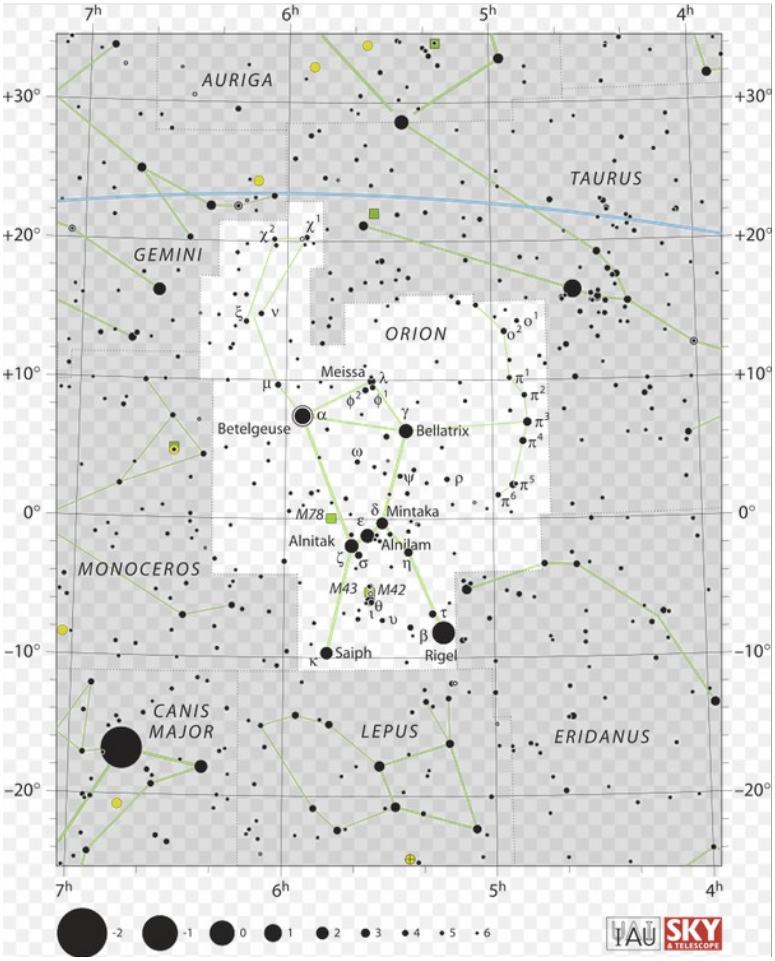
POLARIS

Royal Astronomical Society of Canada
London Centre Newsletter
December, 2018

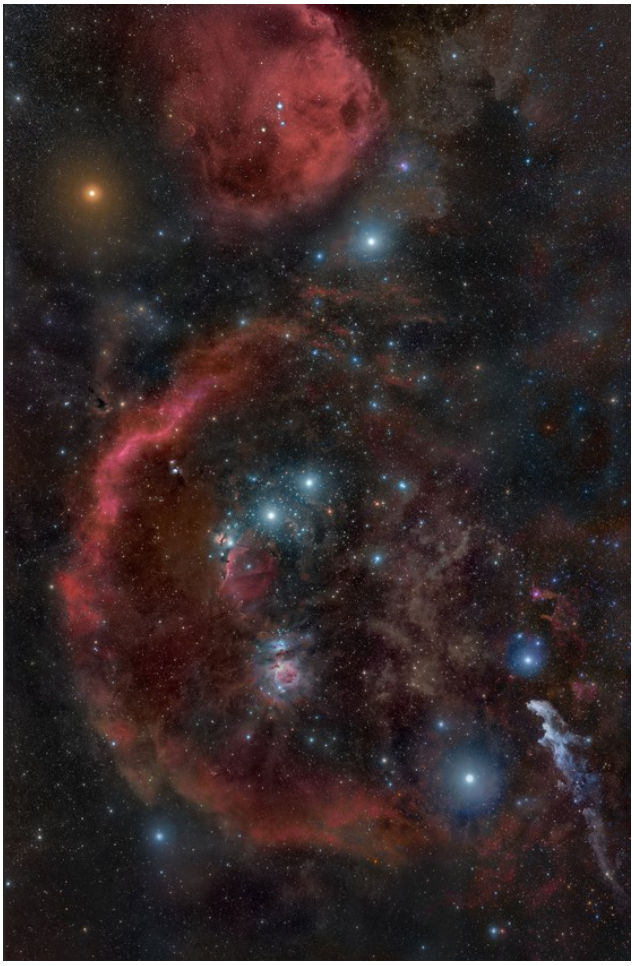
The Hunter

You're all used to me writing articles about hardware and imaging, but this month I'd like to talk about a constellation. We all have our favourite area(s) of the sky and I have three, all associated with the line of the Milky Way, Orion, Cygnus and the Sagittarius/Scorpio region. This article will be about Orion.



Orion has been watched and recorded by man for a very long time. A rendering in mammoth ivory dating back around 35000 years has been found in a cave in Germany. The Baylonians listed it in their catalogs as 'The Heavenly Shepherd' the ancient Egyptians regarded it as the god Sah. It is mentioned in the Bible several times. The name Orion comes to us from Greek mythology. Orion was a supernatural hunter with a Gorgon for a mother and Poseidon for a father. He was boastful of his prowess and Gaia (the earth) sent a scorpion to kill him. As enemies, Orion and Scorpio are never in the sky at the same time, to keep them apart.

I think I come by my love of Orion honestly. I'm up early every morning and out on the road with my



dogs, and my first sight of Orion in the pre-dawn sky always thrills me. I mind well my time in the military when, being on night fire-picket duty I felt that I wasn't alone when Orion was in the sky overhead. But why is Orion such a great area of sky, either visually or photographically?

Orion is chock-a-block with bright, easy to recognize stars. From the blood-red Betelgeuse at one shoulder to the icy-hot blue of Rigel at his opposite knee and the diamond-white line of his belt with its fuzzy scabbard Orion is one of the most recognizable of constellations.

Betelgeuse, Alpha Orionis, is the ninth brightest star in the sky (usually) and the second brightest in Orion. It is a supergiant of spectral type M and is a variable star with its brightness ranging from 0.5 to 1.3 magnitude. It lies 222 parsecs away from us and has a radius of about 885 to 955 solar radii. At its largest it would extend out to the asteroid belt if it was in the Sun's place. Its luminosity is approximately 90000 to 150000 times that of the sun and its absolute magnitude is about -5.85 which would make it considerably brighter than Venus if it was only 10 parsecs away. Astrophysicists think that Betelgeuse is at the end of it's life and, when it runs out of fuel will collapse and then explode as a type 2 supernova. At this time it will be easily visible in daylight and will outshine the full moon at night.

Rigel, the brightest star in Orion but called Beta Orionis, is a blue-white supergiant of spectral type B8 and lies at the western knee of the constellation. It is the seventh brightest star in the sky and has an apparent magnitude of 0.13. Its distance is about 863 light years from earth. It is a visual binary with a companion star of magnitude 6.7 that is easily split by most amateur telescopes but is a challenge due to the brightness of the primary star. Rigel B itself is a close binary and its partner appears to be a spectroscopic multiple system of perhaps three stars.

Bellatrix, Gamma Orionis, lies on Orion's western shoulder. It is a blue giant and has a spectral type of B2, a mass of about 9 solar masses and a luminosity of about 9200 times that of the sun. It is evolving away from the main sequence as its fuel is becoming depleted.

The three bright belt stars; Alnitak, Alnilam and Mintaka, are all late O or early B stars all around 2nd magnitude. They, along with the sword of Orion make up a group of young, hot stars known as the Orion OB1 Association. None of these bright stars is very old as stars go with ages from 3-8 million years. All are of spectral type O and B. Outside of the bright constellation-forming stars are thousands of lower mass stars.

Theses are embedded in the giant Orion Molecular Cloud Complex; a huge star-forming region approximately 1000-1500 light light years away and spanning hundreds of light years. The Orion Complex includes many bright and dark nebulae some of which are visible to the naked eye.

The most famous naked eye object in the OMCC is in Orion's sword. Looking at the sword with the naked eye it may seem a bit 'fuzzy'. With any optical enhancement at all the true nature of the sword becomes apparent as the 'stars' turn into the bright nebulosity known as the Orion Nebula (Messier 42/NGC 1976). This is an active star-forming region with four reasonably bright young stars and four dimmer all known as the Trapezium Cluster at its core. The Orion Nebula is illuminated for the most part by the UV radiation given off by these young, hot stars.

North of the Orion Nebula, around the star Alnitak, the easternmost belt star are several groups of nebulosity. The Flame Nebula (NGC 2024) is just to the east of Alnitak and is a very interesting area of gas and dust that shows a lot of structure. The bright nebulosity is blocked out by a large network of dust which lies between it and us.

Just south of Alnitak is a an area of hydrogen gas being illuminated by the star Sigma Orionis that extends in a line from Alnitak to just north of the sword. The brightest part of this area is just south of Alnitak and is punctuated by the famous Horsehead Nebula. This is a n area of dust masking the eastern edge of the bright nebulosity in the shape of a horse's head. While people claim to have seen this with large binoculars and small telescopes it is a VERY difficult target unless you are under very dark skies. Even then a Hydrogen-beta filter helps greatly (this is the only target I know of that needs an H-beta filter).

Barnard's Loop is a long band of nebulosity arcing from near Rigel in the south-west of the constellarion, around to the east and ending up near Orion's west shoulder. It is the brightest just south of Betelgeuse north of the declination of the belt. It is visible under exceptional skies with the naked eye but I think that would also take exceptional eyes, which I don't have.

Around Lambda Orionis (Meissa) at Orion's head is a large, round area of nebulosity illuminated by Meissa and several other associated stars which is also visible in some large binoculars and under good skies.

The last bit of nebulosity I'll discuss is just to the west of Rigel and is known as the Witch Head Nebula (IC 2118). This bluish-white nebula is illuminated by the strong UV radiation being given off by Rigel and glows with a surface brightness of about magnitude 13 and is not visible with the unaided eye. It makes a nice challenge target when Orion is highest.

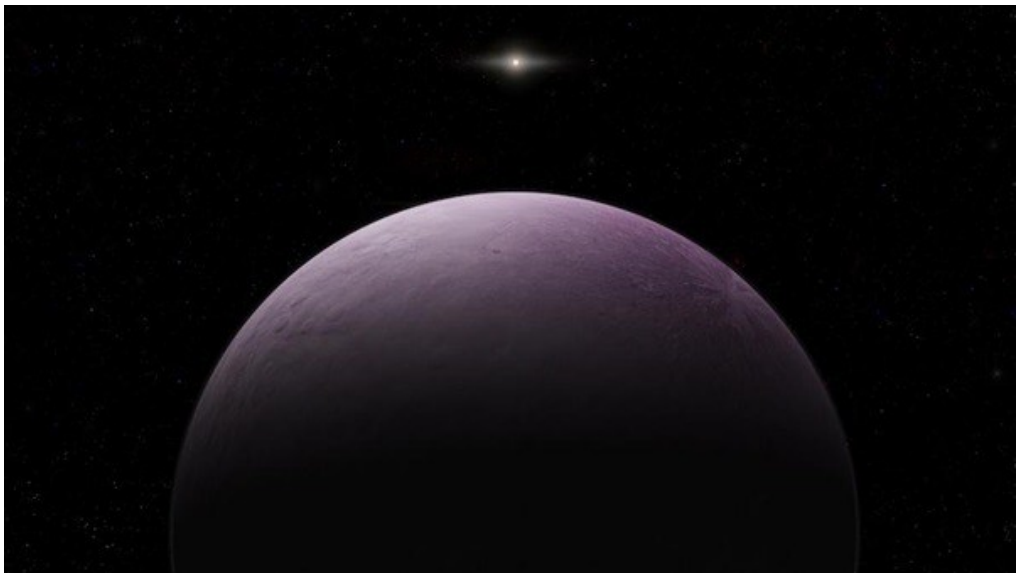
Of course, there are many, many other targets of interest in and around Orion. Next time you sit down at the eyepiece when Orion is high, take a swing through.

Image attributions:

Map of Orion
IAU and Sky & Telescope magazine (Roger Sinnott & Rick Fienberg) (Wikipedia CC BY 3.0)
Orion Head to Toe
Rogelio Bernal Andreo (Wikipedia CC BY-SA 3.0)
Orion Nebula
NASA/ESA Hubble Space Telescope (Public Domain)
Flame and Horsehead
Author

Astro News

Astronomers have found the most distant dwarf planet in the solar system to date



A Far-Out Planet

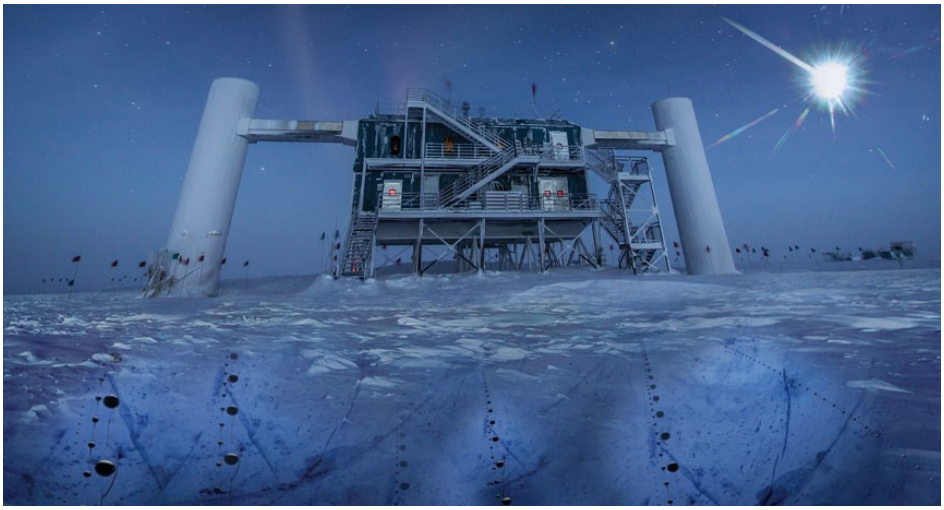
An ambitious team of astronomers has discovered the most "far out" object ever observed in our Solar System. The object, a pink dwarf planet called 2018 VG18 and nicknamed "Farout," lies more than 100 times further from the sun than the Earth is.

This discovery, made by Carnegie's Scott S. Sheppard, the University of Hawaii's David Tholen and Northern Arizona University's Chad Trujillo, was formally announced today (Dec. 17) by the International Astronomical Union's Minor Planet Center. Farout is about 120 AU away — 1 AU is the distance between the Earth and the Sun — making it the first object discovered at over 100 AU. Farout is significantly farther than the now second most-distant object Eris, which is at about 96 AU. The pink dwarf planet is more than three-and-a-half times more distant than the famous, blue dwarf planet Pluto.

Read about it at.....

http://www.astronomy.com/news/2018/12/astronomers-have-found-the-most-distant-dwarf-planet-in-the-solar-system-to-date

Neutrino discovery launched a new type of astronomy



Mysterious particles called neutrinos constantly barrel down on Earth from space. No one has known where, exactly, the highest-energy neutrinos come from. This year, scientists finally put a finger on one likely source: a brilliant cosmic beacon called a blazar. The discovery could kick-start a new field of astronomy that combines information gleaned from neutrinos and light.
It began with one high-energy neutrino spotted on September 22, 2017, by the IceCube observatory, a giant particle detector with thousands of sensors buried deep in the ice at the South Pole. Alerted by IceCube, astronomers soon spotted a flare from a blazar about 4 billion light-years away. The neutrino had come from the same area of the sky. With that matchup in time and space between the neutrino and the blazar's light, scientists in 2018 pegged the blazar as the particle's probable source

(*SN: 8/4/18, p. 6*).

Read more about this at...

https://www.sciencenews.org/article/neutrino-astronomy-top-science-stories-2018-yir

Astronomy Events – January 2019

- January 3, 4 - Quadrantids Meteor Shower. The Quadrantids is an above average shower, with up to 40 meteors per hour at its peak. It is thought to be produced by dust grains left behind by an extinct comet known as 2003 EH1, which was discovered in 2003. The shower runs annually from January 1-5. It peaks this year on the night of the 3rd and morning of the 4th. The moon will be a thin crescent and should not interfere with what could be a good show this year. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Bootes, but can appear anywhere in the sky.
- January 6 - New Moon. The Moon will located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 01:28 UTC. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.
- January 6 - Venus at Greatest Western Elongation. The planet Venus reaches greatest eastern elongation of 47 degrees from the Sun. This is the best time to view Venus since it will be at its highest point above the horizon in the morning sky. Look for the bright planet in the eastern sky before sunrise.
- January 6 - Partial Solar Eclipse. A partial solar eclipse occurs when the Moon covers only a part of the Sun, sometimes resembling a bite taken out of a cookie. A partial solar eclipse can only be safely observed with a special solar filter or by looking at the Sun's reflection. The partial eclipse will be visible in parts of eastern Asia and the northern Pacific Ocean. It will be best seen from northeastern Russia with 62% coverage.
  (NASA Map and Eclipse Information)
- January 21 - Full Moon, Supermoon. The Moon will be located on the opposite side of the Earth as the Sun and its face will be will be fully illuminated. This phase occurs at 05:16 UTC. This full moon was known by early Native American tribes as the Full Wolf Moon because this was the time of year when hungry wolf packs howled outside their camps. This moon has also been know as the Old Moon and the Moon After Yule. This is also the first of three supermoons for 2019. The Moon will be at its closest approach to the Earth and may look slightly larger and brighter than usual.
- January 22 - Conjunction of Venus and Jupiter. A conjunction of Venus and Jupiter will be visible on January 22. The two bright planets will be visible within 2.4 degrees of each other in the early morning sky. Look for this impressive sight in the east just before sunrise.
- January 21 - Total Lunar Eclipse. A total lunar eclipse occurs when the Moon passes completely through the Earth's dark shadow, or umbra. During this type of eclipse, the Moon will gradually get darker and then take on a rusty or blood red color. The eclipse will be visible throughout most of North America, South America, the eastern Pacific Ocean, western Atlantic Ocean, extreme western Europe, and extreme western Africa.

Exerpted from Sea and Sky at....

http://www.seasky.org/astronomy/astronomy-calendar-2019.html

Club Outreach Report

Cronyn Observatory Public Nights, Exploring the Stars & Special Events, November—December 2018

By Robert Duff

Western Science Students' Council Discovery Week 2018, Cronyn Observatory, November 19th, 2018

Cloudy skies greeted 75 visitors for the Western Science Students' Council Discovery Week 2018, for the Special Event, "A Night Under the Stars," at Western University's Cronyn Observatory, Monday, November 19th, 2018, 8:00—10:00 p.m. They were welcomed by a Science Student's Council member who counted visitors and directed them upstairs into the dome and downstairs for demonstrations in the *"Black Room."*

Downstairs in the *"Black Room"* graduate student Ben George gave demonstrations of the *"Transit Demonstration"* activity, with the *"Transit Demo"* model—showing how the transit detection method worked for finding extra-solar planets, and the *"Spectroscopy Demonstration,"* with the visitors putting on *diffraction grating* glasses to view the spectra of 4 gas discharge lamps, including hydrogen, helium, neon and mercury.

Graduate student Hadi Papei was telescope operator in the dome and directed the big 25.4cm refractor to show visitors the lights on the communications tower in south London, using the 17mm Nagler eyepiece (258X). He soon directed the 25.4cm refractor towards the 4-day-past-first quarter Moon, swapping in the 52mm Erfle (84X) eyepiece and then the 32mm Erfle (137X) eyepiece for better views.

RASC London Centre member Bob Duff set up the observatory's Meade 8-inch (20.3cm) Schmidt-Cassegrain (20mm Plossl eyepiece, 100X) inside the dome so as to view through the door to the observation deck and show visitors the red lights and flashing white lights on the communications tower in south London, and later the computer screen in the Western Sports & Recreation Center. The visitors were gone from the dome by around 9:50 p.m. after an enjoyable evening learning about astronomy and viewing through telescopes, despite the mostly cloudy weather.

Exploring the Stars, Lester B. Pearson School of the Arts, November 20th, 2018

A hazy cloudy sky greeted 52 visitors (34 children and 18 adults) from the Lester B. Pearson School for the Arts (Grade 6) for Exploring the Stars at Western University's Cronyn Observatory, Tuesday, November 20th, 2018, 7:00 p.m. Graduate student Ben George presented the digital slide presentation *"Our Solar System"* and fielded questions. He followed this with the activity *"Crater Experiment"* and

invited the children to a table set up at the front of the lecture room where various size balls were dropped into a pan filled with flour, topped with chocolate powder, to demonstrate impact cratering.

RASC London member Bob Duff made ready the big 25.4cm refractor in the dome, installing the 32mm Erfle eyepiece (137X), and directing it towards the flashing white lights on the communications tower in south London. He also set up the London Centre's 25.4cm Dobsonian on the observation deck, installing the 17mm Nagler eyepiece (66X), and directing it towards the wind turbine on the Engineering building. When everybody arrived upstairs in the dome, Bob gave a talk on the history of the Cronyn Observatory and technical aspects of the 25.4cm refractor. He called their attention to the Cassegrain reflector and Schmidt camera piggy-backed on the 25.4cm refractor and explained the difference between a reflector and refractor telescope. He also showed them the 2 clocks on the east wall of the dome and explained the difference between Standard and Sidereal Time.

The visitors were then divided into 2 group with one group going outside on the observation deck with Bob to view the wind turbine, and later a chimney, on the Engineering building through the 25.4cm Dobsonian (17mm Nagler eyepiece, 66X). Ben showed the other group the lights on the communications tower through the 25.4cm refractor (32mm Erfle eyepiece, 137X). The 2 groups circulated between the dome and the observation deck to view through both telescopes. The visitors were gone by around 9:00 p.m. after an enjoyable and interesting evening learning about astronomy and viewing through telescopes, despite the cloudy sky.

Cronyn Observatory Public Night, Saturday, November 24th, 2018

Cloudy skies with occasional light rain greeted some 40 visitors to Western University's Cronyn Observatory Public Night, Saturday, November 24th, 2018, 7:00 p.m. Graduate student Hadi Papei made 2 presentations of his digital slide presentation *"Exoplanets"* and fielded questions. There were 31 visitors for the first slide presentation and a few for the second presentation. Visitors went upstairs into the dome and downstairs for demonstrations in the *"Black Room"* and tours of the historic *"Period Rooms."*

RASC London Centre was represented by Everett Clark, Bob Duff, Dale Armstrong, Peter Jedicke and Mark Tovey. Since rainy weather ruled out opening the dome, Everett set up the observatory's Meade 8-inch (20.3cm) Schmidt-Cassegrain (20mm Plossl eyepiece, 100X) so as to view out the door to the observation deck, directing it towards the TV screen visible in the Western Sports & Recreation Center windows. Dale removed the the diagonal prism and installed the 20mm Plossl eyepiece (100X) directly into the back of the 8-inch (20.3cm) Schmidt-Cassegrain. Dale gave 2 talks in the dome on the history of the Cronyn Observatory and technical aspects of the big 25.4cm refractor. He called everybody's attention to the Cassegrain reflector and Schmidt camera piggy-backed on the 25.4cm refractor, as well as the 8-inch (20.3cm) Schmidt-Cassegrain set up on the dome floor, and explained the difference between a reflector and refractor telescope. Dale showed them the 2 clocks on the east wall of the dome and explained the difference between Standard and Sidereal Time. Bob was counting visitors throughout the evening and supervised as people viewed the TV screen visible in the Western Sports & Recreation Center windows through the 8-inch (20.3cm) Schmidt-Cassegrain. Dale gave several informal talks to other groups of visitors.

Downstairs in the *"Black Room,"* graduate student Ben George gave demonstrations of the *"Transit Demonstration,"* with the *"Transit Demo"* model—showing how the transit detection method worked for finding extra-solar planets—and the *"Spectroscopy Demonstration,"* with the visitors putting on *diffraction grating* glasses to view the spectra of 4 gas discharge lamps, including hydrogen, helium, neon and mercury.

Mark Tovey gave tours of the historic *"1940s Period Room,"* a recreation of Dr. H. R. Kingston's 1940 office, with his brass refractor and the *Sotellunium*—a mechanical eclipse demonstration model built by W. G. Colgrove—on display; and the *"1967 Period Room,"* recreating the early control room of the Elginfield Observatory to celebrate the 150th anniversary of Confederation—Canada 150. The *"W. G. Colgrove Workshop Period Room"* was also open for visitors' inspection. The 3 "*Period Rooms"* were designed by Mark Tovey.

The visitors were gone by around 9:00 p.m. after an enjoyable and informative evening learning about how extra-solar planets are found, spectroscopy, the history of the observatory and technical aspects of telescopes.

Exploring the Stars, St. Thomas Aquinas Catholic Secondary School, December 11th, 2018

Cloudy skies and damp, snowy weather greeted 8 visitors, including two Grade 9 and three Grade 10 students and one teacher from St. Thomas Aquinas Catholic Secondary School, along with 2 student teachers, for Exploring the Stars at Western University's Cronyn Observatory, Tuesday, December 11th, 2018, 6:00 p.m. Graduate student Viraja Khatu presented the slide presentation *"Telescopes"* and fielded questions. She followed this with the activity *"Telescope Kits,"* inviting the students to the table set up at the front of the lecture room where they assembled and tested telescopes from small reusable kits.

RASC London Centre was represented by Bob Duff and Paul Kerans. Since cloudy, snowy weather ruled out opening the dome, Bob and Paul set up the observatory's Meade 8-inch (20.3cm) Schmidt-Cassegrain (20mm Plossl eyepiece, 100X) so as to view out the door to the observation deck, directing it towards the computer screen visible in the Western Sports & Recreation Center windows. They also set up the London Centre's home-built 30.5cm Dobsonian (17mm Nagler eyepiece, 88X) inside the dome for demonstration.

When everybody arrived upstairs in the dome, Bob gave a talk on the history of the Cronyn Observatory and technical aspects of the 25.4cm refractor, using the 32mm Erfle eyepiece (137X) for demonstration. He called their attention to the Schmidt camera and Cassegrain reflector piggy-backed on the 25.4cm refractor, and showed them the 30.5cm Dobsonian, explaining the difference between a reflector and refractor telescope. He also showed them the 2 clocks on the east wall of the dome and explained the difference between Standard and Sidereal Time.

The students asked questions and Bob supervised as they viewed the computer screen in the Western

Sports & Recreation Center through the 20.3cm Schmidt-Cassegrain. Paul showed the visitors his 2 iron and stony-iron meteorites and invited them to "walk on the Moon and Mars" by placing the 2 round wood and clear plastic display cases containing tiny *"Moon Rock"* and *"Mars Rock"* meteorite samples on the floor.

Viraja then brought everybody downstairs into the *"Black Room,"* where she did the *"Transit Demonstration,"* with the *"Transit Demo"* model—showing how the transit detection method worked for finding extra-solar planets—and the *"Spectroscopy Demonstration,"* with the visitors putting on *diffraction grating* glasses to view the spectra of 4 gas discharge lamps, including hydrogen, helium, neon and mercury.

Viraja also gave them a brief tour of the historic *"1940s Period Room,"* a recreation of Dr. H. R. Kingston's 1940 office, with his brass refractor and the *Sotellunium*—a mechanical eclipse demonstration model built by W. G. Colgrove—on display, and invited them to sign the guest book. The "*Period Room"* were designed by RASC London Centre member Mark Tovey.

Books of the Month

The visitors were gone by 8:00 p.m., after an interesting and enjoyable evening learning about telescopes, meteorites, the transit method for finding extra-solar planets, spectroscopy and some of the history of the Cronyn Observatory.

As always, these "Books of the Month" are available for loan to members, to be returned at the following monthly meeting. The books for December 2018 are as follows:

The Science of Shakespeare: A New Look at the Playwright's Universe, by Dan Falk. c2014

Universe on a T-shirt: the Quest for the Theory of Everything, by Dan Falk. c2002.

365 Starry Nights: an Introduction to Astronomy for Every Night of the Year, text and illustrations by Chet Raymo. c1982.

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