AURORA
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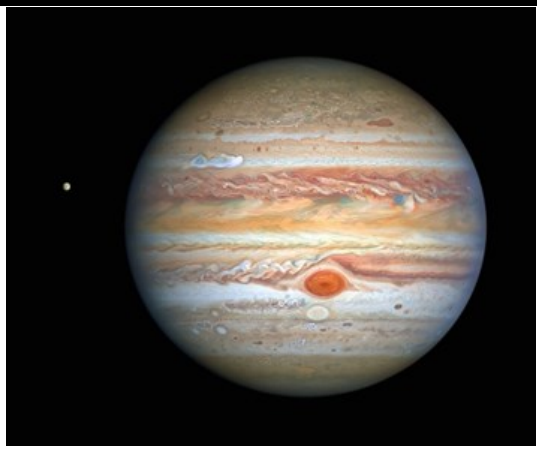
Jupiter - the BIG Planet by Juliana Grigorescu

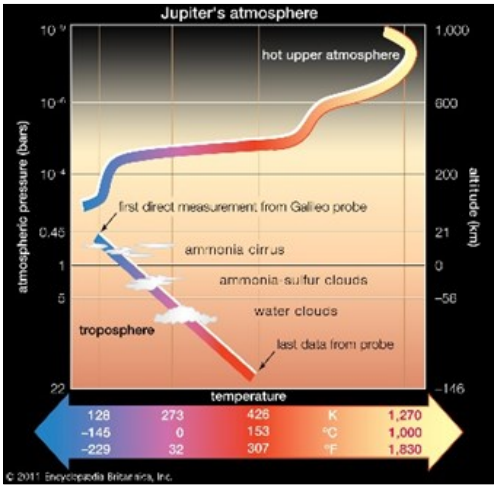


Jupiter is the biggest planet in the Solar system at a distance of 5.2 AU. It has an average radius of 10.5 Earth radii and it exhibits an obvious equatorial bulge. The mass is 317 times the mass of the Earth and the average density is 1.3 g/cm^3. The rotation period is 10 hours, the revolution period 12 years.

Extraordinary features:

- Miniature Solar System with 79 known moons around it (as of 2021).
- Giant liquid planet.
- Vacuum cleaner of the Solar System, deflecting object due to its gravity (the sling-shot effect).

The interior of Jupiter consists of molecular hydrogen and helium, with traces of other elements, to the outside, a layer of metallic hydrogen (in a liquid state), a rocky core at a temperature of 30,000 K. Jupiter emits more energy than it receives from the Sun. Why is that? Is Jupiter still contracting and converting gravity into heat? This is one of the explanations.



The atmosphere is conventionally determined to be at the level of the ammonia-sulfur clouds and it is mostly hydrogen with clouds of methane and ammonia. Can you step on Jupiter? No. You will fall through the gaseous atmosphere in your protective space suit and be eventually crashed by the pressure in the interior of the planet (and melted too!).

By far, Jupiter has the most extreme weather in the Solar System: there are strong winds (jet streams) seen as cloud bands, a permanent storm 300 years old, at least - the Great Red Spot, a persistent anticyclonic storm located 22° south of the equator. There are occasional storms such as the White Ovals and lightning storms with extreme wind in the lower atmosphere of Jupiter, tens of times stronger than storms on our planet.

The magnetic field of Jupiter is a monster: if you could see it, it would be the biggest entity in the sky, many times the size of the full moon. In the Solar System it extends all the way to the orbit of Saturn. The radiation is the result of charged particles moving in this intense magnetic field. You can hear Jupiter and its radio radiation from planet Earth (with a simple, specially crafted, antenna).

(Continued on page 6)

In This Issue

Calendar of Events

Our next meeting…

June 15, 2021
at
Online Zoom Meeting begins at 7:30 p.m.

Main Speaker…

Steve Pellarin

Topic…

To Be Announced

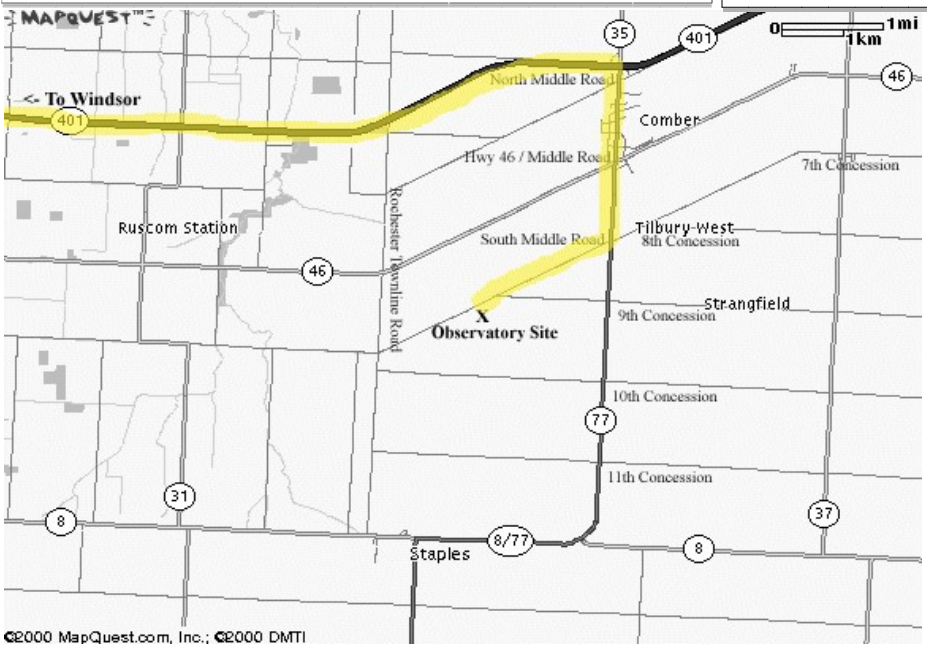
Director of Observing Report
by Steve Mastellotto

Activities...

Mercury and Venus: On Friday May 28th Mercury and Venus will be 0.4 degrees apart after sunset which occurs at 9:00 p.m.. 45 minutes later in the darkening sky you will find the pair 5 degrees above the horizon. You should easily spot Venus at mag. –3.9 but Mercury is mag. +2.5 and will require binoculars or a telescope.

Council Meeting: The RASC Windsor Centre Council will be meeting on Tuesday June 8th via Zoom Meeting.

Annular Eclipse: On Thursday June 10 the Sun will be eclipsed by the Moon for Northeastern Canada. Windsor will see the Sun rise at 5:55 a.m. with a sizeable bite taken out of it - 0.64 mag. This should make a good photo op as the morning haze should sufficiently filter the bright Sun for some shots but be careful not too look too long as the intensity will grow quickly and could damage your eye or electronics. The eclipse ends by 6:37 a.m. for Windsor.



Hallam Observatory Site

Directions: The map at left shows the Comber area and it includes the major highways (401, 77, 8 and 46) that are in the area of the observatory.

The most direct route from Windsor is "highlighted" on the map which is to take Highway 401 East to Highway 77 South to South Middle Road. Turn right onto South Middle Road and go about 1 kilometer and just after the point where Concession 9 joins it (it is hard to see this intersection) you will find the observatory site on the South side (left) of the road. 3989 South Middle Road.

If you hit the Rochester Townline Road (you come to a stop sign) you have gone too far.

Submissions

Aurora is published monthly except for July, August and December. The September, October, January, March and May issues are full newsletters (usually 6 pages) with a number of member submitted articles. The November, February, April and June issues are short flyers (2 pages).

Submitted articles can be of any length from a paragraph to multiple pages. I can scan pictures and/or diagrams (both prints and film) to support your article and the originals will be returned to you.

Submission deadline is the 1st of the month.

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Membership

The Windsor Centre of The Royal Astronomical Society of Canada meets on the 3rd Tuesday of every month (except July and August) at the Ojibway Park Nature Centre. In addition to regular meetings the centre hosts a number of observing nights, a picnic and a December social. Members receive a copy of the Observer's Handbook, a subscription to SkyNews magazine and access to the Centre's library and telescopes. Optionally the RASC Journal is available in print form—online version free.

Annual Membership Fees: Please see the RASC website at **www.rasc.ca** for current rates.

Contact Greg Mockler (greg.mockler@live.com) or visit our website at: http://www.rascwindsor.com for more information.

April 2021 Meeting Minutes by Nancy Ng

The general membership meeting was held on **April 20, 2021 at 7:35 p.m. EDT via Zoom** online meeting and hosted by **RASC Windsor Centre President - Mahayarrahh-Starr Livingstone**.

Starr welcomed members and guests to the Zoom meeting. Also present was the guest speaker for the evening **Professor Laura Parker**. Members were invited to review the minutes from the March 16, 2021 meeting that were printed in the Aurora newsletter. A **motion to accept the minutes** as presented was made by **Randy Drumm** and seconded by **Sandy van Gaalen** and the **motion carried.**

Director of Observing Report, Nancy Ng: Nancy began by sharing photographs that she took from inside Hallam observatory. **Hallam Observatory Director, Randy Drumm** with help from his wife had thoroughly cleaned all areas and provided sanitary wipes and hand sprays during this time of Covid safety. Members were then asked to share their activities from the past month. **Starr shared two images** which he took out at Hallam. **M101, the Pinwheel Galaxy** and his view of a thin **1.7 day old moon**. Nancy displayed a shot of this same moon as it was setting behind the dome of the observatory. **Brian Simpson's** impressive views of **M97, the Owl Nebula and M2**, the Orion Nebula provided great examples of the bright blue and red colours which he patiently processed from deep space. **Randy Drumm contributed 3 separate images of the Orion Nebula** with different perspectives in processing techniques which resulted in his final image.

Mercury was at superior solar conjunction on April 18th. By May 18th the planet will reach its highest altitude at sunset of 18 degrees. The planets **Jupiter and Saturn** will both be above the SE horizon by 4 a.m.. If you are out before sunrise you will see the last quarter moon as it passes beneath the planets on May 3rd, 4th and 5th. On May 12th the moon will have passed through new moon phase and will now be visible just after sunset low in the western horizon. This one day old moon will be in **conjunction with Venus** with a separation of only 0.42 arcminutes. The moon will then then travel to conjunction with Mercury and Mars on the 13th and 15th consecutively.

Nancy provided a view of the **night sky for April 20th**. Beginning to emerge from the east at 9 p.m. are the summer constellations **Hercules, Bootes and Virgo**. Throughout the evening they will continue to parade across the night sky with **Leo the Lion** leading them. By 10:30 p.m. some of the winter constellations of **Taurus, Orion, Lepus and Canis Major** will be lost to the western horizon. When we gather for our next meeting on May 19th four of the summer constellations **Cygnus, Lyra, Ophiuchus and Libra** will be starting their trek from the edge of the eastern horizon and travelling west. **Hydra,** the longest of the constellations can now be seen in its entirety just below the ecliptic and the zodiacal constellations. On this evening you will find Mars sitting between the outstretched arms of the twins Castor and Pollux in Gemini constellation.

Starr, in his position as Light Pollution Abatement Director was successful in connecting via email to Canadian Astronaut, Chris Hadfield. He requested photographs which he may have taken from the International Space Station that would show the light pollution in our area. Two images taken by Mr. Hadfield were provided and bright lights from larger cities as seen from space were visible.

Main Speaker: Laura Parker, Professor and University Scholar, Department of Physics & Astronomy at McMaster University - Galaxy Evolution: Laura delivered an energetic and observationally based presentation on the evolution of galaxies. She began with beautiful images of galaxies taken by the Hubble Space Telescope. She noted that while we can visually see these galaxies most of their mass is found in the **invisible and massive dark matter halo** which surrounds them. Powerful gravitational pulls from these halos are a large component involved in the interaction between galaxies. From our perspective galaxies do not change over the short period in which they can be directly observed in a persons lifetime. This creates obstacles for scientists who are trying to observe the **evolution of galaxies over billions of years**. Laura mentioned two observational solutions. Data is acquired by observing the chemistry and detailed properties of our own Milky Way galaxy and the globular clusters which surround us. When powerful telescopes examine galaxies which are billions of lightyears away they are documenting how they appeared in the very distant past. In this way galaxies are **observed in different stages** of their evolution.

Laura presented a slide of the commonly known **Hubble Fork diagram**. Hubble's scheme divides galaxies into three broad categories based on their visual appearance or morphology. **Ellipticals, spirals and lenticular** shaped galaxies are presented with a smaller category of irregular galaxies. Our Milky Way galaxy is in the shape of a spiral with stars orbiting around the centre. In elliptical galaxies stars are orbiting randomly. Smaller galaxies which were evident after the Big Bang required collisions as a fundamental process in their evolution. The difference between **collisional and collisionless interactions** were explained. When galaxies collide their stars and dark matter do not interact and are therefor collisionless. There is still gravitational encounters which affect stellar systems. The massive amounts of gas involved when galaxies collide is collisional and these interactions **trigger huge bursts of stellar formation**. Laura shared a computer simulation of two spiral galaxies known as the **Mice galaxies** seen in the early stage of their merger. By advancing the simulation far into the future astronomers predict they will become one large elliptical galaxy. Slides depicting the end product of various galaxy collisions were viewed as well as the four billion time line for the approach of **Andromeda Galaxy towards our Milky Way.**

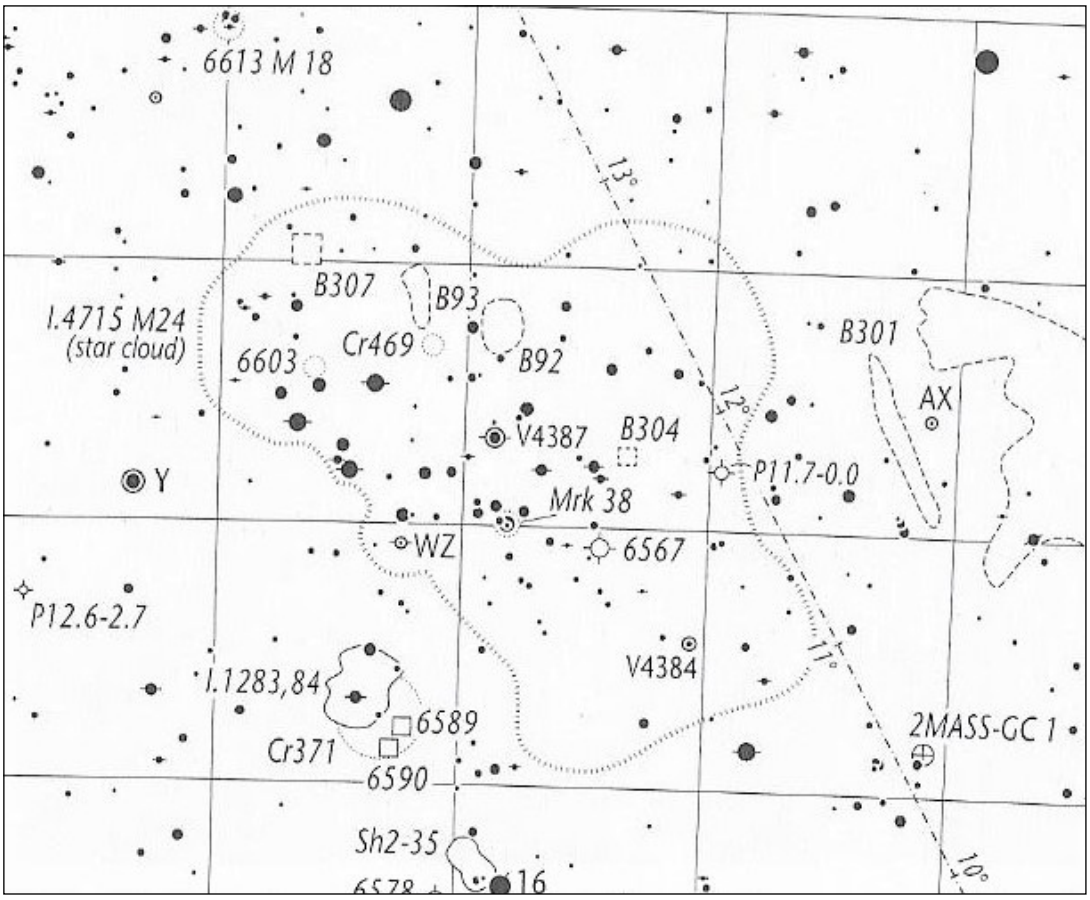
Laura explored the ways that the environment which surrounds a galaxy impacts on its evolution. **Black holes, dark matter halos and nearby neighbours** are a few of the environmental considerations. Galaxies may be found in large clusters, small groups or isolated on their own. Laura's area of study is with groups of galaxies because mergers are more common here and her research focuses on these collisions. Before she can begin collecting this data she must first find a candidate group. Many weeks are spent documenting the red shift of dozens of galaxies to decipher their motions. Once she has isolated a group she and her team record the effects of a process known as **ram pressure stripping.** This can occur when an isolated galaxy enters the large dark matter halo which is surrounding a group of galaxies. With recently new observational capabilities scientists are now able to observe this process. They have found new star formation areas within the ionized gas which is being stretched out of the galaxy by the ram pressure stripping. Her main focus in future studies is to observe this star formation within the 'tail' of these galaxies. Due to their appearance, they have become **known as Jellyfish galaxies**.

Laura and her team are anxiously waiting confirmation that their application for time on the ALMA telescope in Chile will be accepted. This is a once a year request and we wish her the best.

Starr thanked everyone for joining the meeting in particular our guest speaker - Laura Parker. **Meeting adjourned at 9:20 p.m..**

At The Eyepiece: Messier 24 Star Cloud by Mike Ethier

This month I am combining my two articles, At The Eyepiece, and Messier of The Month into one. Also known as the Sagittarius Star Cloud, M 24 has a somewhat confusing history due to a wrong R.A. assigned to it by Barnard. It wasn't until 2001 that the mistake became well known, and Messier's original discovery could be acknowledged (see the longer explanation at cseligman.com, under the IC 4715). There is only one other Messier object with an IC designation, that being M 25/IC 4725. Easily seen with the naked eye, M 24 is very large, extremely star-rich, and beautiful in binoculars and a joy in a rich field telescope, such as the Edmund Astroscan. While much of Sagittarius provides rich sweeping at low power, there is no denying the intensity of M 24.



While it appears stunning with any sort of visual aid, I spent over an hour here one September night in 2014 with a 12" Dob, exploring every nook and cranny of this colourful, star-filled area. Within the cloud are three other small open clusters, as well as a planetary nebula. So if you have some time to spend one fine summer or early autumn evening, M 24 is a recommended stop. The cloud's size is given as 120' of arc, so I began exploring with my lowest possible magnification, which is 43x. Oc 6603 is conspicuous right away. Immediately south of the cluster are 6 bright stars, arrow shaped. These stars appear to be involved with the richest and most splendid area, and seem to be at the heart of the cloud. The sweeping continues to be exceptional if moving south preceding to variable star V4387 (see map). A bright yellow star, V4387 leads south to another beautiful area of thousands of stars. Moving back to the original arrowhead, the star just south of oc 6603 is a deep orange. South following is a bright double star, yellow and blue, one of many doubles within the cloud. There is so much more to discover about the cloud itself, but I will move on to some of the other named points of interest.

Oc 6603 (Size 4'; Visual Mag. 11; brightest star mag. 14; 100 stars) is hazy, bright, and not too small at 43x. It looks so much like a comet that no wonder some people still mistake this cluster for M 24 itself. Even at 43x it begins to resolve. We were also able to resolve some of it in Deb's 6" reflector at 125x. At 60x and 12" the cluster is still bright, and still in the beginning stages of resolving. At 100x there is some resolution all across the cluster, similar to that of a globular cluster. A bright line of unresolved haze runs through the middle, NE to SW. 125X gives decent resolution, with the central hazy bar narrowing. The cluster is finally fully resolved at 250x, including the bar, now seen as a line of tiny stars. There are dark patches on either side of the line, as well as many tiny stars. This object is a real beauty in a 12" scope!

Collinder 469 is a compact cluster (Size 2.6'; Visual mag. 9.1; 15 stars) preceding oc 6603 by 2' of R.A., and just a tiny bit north. I located it at 60x, noting several bright stars in a tight V-shape, with background haze. At 100x it is very compact, with few faint stars resolving. At 200x 15 stars can be counted, several being very faint.

Oc Mrk 38 (2') shows three bright stars at 60x, one of them being yellow and quite bright. At 200x 10 stars are seen very close to the bright three, with a few others close by.

Planetary nebula 6567 lies just south preceding Mrk 38. At a miniscule size of only 12" of arc, the object appears virtually stellar at 250x. A tiny bit of fuzz can be discerned around it, being a greyish-blue colour. It is bright, at mag. 11, and I have seen it with an 8". The central star is mag. 14.3, though it is washed out by the brightness of the haze.

While sometimes passed over for the wondrous nebulae and clusters in Sagittarius, M 24 is worth spending time exploring. I haven't visited yet with Space Eye, my 2" refractor, but it's on the list for summer.

Clear skies.

The Invisible Extinction by Nancy Ng

I usually set up my telescope at dusk and then sit back and patiently wait for the darkness to descend. Luminous planets like Jupiter and Venus are the first to appear in a sky still bright with the afterglow of sunset. I wait in silence under that Great Dome until one by one the first magnitude stars pop into view. It doesn't take very long for the really dark sky to reveal the cosmos in all its glory. Thousands of Stars! The subtle glow from our closest large Galaxy, Andromeda hits my eyes as well. At the speed of light these photons have travelled for over 2½ million years to reach my retina.

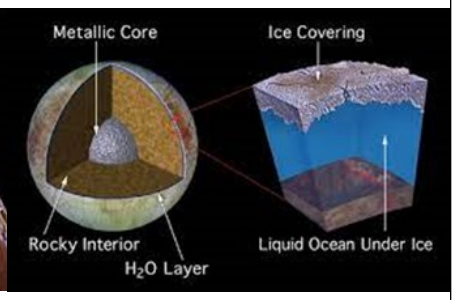
If you spend a moment online you can find the math behind this speed. Travelling for one second at light speed would send you flying around our Earth over 7½ times. Our Sun, our own personal star, is just over 8 minutes away at this speed. Proxima Centauri, the other closest star to Earth is over 4.2 light years away. With a small telescope I can see my favorite galaxy, Sombrero, at 31 million light-years or supernova remnants, star clusters and the glowing red and blue of the Ring Nebula, and……..well, really just magic in the sky!

Then the dreaming begins. People may gaze at the dazzling night sky and wonder at their place in the universe and be humbled by the magnificence of it all. However light pollution, the extra unwanted light can take away this view of our Larger Home. This could result in generations of people losing something of extreme value they may not even know exists. It's invisible to them. The extinction of the Dark Night Sky is a tragedy.

The image above was captured by Nancy Ng and it shows the light pollution generated by the greenhouse industry looking south from the gates to Hallam Observatory.

Jupiter - the BIG Planet (continued from page 1)

Io



Europa

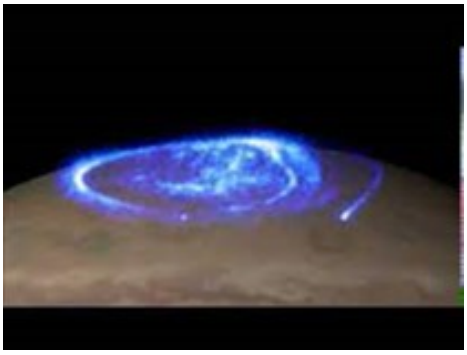
There are 4 big moons, the Galilean moons: Io (active volcanoes), Europa (with an ocean of water under its icy crust), Ganymede (bigger than planet Mercury, with an iron core) and Calisto (icy body). Io has active volcanos, that have been seen erupting. It is simply Hell! Europa might harbour life in the ocean under its crust. The moons have undergone a process of differentiation, with Io the densest and Calisto the least dense moon. The rest of the moons are small bodies, with the biggest (Amalthea) 230 km in size.

A ring system was discovered in 1979 by Voyager 1. It was very tenuous and consisted of particles coming from smashed out material from the moons of Jupiter.

The first mission to fly by Jupiter was Pioneer 10 in 1973, followed by Voyager 1 and Voyager 2 in 1979. In 1995 an orbiter arrived, the Galileo Orbiter, which dropped a probe in the Jovian atmosphere and lasted until September 2003, when the mission ended, as the orbiter plunged into Jupiter's atmosphere in order to avoid a future collision with Europa.

Starting in 2016 the Juno Orbiter entered the scene with these declared goals: "*understand origin and evolution of Jupiter, look for solid planetary core, map magnetic field, measure water and ammonia in deep atmosphere, observe auroras".*

NASA has approved an update to Juno's science operations until July 2021. Check out this mission on NASA's website, the images are incredible, almost like art!



Permanent auroras are visible at the poles, as the strength of the magnetic field is diminished and particles are permanently exciting the gases in the atmosphere.

Member Astrophoto

Left: *First light image for Randy Drumm using his new ZWO ASI 2600MC Pro camera. Messier 51 - The Whirlpool Galaxy along with its' companion NGC 5194 is a combination of 160 frames of 3 minutes each for a total of 8 hours exposure using Randy's Esprit 100 (550mm focal length) and an Optolong CLS light pollution filter from Randy's backyard in Essex.*