 21s	+46° 50' 10"	Circumpolar
May 1st	6.1	15h 53m 34s	+43° 38' 19"	Circumpolar
May 15th	5.7	15h 21m 40s	+36° 52' 19"	Circumpolar
Jun 1st	5.4	14h 44m 46 s	+22° 22' 44"	Sets 8:30am (BST)
Jun 15th	5.5	14h 24m 07s	+07° 07' 07"	Sets 5:30am (BST)
Jul 1st	5.8	14h 13m 46s	-09° 26' 55"	Sets at 10pm (BST) -
IN SOUTHERN SKIES				

The comet was discovered in November 2015 by Jess Johnson of the Catalina Sky Survey using the Mount Lemmon Observatory in Arizona.

It looks like that this may be the comets only visit to the warm climes of the inner solar system. Its current orbital details indicate that its greatest distance from the sun (aphelion) is around 60,000 AU, and would have an orbital period in excess of 14½ million years. However after its passage it will have an orbital eccentricity of greater than 1, indicating that it will leave the influence of the sun and wander through interstellar space.

A Christmas Constellation – Rangifer (The Reindeer)



A now defunct constellation that was created by the French Astronomer Pierre Charles Le Monnier in 1736. He was only 20 when he went on an expedition to Lapland as part of a geological survey to measure the oblateness of the Earth. He proposed the constellation to commemorate the expedition.

The constellation was located between Cepheus and Camelopardus. The last recorded use of the constellation was in an atlas published in 1801, but it was never internationally recognised.

Le Monnier assigned 46 stars of the 5th to 7th magnitude to the constellation (none of these stars would be visible to the eye on a normal night near Rotherham!). It also contains the galaxy NGC 1184, which is at magnitude 12.5.

Most of this constellation has now been given back to Cepheus.

Le Monnier is also notable for having observed Uranus and noting it in his notebook as a star some 12 times prior to its identification and discovery by William Herschel.

It's a pity there wasn't a nice red giant star to be used as the reindeers nose.

Are you new to Astronomy? Then the BAA "Back to Basics" Workshop is for YOU!

Saturday March 11th 2017

SWINTON MASONIC HALL, 63 STATION STREET, SWINTON, MEXBOROUGH S64 8PZ

The **British Astronomical Association** has designed a programme of talks and practical sessions to help you learn basic techniques and develop your interest to its full potential. Experienced people will be on hand to answer your questions.

The cost for the meeting is £8.00 BAA Members & children under 16. £10.00 for non-members. Price includes refreshments and a buffet lunch.

We are pleased to advise the following retailers will also be coming, BAA Sales, W&W Astro and The Far-Sighted Binocular Company

SPACE IS LIMITED SO ALL ATTENDEES MUST PRE-BOOK

Another Meccano Orrery: a Uranilabe

The picture of a Meccano Plutolabe sent to Roy then plonked in the July 2016 Messenger went down really well when seen 'in the metal' at a society meeting, especially when the brake came off the venerable clockwork motor. A recent off-the-cuff "Do you want another?" gained an enthusiastic "Yes!" - so here it is.

Although Meccano has been a passion for more than four decades, I'm not particularly noted in the fraternity as orrery builder - not at all as an orrery designer! - but don't mind knocking one out from a published design as the fancy takes me. The real work is in the gearing with particular regard to adhering to standard Meccano 38 DP tooth counts with none of the available 'specials' plus a self-imposed error of <1.0% in a body's rotation and orbit period. The Plutolabe and its ilk use epicyclic (planetary) gearing to achieve this. To explain: for plain gearing, the drive ratio is an inverted fraction of tooth (t) counts so, for example, a 19t driver has to rotate three times to rotate fully an engaging 57t; 57/19 = 3:1. In a planetary arrangement, the outcome is the plain ratio +1. It's the equation of a straight line, y = mx + c where c = o for simple meshing and c = 1 for epicyclic as one gear adds a rotation around the other. The advantage is that +1 from the rotating moon arms can yield funny fractions to fine-tune ratios. An alternative method is to repeatedly average two drives in a differential but the arithmetic, construction, sheer mass and friction soon get out of hand for all except the dedicated orrery and astro clock builder!



From the front with the inner three moons Ariel, Umbriel and Titania to the fore.

This little Uranus orrery was designed then built by the serial and master astro builder Michael Whiting then featured in the March 2009 edition of Constructor Quarterly. With Meccano jargon and construction details removed to protect the innocent and common knowledge among the MSAS mob taken out, the article reads:

Uranus was observed long before its discovery and recognition as a planet by Herschel in 1781. Within six years, its two largest moons Titania and Oberon were discovered but it wasn't until 1851 that two further moons, Ariel and Umbriel were found. Almost 100 years elapsed before the next moon, Miranda, was discovered and the Voyager probe (1986) and the recent dramatic improvement in telescopic techniques, the current moon count stands at 27. This Uranilabe could thus be regarded as 'best science' prior to 1948.

From the same source, the arithmetic is as follows where each number inside parentheses is a tooth count, those in bold are fixed to the vertical axle and those underlined are fixed to Uranus or a moon arm:

Each moon drive includes a 1:1 pair such as (19/19) which are to return the drive back to the central axis. Not represented in the table is the presence of an idler on the lower three arms which reverses the drive without affecting the overall ratio. Ariel is chain-driven from Uranus

therefore does not need to be reversed whereas Umbriel, Titania and Oberon are gear-driven so need the correction otherwise they will have a retrograde orbit.

Body	Actual period	Calculation	Model period	Error, %
Uranus	0.7183	Datum, *D*	-/-	-/-
Ariel	2.5200	$D \times [1 + (\mathbf{50}/20) \times (14/\underline{14})] = A$	2.5141	-0.24
Umbriel	4.1400	$A \times [1 + (18/\underline{28}) \times (19/19)] = U$	4.1302	-0.24
Titania	8.7100	$U \times [1 + (\mathbf{56}/50) \times (57/\underline{57})] = T$	8.7561	+0.53
Oberon	13.4600	$T \times [1 + (\mathbf{20}/38) \times (57/\underline{57})]$	13.3645	-0.71

Also, not is all what it seems with the tooth counts! The 20t Pinions and 56t Gear went out of production in 1921 to be replaced by the exact 3:1 pairing of 19t and 57t; 14t under Uranus are Sprockets on close centres with a dreaded horizontal chain; 18t & 28t on the Umbriel arm are also Sprockets but engaged directly as gears which is a bit lumpy but workable for the low torque in an orrery.

Unlike the Plutolabe, the drive enters the top straight through Uranus then cascades down to the Oberon arm. A minor flaw in the original layout was that for Uranus to spin in the right direction, the Crank Handle at the bottom had to be rotated anticlockwise which isn't natural for most handle-turners; inserting a 1:1 gear pair at the rear allows clockwise cranking. Uranus is a painted deodorant ball drilled to 9.5 mm for a push fit on Meccano's ⅜" (9.52 mm) bosses. Moons are plastic beads from a broken necklace bought from a Rotherham charity shop for a whole 50p then drilled to 2.0 mm for a tight fit on wires cut from bike wheel spokes which are much stiffer than squidgy copper taken from ring main cable as used in the Plutolabe. Unlike the Uranus system, the Meccano version doesn't work very well when inclined almost to the horizontal… With a following wind, further orreries may emerge from the Meccano den as time, other projects and enthusiasm allow!

Rob Mitchell

BIY orreries

Orreries have featured widely in Meccanoland since the 1930s. A commercial source of published instructions is MW Mail Order (www.hsomerville.com/mwmailorder/); jab Printed Model Plans, Classified, scroll down to Orreries. Several have been featured in the sumptuous Constructor Quarterly (www.constructorquarterly.com). Loads have also been published in Meccano club literature which included the Plutolabe, later released by MW Mail Order.

M1 The First Messier Object

Currently the Crab nebula is visible in the night sky and at around 8pm, when it is over 20° above the horizon.
It reaches its highest point in the sky at 1:30am some 60° above the southern horizon.

Positional details –

Right Ascension:	**05h34m**
Declination:	**+22°01'**

It is a small object only some 8 arcminutes across, and is at magnitude 8.4. The Crab Nebula is the shattered remnant of a massive star that ended its life in a supernova explosion. Nearly a thousand years old, the supernova was noted in the constellation of Taurus by Chinese astronomers in the year 1054 AD.

The nebula is some 6,500 light years away (although there is some 25% error in this measurement). At that distance the apparent visual size relates to an actual size some 11 light years in diameter, and is expanding at 1,500 miles per second. The mass of the ejected material is thought to be around 3 solar masses whilst the mass of the remaining neutron star is up to 2 solar masses.

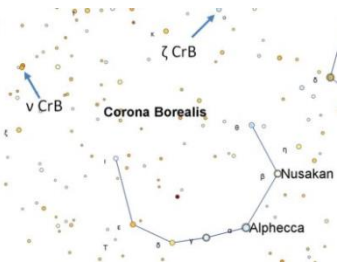
In the centre of the nebula – the remains of the supernova is now a neutron star estimated to be some 18 miles in diameter and spinning 30.2 times per second. This means the surface of the neutron star is moving at 1,700 miles per second!

A transit of the crab nebula by Saturn's moon Titan in 2003 enabled the depth of Titans atmosphere to be measured to 900 km, which was later confirmed by the Cassini spacecraft. The measurement was done by the Chandra X-Ray observatory looking at the absorption of X-Rays by Titans atmosphere. Unfortunately the measurement of the depth of Saturn's atmosphere couldn't be done as Chandra was passing through Earth's Van Allen belt at that particular time. Never mind because the transit will happen again in the year 2267!



The Crab Nebula as photographed by member Mike Scollan

Corona Borealis



The Northern Crown, the symbol of our society is a small semi-circular constellation just to the east of Böotes. In the months of May and June, shortly after sunset, the constellation lies nearly overhead.

The constellation takes its name from the crown, in Greek legend, given to the maiden Ariadne, the daughter of King Minos of Crete. Ariadne had been abandoned on the island of Naxos by Theseus, the legendary hero who slew the Minotaur. The god Dionysus rescued the maiden, fell in love with her, and gave her a jewelled crown forged by Hephaestus, god of the forge. Ariadne and Dionysus had a happy life together. But she was mortal and eventually died. Dionysus placed her crown in the heavens to remember her.

Since they form a remarkably distinctive pattern, many other cultures have associated legends with these stars. The Australian aboriginals called the constellation the Boomerang. The Pawnee of the American Plains beheld these stars as a council of celestial elders. And the Mi'kmaq of eastern Canada saw the constellation as a den for a celestial bear represented by the stars of what we now call Ursa Major.

Corona Borealis was listed in Ptolemy's original atlas of 48 constellations in the first century A.D. The constellation's brightest star, 2nd-magnitude Alphecca, marks the jewel in the crown. Some maps list Alphecca's name as Gemma, the Jewel. The other stars in the crown range from 3rd to 5th approximately. Alphecca is an eclipsing binary star that varies in brightness by just 0.1 magnitude every 17.4 days. Alphecca is about 75 light years away.

Nusakan is the second brightest star in Corona Borealis. Nusakan is one of the more unusual of the brighter naked-eye stars. It is first a "spectroscopic" binary but one in which the two components have actually been distinguished. Appearing a mere 0.3 seconds of arc apart, they are separated in space by about 10 astronomical units (about the distance between Saturn and the Sun). The two orbit with a period of 10.5 years, the brighter star four times more luminous than the other. Nusakan's stellar class is usually classified as a hot F (F0) dwarf, but one with a difference, F0p, where the "p" stands for "peculiar." Nusakan is a classic "chemically peculiar" star in which some chemical elements are wildly altered relative to others. Oxygen is extremely deficient, whereas elements such as strontium, chromium, and europium (one of the "rare earths") are powerfully enriched. Nusakan and others of the "p" variety also have powerful spotty magnetic fields in which various elements are concentrated. As the stars rotate and the spots go in and out of the field of view, the magnetic fields and the apparent chemical compositions vary with time. Nusakan's magnetic fields are very strong. The peculiar spectra make the stars difficult to classify. Nusakan's temperature is actually 8300 Kelvin, more appropriate to that of a warm class A star. From its luminosity and temperature we find a radius 2.5 times that of the Sun and a mass about twice solar

The Corona Borealis does have a few pleasing double stars that make for excellent viewing in binoculars and smaller telescopes, and the whole constellation is very beautiful in a pair of binoculars which reveal many chance pairings of colourful stars. Alphecca is attended by a gaggle of 8th and 9th-magnitude stars, an assembly that is quite lovely in binoculars. Off the tip of the crown, halfway to Hercules, look for the pair of orange stars that make up the star ν (nu) Coronae Borealis. The pair is split by 360", wide enough for sharp-eyed stargazers to resolve without optics. For telescopes, perhaps the prettiest double star in these parts is zeta (ζ) CrB, a blue-white and greenish-white double. The spacing is a little tight, about 6.3", but still resolvable at moderate magnification in any telescope on all but the most turbulent nights. The 5th and 6th magnitude pair lies on the northern edge of the constellation.

Corona Borealis holds little in the way of bright deep-sky objects. But if you have a 20" or larger telescope tucked away in your closest, you might spy the brighter members of a distant cluster of galaxies, the Corona Borealis Cluster, itself the anchor of the immense "Cor Bor Supercluster". These extremely distant galaxies are more than a billion light years away and, from our skies, they shine at 16th magnitude and fainter.

Programme for December 2016 & January 2017

Date	Time	Location	Subject / Event	
Thu Dec 1st	19:45	Club Room	Images of Space, Art or Science?	*Paul Money*
Thu Dec 8th	19:45	Club Room	We're going to the movies	*Jez Robinson*
Fri Dec 9th	19:45	Observatory	PVE	*Les Marsden*
Sat Dec 10th	19:45	Observatory	PVE	*Les Marsden*
Wed Dec 14th	19:45	Club Room	Executive Committee Meeting	
Thu Dec 15th	19:45	Club Room	TBA	*Sue Cartwright*
Thu Dec 22nd	!9:45	Club Room	Grubb Telescopes	*Steve Taylor*
Thu Dec 29th	19:45	Club Room	Meteors & Quadrantids	*Paul D'Silva*
Thu Jan 5th	19:45	Club Room	TBA	*Chris Arridge*
Wed Jan 11th	19:45	Club Room	Executive Committee Meeting	
Thu Jan 12th	19:45	Club Room	TBA	*Phil Muffett*
Thu Jan 19th	19:45	Club Room	The Development of our Calendar	*Ed Bothamley*
Thu Jan 26th	19:45	Club Room	Annual Astro Imaging Competition	*Tony Morris*

Old Moor RSPB – Manvers Way, Barnsley, S73 0YF
PVE – Public Viewing Event – Bookable Only
CAE – Community Access Event
PO – Public Outreach
TBA – To be announced – (otherwise – We don't know!)

Web site: http://msas.org.uk
Meeting room is at Swinton Working Men's Club, Station Street, Swinton, South Yorkshire, S64 8AU.
Observatory is at Lee Brook Lane, Hoober, S62 7SH
Mexborough & Swinton Astronomical Society is Registered Charity N° 1064103 in England & Wales

For submissions to The Messenger - Editor: Roy Gunson: royg@gmx.co.uk

Coming Soon .....

Next Issue of Messenger will be the February edition

Get ready to be wrapped up warm – Quadrantids viewing at the Observatory on Tuesday January 3rd

Also get your images ready for the Photo Competition on 26th January