CELEBRATING 40 YEARS 1978 - 2018

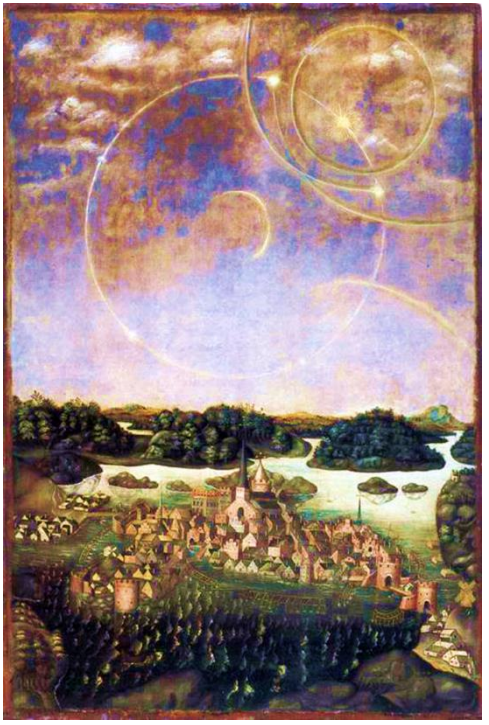
The Messenger

Mexborough & Swinton Astronomical Society

May 2019

Vädersolstavlan

(Swedish for "The Sun Dog Painting")



This is an oil-on-panel painting depicting a halo display, an atmospheric optical phenomenon, observed over Stockholm on 20 April 1535. The painting was commissioned by the Swedish reformer Olaus Petri, and the resulting controversies between him and King Gustav Vasa and the historical context remained a well-kept secret for centuries.

It is named after the sun dogs (Swedish: Vädersol, "Weather sun") appearing on the upper right part of the painting.

While chiefly noted for being the oldest depiction of Stockholm in colour, it is arguably also the oldest Swedish landscape painting and the oldest depiction of sun dogs.

Sun dogs were apparently well known during the Middle Ages, as they are mentioned in the Old Farmer's Almanac which states that the phenomenon forecasts strong winds, and also rain if the sun dogs are more pale than red. however, Olaus Petri was a clergyman, writer, judge and major contributor to the Protestant Reformation in Sweden and was troubled by the appearance of these sun dogs. Petri interpreted the signs over Stockholm as a warning from God and had the Vädersolstavlan painting produced and hung in front of his congregation. Notwithstanding this devotion, he was far from certain on how to interpret these signs and in a sermon delivered in late summer 1535, he explained there are two kinds of omens: one produced by the Devil to allure mankind away from God, and another produced by God to attract mankind away from the Devil — one being hopelessly difficult to tell from the other. He therefore saw it as his duty to warn both his congregation, mostly composed of German burghers committed to a conspiracy against the king, and the king himself of the impending troubles. Olaus was arrested and put on trial for treason, supposedly because he had learned about a conspiracy against the King during confession. Olaus Petri was found guilty on January 2, 1540, and received a death sentence, and even his brother Lars signed the judgment. However, after much bargaining and many requests, friends managed to get him released on bail. Olaus received a royal pardon in 1542, and later that year was appointed inspector over Stockholm's schools. The following year, he was promoted to dean of St. Nicholas' Church in Stockholm, and fulfilled that priestly position during the final nine years of his life.

Mike Hall's May 2019 Skynopsis



Diary all times GMT)

1st	Sunrise 04.32, Sunset 19.22
4th	New Moon
6th	Eta Aquarius meteor shower peaks
7th	Mars 4° North of Moon
8th	Sunrise 04.20, Sunset 19.33
9th	20.00 Mars 7° North-West of the Moon
12th	Moon at First Quarter
15th	Sunrise 04.08, Sunset 19.44
18th	Full Moon
20th	Mercury in superior conjunction, Jupiter 3.5°. West of Moon
22nd	Sunrise 03.59, Sunset 19.54
23rd	Saturn 2.5°. West of Moon
26th	Moon at Last Quarter
29th	Sunrise 03.51, Sunset 20.03

Galactic Goodies:

Nebulae and Messier Objects

Elephant's Trunk in Cepheus IC1396 (3.5mag) getting higher through the month;
North American also in Cepheus likewise.
Eagle M17 and Eagle M16 in Serpens;
Supernova remnant NGC6960, in Cygnus, rising around sunset and rising to 70°deg.around dawn

Planets

Mars is in the West at sunset and will set before midnight
Jupiter rises before midnight, maximum 17°
Saturn rises around midnight and only reaches 18°.

From the Final Frontier: - 'Opportunity's Opportunities

The Opportunity rover has spent almost fifteen years exploring the Martian surface and atmosphere. It should have lasted 92.5 Earth days but has completed over 5,400! It has determined the composition and distribution of rock, mineral and soil. Over a hundred impact craters have been examined for their formation and erosion. Observations made by the 'Mars Reconnaissance Orbiter' have been validated. Opportunity discovered haematite early on and went on to find Rocks rich in iron and magnesium at the 'Comanche' site. The composition of the rocks has given strong clues to the make-up of the atmosphere when water was present. Many of these discoveries by Opportunity indicate the likelihood that Mars could have supported life.

Mike Hall

The Opposition of the Planets

Just recently the planets, especially the "superior ones", Mars, Jupiter, Saturn, Uranus and Neptune have been in a very poor part of the ecliptic for good observation from the South Yorkshire area – so what are the prospects over the next few years. I know – it may be a long while ahead – but we need something to cling on too!

Mars

Oppositions are about 2 years and a month apart. The next Opposition isn't too bad, Mars being fairly large in the sky, just a little smaller than the 2018 opposition. Unfortunately, as the Martian orbit is reasonably eccentric the opposition distance can vary from about 0.36 AU to 0. 69AU.The oppositions for 2022 onwards are all at a fair distance away, and we will have to wait for the opposition of September 2035 before we get a decent sized Mars at opposition!

Date of Opposition	Altitude	Size	Mag	Where
14th Oct 2020	41°	22.3"	-2.6	Pisces
8th Dec 2022	61°	17.0"	-1.9	Taurus
16th Jan 2025	61°	14.5"	-1.4	Gemini
19th Feb 2027	52°	13.8"	-1.2	Leo
25th Mar 2029	37°	14.4"	-1.3	Virgo

Jupiter

Oppositions occur approximately one year and one month apart. Oppositions for observing will get better from 2022 onwards for a while.

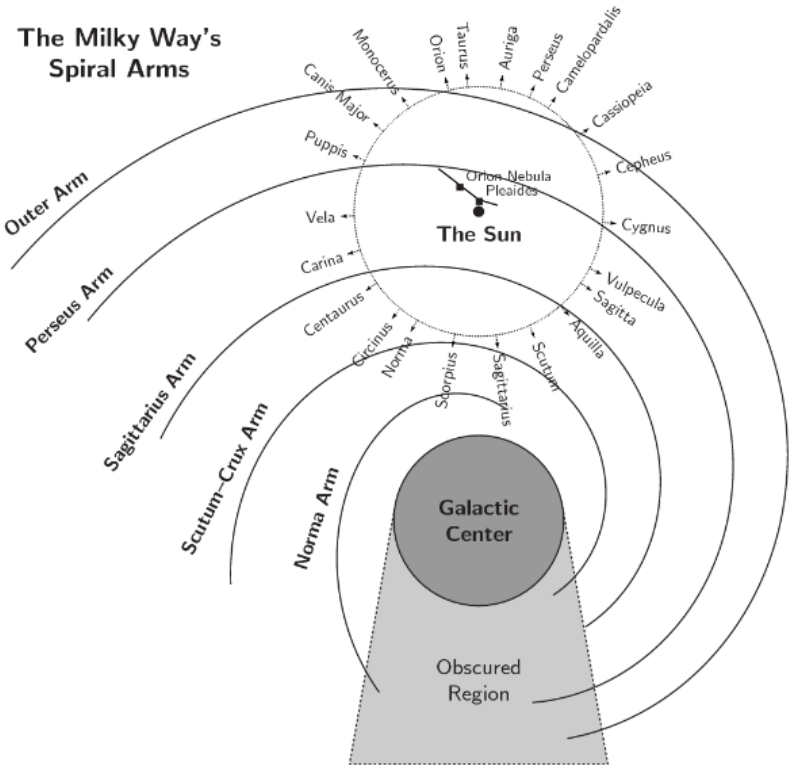
Date of Opposition	Altitude	Size	Mag	Where
10th Jun 2019	14°	45.0"	-2.6	Ophiucus
14th Jul 2020	14°	46.6"	-2.7	Sagittarius
20th Aug 2021	22°	48.0"	-2.9	Capricorn
26th Sep 2022	36°	48.8"	-2.9	Pisces
3rd Nov 2023	50°	48.4	-2.8	Aries
7th Dec 2024	58°	47.1	-2.8	Taurus

Saturn

Saturn takes it's time around the ecliptic, each successive opposition is only about 2 weeks later in the year than the previous one. It's going to be 2030 before we get really high oppositions – however the Earth will pass through the plane of the rings in March 2025. If you notice even though Saturn gets slightly larger in the view during successive oppositions, it gets a little dimmer – this is because the rings are flattening and not reflecting as much light to us. After March 2025 the rings are inclined the other way.

Date of Opposition	Altitude	Size	Mag	Rings	Where
9th July 2019	14°	18.4"	0.1	24°	Sagittarius
20th July 2020	15°	18.5"	0.1	21°	Sagittarius
2nd Aug 2021	18°	18.6"	0.2	18°	Capricorn
14th Aug 2022	21°	18.8"	0.3	13°	Capricorn
27th Aug 2023	24°	19.0"	0.4	9°	Aquarius
8th Sep 2024	28°	19.2"	0.6	3°	Aquarius
21st Sep 2025	33°	19.4	0.6	3°	Pisces

Where we are in the galaxy



The Galactic centre is some 26,000 light years away from the Sol system, in the direction of the constellation Sagittarius. The centre comprises of a supermassive black hole, and it is also estimated that there are upwards of a ten million stars within a few parsecs of this central black hole. This quantity of stars id believed to have formed within the last million years or so from a massive infall of gas and dust being swept up by the central black hole. This black hole is estimated of having a mass in excess of 4 billion solar masses!

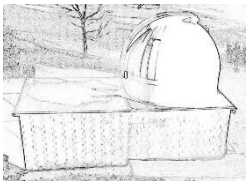
The Orion arm is a minor spiral arm of our galaxy which contains the Sun and solar system, it is a branch of the Perseus Arm and is thought to be 10,000 light years in length. Within the arm, the Solar System is close to its inner rim, in a relative cavity in the arm's Interstellar Medium known as the Local Bubble.

The local Bubble is cavity in the interstellar medium. It is at least 300 light years across and is defined by its neutral-hydrogen density which is approximately one tenth of the average for the Milky Way.

The exceptionally sparse matter, namely gas, of the Local Bubble is the result of supernovae that exploded within the past ten to twenty million years and remains in an excited state, emitting in the X-ray band. It has been suggested that multiple supernovae in the Pleiades moving group are likely responsible.

The Solar System has been traveling through the region currently occupied by the Local Bubble for the last five to ten million years

The View from the Ob



Some notes on what's happening within the Society:

Plans are afoot for an official opening for the Observatory extension on Saturday June 22nd. So far, we have got the Mayor and Deputy Mayor of Rotherham to attend and perform a small opening ceremony, which should involve the cutting of a tape or opening a curtain covering a small plaque or some such thing. We are also hoping to incorporate this into more event during the day, this might be a solar viewing event, some food (and drink). We may even try programme a talk or two into the event. If any member has any ideas please speak to a committee member. One possibility is We made need help with food – one idea so far is that members bring an item of food for the buffet table or, alternatively we might consider booking a large table at a restaurant somewhere in the evening?

In the summer we will be also putting on a major display at Swinton Library in conjunction with the 50th anniversary of the moon landings of Apollo 11 that took place on July 21st 1969. We will be taking up the Skylark rocket and associated display. Phil Muffett will be giving them a talk. There will be a selection of member photographs on display at the library as well.

Next autumn we are in the process of planning a series of talks and events around lunar observing. This will include a special guest speaker, (Bill Leatherbarrow, BAA Director of the Lunar Section) on Lunar observing. Some nights at the observatory on the use of the equipment, some data gathering and then data processing sessions at the main club room. We hope to have the full programme of this in place soon.

Coming soon will be our Annual General Meeting, this is scheduled for June 13th, details will be posted on the notice board soon. Have you considered standing for the committee – it's a way to get involved with the society, and we certainly need all the help we can get? There has been one vacant spot on the committee all the last year.

Keep Your Eyes Open

Thursday 23rd May "All These Planets" James Lees



There are countless worlds in the sky above our heads. Alien planets around foreign stars are no longer just an idea. In this talk we'll explore just some of them; moving between the surprisingly familiar to the strange exoplanets. Examining the possible and theoretical ones as well as looking at the ideas behind a few of science fictions famous planets. James Lees is a Physics PhD student at The University of York studying heat transport in Nano-scale materials.

Alongside his degree he also works as a science communicator; writing books, articles and talks on physics and astronomy. Author of "Physics in 50 Milestone Moments"

Friday 14th June "An Englishman, Frenchman and a Spectroscope" Allan Chapman

Our favourite Society President returns with another of his famous talks, come early as the club room is bound to be busy



The Pioneer before Jupiter: Forgotten Successes & Failures

Everyone remember the Pioneer 10 and 11, but what of the early Pioneers? Before NASA was founded on October 1, 1958, the US Air Force had ambitious plans for space exploration, following the launch of the Russian Sputnik, the Air Force was trying to dominate the nation's infant space program. Even after the Advanced Research Projects Agency (ARPA) was founded in February of 1958 and was given the task of coordinating America's military space programs, Air Force efforts and plans figured prominently.

The Air Force's first project was called Project Able, a series of attempts to place a small spacecraft into orbit around the Moon. These orbiters, along with a pair of small US Army-JPL lunar flyby probes, were part of the ARPA-sponsored Operation Mona, which was approved by President Dwight Eisenhower on March 27, 1958. Three launch attempts made by the Air Force between August and November of 1958, now called Pioneers 0, 1, and 2. The pioneer probe was 74cm in diameter and 76 inches from top to bottom, weighing in at 11 kilos.

Pioneer 0 was launched by the Thor-Able rocket and designed to enter Luna orbit. It was launched on August 17th 1958. It was destroyed by an explosion of the first stage of the booster, 73.6 seconds after lift-off at 16 kilometres (9.9 mi) altitude.

Pioneer 1 was the first to be launched under control of the newly formed NASA. Launch took place on October 11 1958. It did not reach the Moon as planned due to a programming error in burnout velocity and angle. This resulted in a ballistic trajectory with a peak altitude of 113,800 km (70,712 mi). The spacecraft ended transmission when it re-entered the Earth's atmosphere after 43 hours of flight on October 13, 1958 over the South Pacific Ocean.

Pioneer 2 was the last of the three project Able space probes designed to probe lunar and cislunar space. Launch took place on November 8, 1958. The third stage of the launch vehicle failed to ignite, making it impossible for Pioneer 2 to achieve orbital velocity. The spacecraft attained a maximum altitude of 1,550 km (960 mi) before re-entering Earth's atmosphere over NW Africa.

Pioneer 3 was a spin stabilized spacecraft launched at 05:45:12 UTC on 6 December 1958 on a new launch rocket – Juno. Launch went entirely according to plan until the first stage engine cut off 3.7 seconds early due to a failure of the propellant depletion sensors, leaving a velocity shortfall of several hundred feet per second. The injection angle was also about 71° instead of the planned 68°, and the de-spin mechanism also failed to operate. The spacecraft reached an altitude of 102,360 km before falling back to Earth. It re-entered Earth's atmosphere and burned up over Africa on December 7.



Thor-Able Launch Vehicle

Pioneer 4 was launched on March 3rd 1959, and achieved its primary objective of an Earth-Moon trajectory. Only partially successful however a slightly longer than nominal second stage burn made the pass distance of the Moon to be 60,000 km, instead of the planned 20,000. This meant that Pioneer 4 did not come close enough to trigger its photoelectric sensor which would have turned on the Geiger counter detector which had replaced the n-board camera used in previous designs. This spacecraft is believed to be still in solar orbit.

The next “pioneer mission” was designated Pioneer P-1. It was launched on September 24, 1959 on an Atlas C-Able launcher and was destroyed in an explosion on the launch pad at Cape Canaveral during a pre-launch static test.

Pioneer P-3 was intended to be a lunar orbiter probe, but the mission failed shortly after launch. Launch took place on November 26, 1959 and after 45 seconds a shock was recorded by the Atlas's rate gyros followed by the fiberglass payload fairing breaking off of the launch vehicle. The third stage and payload were stripped away after being subjected to severe aerodynamic loads while passing Max Q and the second stage sustained damage followed by loss of its telemetry after 104 seconds.

We then get Pioneer 5, and a success story. Designed to go into solar orbit between the Earth and Venus it was launched on March 5th 1960. Achieved solar orbit at 0.995 AU, contact was lost on April 30th 1960.

The next in this line was designated Pioneer P-30, again designed to be a lunar orbiter mission. Launched on September 25th 1960. At an altitude of about 370 km (230 mi), the first stage separated from the second stage. The Able second stage ignited and started up properly, however thrust quickly decayed and then dropped to zero. The vehicle was unable to achieve Earth orbit, re-entered, and was believed to have come down somewhere in the Indian Ocean.

Pioneer P-31, quickly followed, launching on December 15th 1960. The launch was uneventful until after 66 seconds when a severe axial disturbance was recorded, followed by rapid loss of LOX tank pressure and changes in the Atlas's engine exhaust indicative of oxidizer starvation. At 73 seconds, the Atlas experienced total structural breakup and loss of telemetry. Bang goes another one!

Pioneer 6 was a similar mission to Pioneer 5, looking at solar radiation, launched on December 16th 1965 into a solar orbit with a distance of 0.8 AU, it last provided telemetry on December 8th 2000, some 35 years after launch.

Pioneer 7 was launched on August 17th 1966, into a solar orbit of 1.1AU. It flew within 12 million kilometers of Halley’s comet and made measurements of the composition of the tail material. Last contact was on March 31st 1995.

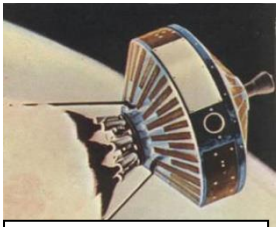


Atlas-Able Launch Vehicle

Pioneer 8 was an identical probe to 6 and 7, launched into a 1.1AU solar orbit, was last contacted on August 22nd 1996.

Pioneer 9 was again a duplicate mission, launched on November 8th 1968, into a 0.8au orbit, was last contacted in1983.

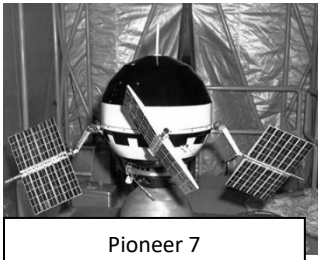
This takes us then up to the amazing Pioneer 10 and 11 missions which undertook the ground-breaking flybys of Jupiter and Saturn.



Pioneer 1,2 & 3



Pioneer 4



Pioneer 7

Diary

Date	Time	Location	Subject / Event	
Thu May 2nd	**19:45**	**Club Room**	**Deep Science at Boulby Underground Laboratory**	*Sean Paling*
Wed May 8th	**20:00**	**Club Room**	**Executive Committee Meeting**	
Thu May 9th	**19:45**	**Club Room**	**Cygnus**	*Roy Gunson*
Thu May 16th	**19:45**	**Club Room**	**Ranger & Surveyor – Apollo's Vanguard**	*Paul D'Silva*
Thu May 23rd	**19:45**	**Club Room**	**All These Planets**	*James Lees*
Thu May 30th	**19:45**	**Club Room**	**TBA**	*Mike Hall*
Sun Jun 2nd	**13:00**	**Observatory**	**Members Only – Solar Observing**	
Thu Jun 6th	**19:45**	**Club Room**	**TBA**	
Wed Jun 12th	**20:00**	**Club Room**	**Executive Committee Meeting**	Wed May 8th
Thu Jun 13th	**19:45**	**Club Room**	**AGM**	
Fri Jun 14th	**19:45**	**Club Room**	**An Englishman, Frenchman and a Spectroscope**	*Alan Chapman*
Thu Jun 20th	**19:45**	**Club Room**	**TBA**	
Sat Jun 22nd	**12:00**	**Observatory**	**Official Opening Observatory, Food & Fun**	*Mayor of Rotherham*
Thu June 27th	**19:45**	**Club Room**	**TBA**	

(Details correct to time of publication)
PVE – Public Viewing Event – Bookable Only

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

The First Molecule Found

The one that gave birth to all other things, the first molecule, has been found by astrophysicists. This confirms what they already knew had existed. The molecule is a helium hydride ion (HeH+).
Though what they found wasn't exactly the original, they say it has the same molecular structure as that which came first.

"For the first time, we've detected the same type of molecule in a nearby nebula," said David Neufeld, co-author of the study in the journal Nature, who's a professor and astrophysicist at Johns Hopkins University in Baltimore.
We now have several pieces of the puzzle that would give us an understanding of the events that took place at the beginning, the Big Bang, and how the rest of matter came into existence. All we need to do is to try and put them together.
Of course, even after all the data and evidence, we might still only have a rudimentary understanding of the universe's origins but we must continue to forge onward. And these efforts are making it possible to reconstruct the events that occurred at the beginning and those that followed to unveil the secrets of the universe.