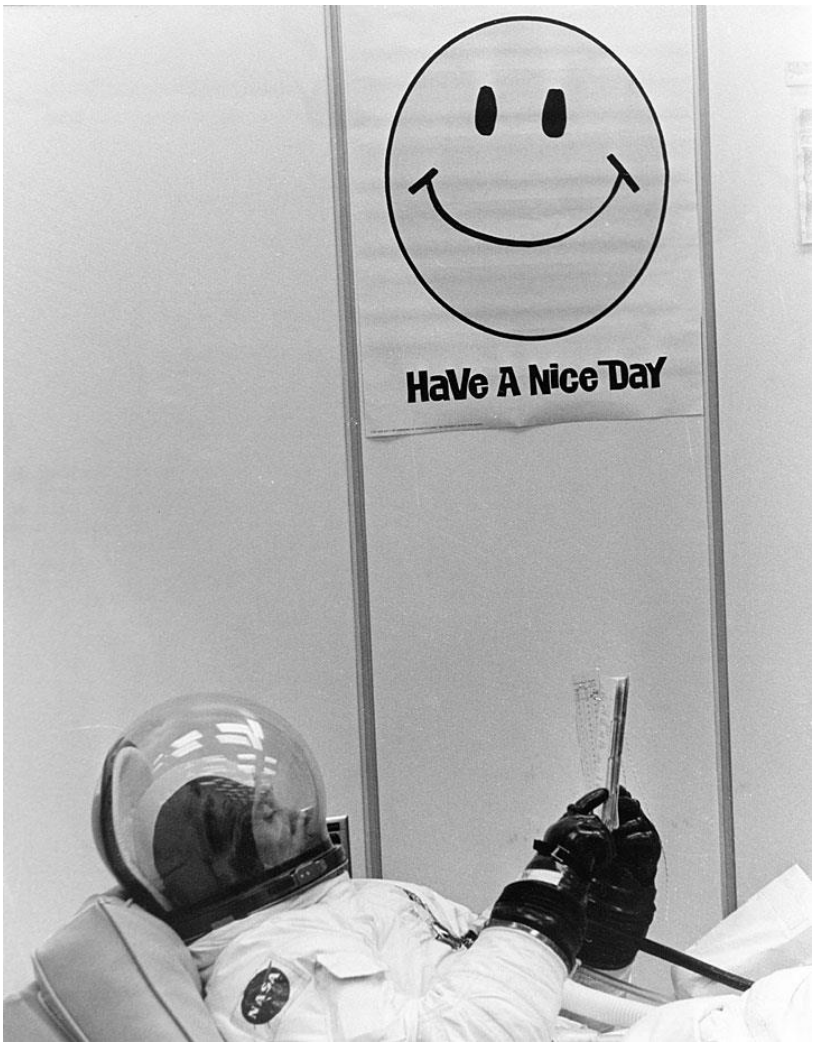
SKYNEWS

Thor's Helmet - NGC 2359, March 5, 2022, by Dan Posey

The Return of Astronomy Day!

After being suspended for two years due to covid-19, International Astronomy Day events will be returning to Victoria for 2022! The public is invited to experience daytime activities and displays at the Royal BC Museum from 10:00am to 3:00pm, on Saturday, May 7th. After a short break, we'll be heading up to the Dominion Astrophysical Observatory and the Centre of the Universe, for an evening of public telescope viewing, tours, and lectures between 7:30pm and 11:00pm. Visitors with tickets (*see next page for details*) will be admitted to Observatory Hill starting at 7:15pm.

The Victoria Centre of the Royal Astronomical Society of Canada is proud to sponsor family-friendly Astronomy Day activities, beginning at the Royal BC Museum at 10am, with solar telescopes set up outside on the main concourse for safely viewing the Sun, weather permitting. Inside the RBCM's Clifford Carl Hall there will be astrophotography, historical displays, and an information desk. There will also be several free lecture presentations on astronomy in the Newcombe Conference Hall. RASC Victoria volunteers and Science Venture staff, from the University of Victoria, will be on hand to engage children with hands-on activities. While visiting all of the astronomy presentations, displays, and workshops are free of charge, regular admission charges will apply to the permanent galleries of the Royal BC Museum and the IMAX theatre. We will also be following whatever current provincial public health guidelines and restrictions that are in place at that time at the Royal BC Museum.



In the late afternoon, the RASC Victoria Centre will be participating in a cross-Canada lunar observing webinar. The Friends of the Dominion Astrophysical Observatory, the RASC Victoria Centre, the National Research Council of Canada, and the Herzberg Astronomy and Astrophysics Research Centre will be hosting the evening's activities on Observatory Hill (5071 West Saanich Road). The Centre of the Universe exhibits will be open that evening, and the Observatory (including the historic Plaskett Telescope) will be open for tours. RASC members will have their personal telescopes set up for public viewing, weather permitting. There will be a presentation about the Hubble and Webb space telescopes given by author, Chris Gainor.

Entry to the Observatory grounds for all public outreach evenings in 2022, is by ticket only, owing to site crowd capacity restrictions. The tickets are free but do require a reservation (*for more information go to*: *https://centreoftheuniverse.org/*). Be aware that the Observatory and Centre of the Universe facilities will be regulated by whatever current federal covid guidelines and restrictions are in place at that time.

International Astronomy Day 2022 in Victoria marks the beginning of public outreach season at the Dominion Astrophysical Observatory, after being suspended for 2020 and 2021 during the Pandemic. Further public events at the DAO will take place this spring and summer on select Saturdays. The RASC Victoria Centre is proud of its history, for its association with both amateur and professional astronomy in Victoria, and its mandate for public education in Astronomy. Come celebrate International Astronomy Day with the RASC on Saturday, May 7th!

For more information please go to our website at: *http://victoria.rasc.ca*

Contact person: Randy Enkin (*president@victoria.rasc.ca*)

Laurie Roche

Editorial Remarks

Humanity's return to the Moon is starting to look a lot more real, with the recent progress of the Artemis Mission. Long delayed by bureaucracy, budget cuts, and technical problems, the first rocket launch in this program is expected to happen sometime in June. Artemis 1 has just wrapped up its latest round of testing on the launch pad and will now be rolled back into the hanger, until it emerges again for its launch window. This uncrewed test flight will travel to the Moon, delivering thirteen cube satellites, many of them on behalf of allied space agencies. It's an exciting time at NASA, given the last time a rocket this size was preparing for launch from their facilities was for the deployment of Skylab, using a Saturn V rocket. Artemis 2, currently scheduled for late 2024, will orbit the Moon with four astronauts. There's a lot of excitement in the Canadian Space Agency about this mission, as one of the four seats aboard the Orion space craft for this mission is reserved for a Canadian astronaut; making it the first time a Canadian will travel beyond low Earth orbit. RASC Centres have been holding star parties, mostly virtually, to celebrate the first launch of this program. RASC Victoria, working in partnership with the Friends of the Dominion Astrophysics Observatory, hosted our virtual event on April 16th.

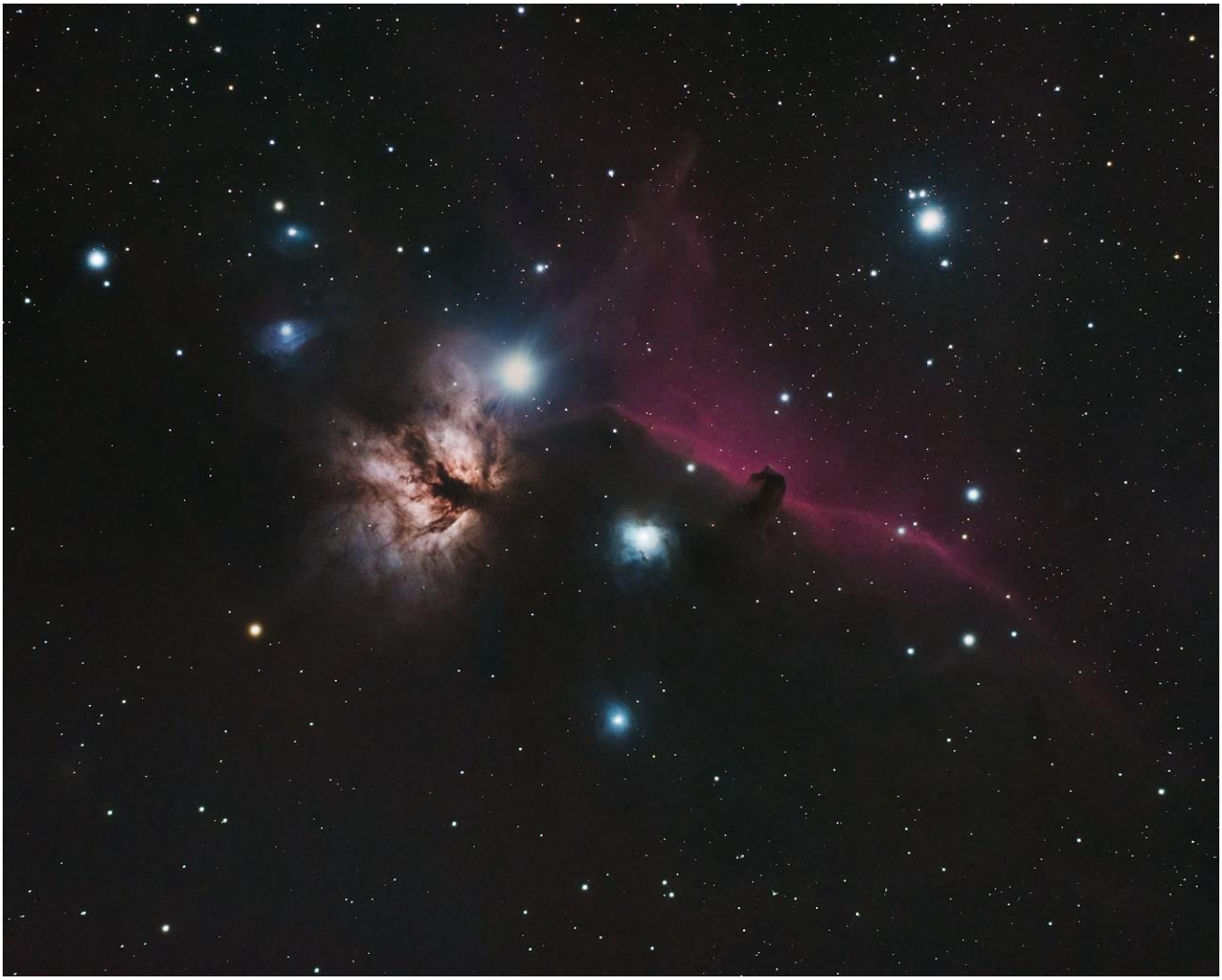
Astronomy poses an unsettling question to everyone who approaches the subject: *how much are you willing to not know*? The Universe is big and strange in ways we don't yet fully understand. The sum of human knowledge and relative geographic isolation of regions once made becoming a polymath a realistic mountain to climb. In there here and now, the staggering amount of information, capable of being transmitted globally in seconds, that is now available directs those with a thirst for knowledge into specialization to a degree we've never seen before. The modern polymath will scratch the surface of a subject here, break through the surface of another subject there, and so on. It's as daunting as the mythical adventure of Thor, when he was tricked during a drinking contest by a giant into trying and failing to drink the oceans dry. In reaction to the overwhelming amount of knowledge humanity has amassed, many of us have become cyborgs, in that we now dedicate ourselves more to knowing how and where to retrieve data from other sources, rather than trying to store the information in our own neural networks.

M78 (Reflection Nebula in Orion), March 10th, 2022, by Scott Garrod

Astronomers and astrophysicists are still grappling with the scale of their subject and the vast unknown, with new discoveries being made and new data being collected all the time, and all from the observing point of one tiny speck in the Universe. For an amateur astronomer or space enthusiast at times it can all be a bit overwhelming. When confronted by the enormity of the Universe, RASC Victoria can exist as a support group, to help you navigate both the vast array of tools used by amateur astronomers and the study of the Universe itself. Astronomy Café provides a somewhat structured meeting place on Monday nights, currently via Zoom, to help everyday amateur astronomers like yourself to appreciate and learn more about the many facets of Astronomy. There are also *Special Interest Groups*, for more focused pursuits. For observers and imagers, RASC National has numerous observing lists and imaging challenges to help give you a bit more of a mission orientated approach to your hobby. Public outreach events and meetings, currently confined to being online experiences, will one day be back in-person. Observers will again gather in large groups and there will one day be the opportunity to camp out at star parties. So while you're finding your way through this hobby, filled with wonders that can last a lifetime, know that you're doing so both alongside and with the support of like-minded individuals.

In this issue of *SkyNews*, we'll have more recaps from our Centre's activities, an article for the 50th anniversary of Apollo 16 mission, as well as all the astrophotography and articles you've come to expect from the *Victoria Centre SkyNews*.

Bruce Lane: SkyNews Editor



Horsehead and Flame Nebulae, March 9th, 2022; by Martin Gisborne

Astro Café: Continues Online

The weekly social gathering of amateur astronomers on Monday nights, known as Astro Café, has been continuing online. As with many groups, we're trying to find ways to still function as an astronomy society, without meeting in person. Members are posting their astrophotography, short articles, as well as links to astronomy stories from the Internet. Sadly, you'll have to make your own coffee and the only cookies are those your browser picks up when you visit our website. You can access the *Virtual Astro Café* at: *https://www.victoria.rasc.ca/astronomy-cafe/*

The first Astro Café of March was hosted by Chris Purse, who gave a rundown on upcoming talks and topics, including the potential for upcoming, in-person Astro Café sessions returning to the Fairfield Gonzales Community Association. Dan Posey gave a recap on his night up at the Plaskett Telescope and showed some images; Dave Robinson showed some pictures from RASC Edmonton. Brock Johnston, Garry Sedun, and Martin Gisborne showed and discussed some of their own astrophotography; Chris Gainor gave some updates on the James Webb Space Telescope and the other upcoming space missions, while Lauri Roche talked about upcoming events by the Friends of the Dominion Astrophysics Observatory. Afterwards there was a discussion about the upcoming volunteer effort for Astronomy Day, Special Interest Groups, potential speaker topics, Messier marathons, and a book recommendation (*The Last Stargazers* by Emily Levesque).

The next Astro Café began with Chris Purse mentioned *Not Yet Imagined: A Study of Hubble Space Telescope Operations* NASA history book that he just received in the mail, written by our very own Chris Gainor. Randy Enkin gave a presentation on *Locating Endurance*; Dave Robinson discussed the installation of the new 32" aperture telescope for RASC Edmonton Centre; and Lauri gave an update on upcoming FDAO virtual events, Astronomy Day, and RASC National's programs to celebrate the upcoming Artemis mission. Brock showed an image of the Cone Nebula (NGC 2264); Martin Gisborne showed some of his astrophotography and showed a book that he's reading (*Agnes Mary Clerke and the Rise of Astrophysics* by M.T. Brück); and David Lee brought up some planetarium software and showed the location of Cone Nebula and Rosette Nebula. Randy mentioned the location and anniversary of the Plaskett's star; Joe Carr gave a presentation of some images by Dan Posey (from the RASC Victoria Plaskett Telescope imaging session); Marjie Welchframe showed an acrylic painting she did of a plant and talked about the guest speaker for next week's Astro Café; and Bill Weir discussed Fr. Lucien Kemble.

The Moon, taken on March 8th, 2022; by Lucky Budd

The third Astro Café started off with Deborah Lokhost, from the NRC Herzberg Astronomy and Astrophysics Research Centre, giving a lecture on the *Dragonfly Telephoto Array*. Dave Robinson showed some more images from RASC Edmonton; Chris Purse briefly highlighted the Galactic Atmospheres gallery; David Lee discussed the Citizen Science Portal and Arduino microprocessors for the Maker Group; David Payne talked about the upcoming Astrophotography SIG meeting; Chris Gainor gave another update on the JWST and talked about the distribution of his Hubble history book; with Jeff Pivnick wrapping things up with a brief mention of next week's guest speaker on Astro Café.

For the last Astro Café of the month, Vickie Siegel gave a lecture on *Stone Aerospace Robotics for the Ocean Worlds*. Dorothy Paul encouraged RASC Victoria members to become specialty judges for the upcoming Vancouver Island Regional Science Fair; Dave Payne showed some images of the Hamburger Galaxy and Hickson 44 (the latter from data gathered during the Plaskett Telescope session); and Dave Robinson talked about an imaging challenge that RASC Edmonton are doing to observe NGC 2022. Randy presented some of his recent lunar sketching, before talking about the upcoming Council meeting, the plan to make Astro Café into a hybrid event (in-person and online) and the need for more volunteers to make that happen, and of course the upcoming Astronomy Day events.

Bruce Lane

NGC 2264 Cone Nebula, Mar 9, 2022; by Brock Johnston

Special Interest Groups

Getting Started in Astronomy

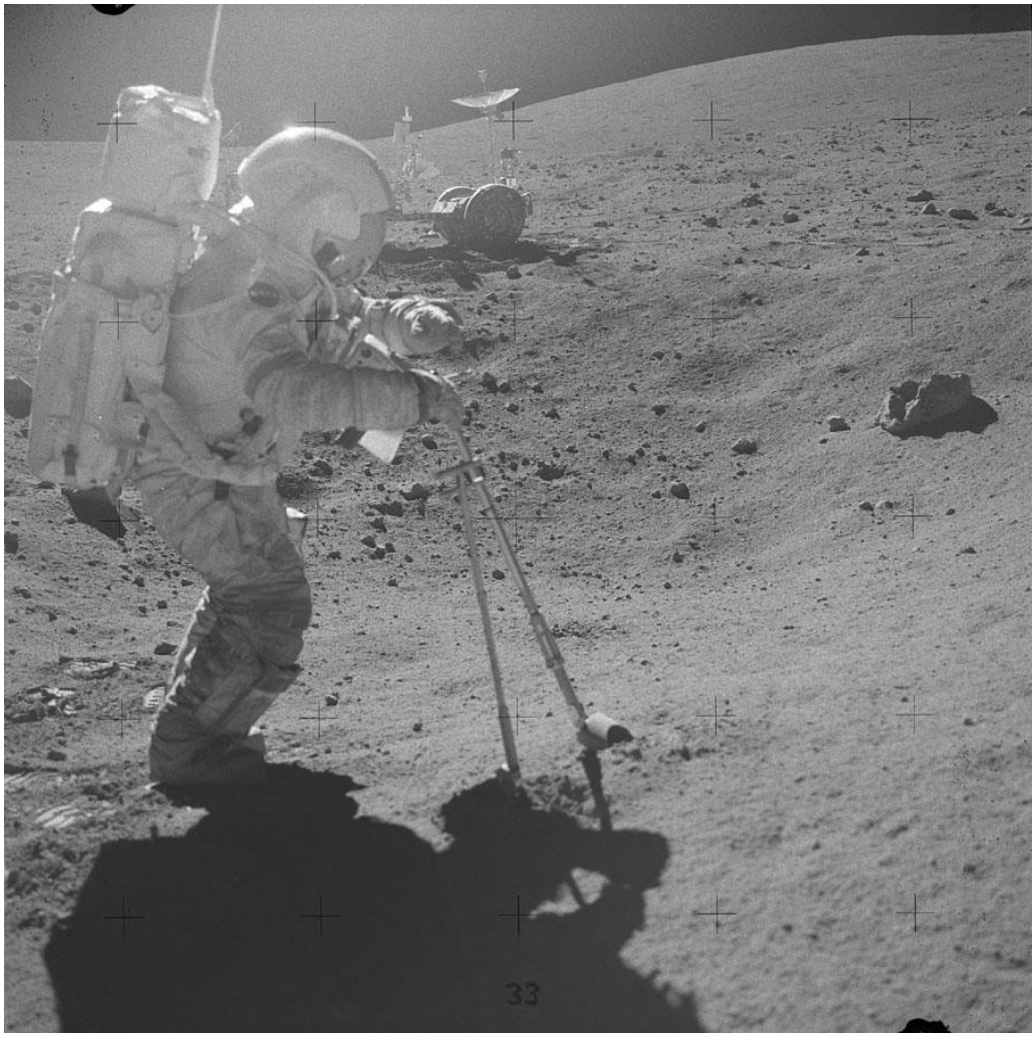
In April, we had an excellent presentation on the constellation Leo, from Duane and Derek. Next month we will feature Virgo. We had a discussion of basic concepts that are useful for instructors of the new Nova program, in terms of the detail and the method of information delivery. In terms of coming events there are opportunities to view the planets in the early morning during the coming months. For more information on this group, please contact David Lee at *david@victoria.rasc.ca*

Astrophotography

Members continue to show images taken through the gaps in our rainy season. Martin showed how he uses deconvolution and his workflow. The Stretch routine that David Payne has been collaboratively developing for use in PixInsight will be featured on an upcoming episode of the Astro Imaging Channel on May 29th. For more information about this group, please contact David Payne at *vp@victoria.rasc.ca*

Electronically Assisted Astronomy

The EAA group continues to talk about techniques and equipment that can support electronically assisted observing. This initiative will be presented again at the RASC National level. Locally, we hope to utilize EAA for upcoming events, as a transition back to in-person public outreach. For more information on this group, please contact David Lee at *david@victoria.rasc.ca*



Makers

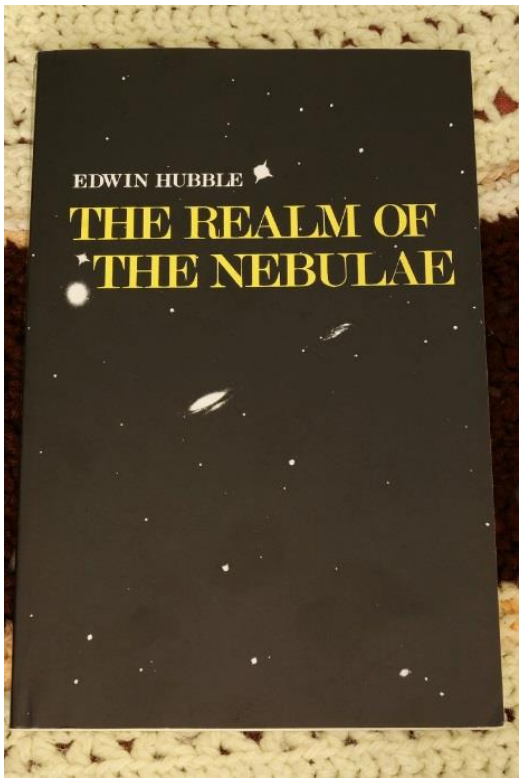
The Makers SIG continues to focus on member projects. A request from Garry about sensors and the *Internet of Things* was met with a presentation, from David, on the Arduino family of IoT (development boards) products. Capabilities and issues related to this type of technology was discussed. For more information about this group, please contact Jim Cliffe at *jim@victora.rasc.ca*

David Lee

From the Library

The RASC Victoria Centre Library is housed in the Astronomy Department's faculty lounge, located on the 4th floor of the Elliott Building, at the University of Victoria. It contains over 500 titles, curated by Alex Schmid, our RASC Victoria Centre Librarian. Alex is currently running our library in the same way the Greater Victoria Public Library runs its shut-in branch, driving around to do deliveries and pickups for our membership to provide access to books from the collection. For more information and to make a book delivery request, please contact Alex Schmidt at: *librarian@victoria.rasc.ca*

Our library covers many aspects of astronomy: observing, astrophotography, telescope construction, space exploration, astrophysics, and much more. Normally, the library is opened up during the social gatherings in the faculty lounge, after our monthly meetings, with coffee, juice, and cookies provided by our Centre. In the past I've been doing book reviews of the contents of our Centre's library, but until the resumption of our monthly meetings at the University of Victoria, I'll mostly be doing reviews of the astronomy books from my personal library, ones that can be purchased online or better yet at your local bookstore.



This month we're taking a closer look at *The Realm of the Nebula*, by Edwin Hubble. While Hubble is often falsely credited with the discovery of red shifting galaxies, he did apply much of his career towards that subject. This volume was created from the content of his Silliman lectures at Yale University in 1935. His lectures covered a lot of ground are a good introduction to the subject, although you'll have to cope with the word *nebula* being used to refer to galaxies. He does give credit to the work done by Vesto Slipher and others, something he was criticised for not doing in earlier publications on the subject. He even thanks his tireless telescope operator, Milton Humason, without whom much of his work wouldn't have been possible using the tools available at the time. There's even a footnote to JS Plaskett. George Ritchey is only referred to as an astrophotographer, and not as the designer of the revolutionary Mount Wilson Observatory and telescope that Hubble used for his ground breaking work. Hubble also has a lot of time to talk about Harlow Shapley, whom he bested in the argument about whether our galaxy is an island universe. Whatever your views on Cosmology, *The Realm of the Nebula* is an interesting read and it's available to be borrowed from our RASC Victoria Library.

Bruce Lane

Hill and Dale (Observing on the Island)

March brought the usual springtime mix of clouds and rain, but there were still enough clear nights for observers and astrophotographers to make the most of the night sky. With the limited capacity at the Victoria Centre Observatory and there no longer being weekly scheduled observing sessions, most experiences under the stars these days continue to be between one amateur astronomer and their optics, existing in their individual solitudes. It's only afterwards, other than those participating in electronic assisted astronomy, that they can share their observing experiences and images via various online connections: Astro Café, RASC Victoria's Zenfolio account, our RASC Victoria Facebook page, email sharing, and here on *SkyNews*!

The big imaging event for RASC Victoria was the March 5th, Plaskett Night! A few times a year, the National Research Council allots us time on the Plaskett Telescope, up on Little Saanich Mountain. Only specially trained and authorized telescope operators are permitted to run the massive, 1.8 meter aperture, reflecting telescope. After Michel Michaud moved back to Quebec, last I checked, Dan Posey has become our Centre's only remaining trained Plaskett operator. Even for someone acquainted with using an equatorial mount, with an understanding of right ascension and declination coordinates, the Plaskett Telescope offers additional challenges. Some of the components, added after the telescope was installed in the Dominion Astrophysics Observatory, have resulted in the telescope being unable to safely traverse past specific spots in the structure that houses it. This means that the telescope operator must not only know the coordinates of the target and the current time, but also superimpose the target's location in relation to the telescope no-go points inside the dome. It's certainly a long way away from button mashing with a portable Go-To mount, where the worst results from your inexperience is a bit or cord wrap or your telescope pointing at the ground, because your target isn't currently above the horizon.

In the *Before Times*, on Plaskett Nights, the telescope operator would sometimes find themselves surrounded by their fellow RASCals in the control room, waiting for the opportunity to see one of the

many objects viewed throughout the evening, as previews on a computer monitor. For this evening, only one other RASCal, Doug Hardy, was allowed to join Dan in the control room. To offset the lack of participation in person, the imaging session was broadcast on Zoom for members of RASC Victoria. The weather conditions were good and Dan Posey on site to operate the telescope from 6pm until 6:30am. After doing a tour of a number of deep space targets, the telescope then focused on imaging three of them in depth: the Whirlpool Galaxy (M51), the Black-eye Galaxy (M64), and Hickson 44 (*seen on previous page*).

The current restrictions up on Observatory Hill, with four observers allowed at the VCO and another two set up at the Plaskett Telescope parking lot, are the norm for the foreseeable future. Pandemic health restrictions are subject to change though, so if you're on the VCO observer's email list, watch for continuing updates.

A reminder that although the VCO belongs to and is for the use of the members of the RASC Victoria Centre. In the *Before Times*, MiCs (Members in Charge) ran both weekly scheduled and unscheduled sessions to take advantage of the weather, but for the foreseeable future observing sessions will be a lot less scheduled and less frequent. The VCO is located on National Research Council property. This means that all visitors to our observatory must be on our observer list and registered with the NRC. To get on the list, just contact Chris Purse (Membership Coordinator) at *membership@rasc.victoria.ca* and we'll see you up there on the Hill one of these nights.

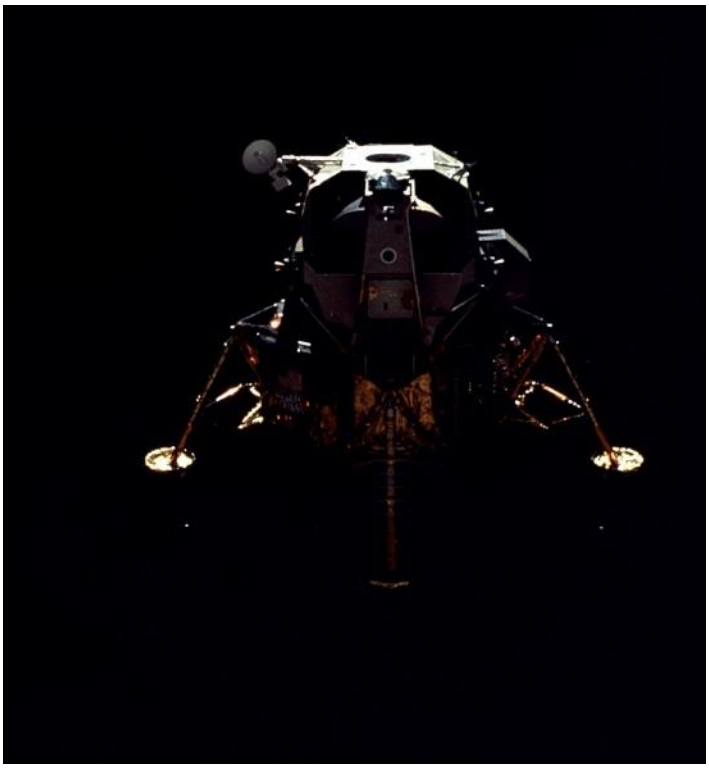
Bruce Lane

Cone Nebula and Christmas Tree Cluster, imaged on March 3, 8, and 9th, 2022; by Lucky Budd

Apollo 16: Space is Hard

While preparations were underway for the launch of the Apollo 16 mission, they would be leaving behind a lot of turmoil and ground shaking events happening back on Earth in the year of 1972. The Vietnam War was still inconclusive, but the North Vietnamese were on the offensive for most of the year. A couple months before the Apollo 16 mission, Nixon traveled to China for a historic summit with Chairman Mao, with a pair of pandas later sent back as gifts to the American people. A month after the Apollo mission, the US and Soviet Union signed the Salt 1 Anti-Ballistic Treaty in Moscow. Then in June, the Watergate Scandal rocked the Nixon administration in a breach of trust and locked offices that would send shockwaves through the US political system for decades to come.

The Apollo 16 mission very nearly didn't get off the ground. A number of technical problems resulted in the March launch being put off until April. The most problematic setback resulted from a command module fuel tank being damaged during a test. The result was that the entire Saturn rocket assembly had to be rolled back into its hanger for repairs. NASA used the delay to upgrade various systems for the missions, including the astronaut's space suits. Then, on April 16th, Commander John Young, Lunar Module Pilot Charles Duke, and Command Module Pilot Thomas Mattingly were finally off the launch pad and on their way to the Moon.



Charles Duke had been hospitalized in January with double bacterial pneumonia. If the launch date hadn't been delayed it's possible he wouldn't have recovered in time and he would have been replaced by his backup: Fred Haise. Haise had already done stints at NASA as the back-up lunar lander pilot for the Apollo 8 and 11 missions. Fred Haise had been scheduled to be the sixth human to walk on the Moon, but an accident during the Apollo 13 mission, turned anticipated triumph into a struggle for survival. Duke's good fortune of the launch delay, took away Haise's last chance to walk on the Moon. Fred Haise was assigned to be the lunar pilot for Apollo 19, but that mission was cancelled due to NASA budget cuts. He transferred to the Shuttle Program, only to have delays and the premature crash of Skylab result in his orbital shuttle mission being cancelled. He retired from NASA in 1979 and became a test pilot for Grumman.

During their initial orbits of the Earth, the Apollo 16 spacecraft began having minor system problems. The control panels indicated a coolant leak in the command service module; a problem developed in the attitude control module of the Saturn upper stage booster; a helium regulator on the number two module resulted in gas being vented; another helium leak was found on the number one module; and there was a nitrogen bottle leak in the upper stage booster. Just another day at NASA. Once they were assured it was safe to do so they fired the last booster to begin their translunar trip.

Three days away from the Moon, the CSM (command and service module) undocked from the S-IVB (booster) and retrieved the LM (lunar module). The thrusters of the command and service module blew a lot of paint off of the lunar module in the process, resulting in the timing of the inspection of lander being moved up. The debris field of paint chips that surrounded the spacecraft also made it difficult to use optical navigation sights and external cameras. Meanwhile, the last booster was sent off on its own mission, first to get clear of the manned modules and then make its way to the Moon for a planned collision, to gather seismic data. Communications were lost with the booster before impact and the exact crash site was unknown, until its wreckage was discovered in 2016 by the Lunar Reconnaissance Orbiter.

After achieving lunar orbit, the CSM blew the door off of the scientific instrument module, exposing the instruments to space, so they could gather data while spacecraft orbited the Moon. The boom of the mass spectrometer was stuck in a semi-deployed position. It still functioned for a while, but was eventually ejected. Because of problems the astronauts had earlier, training with their space suits to prepare the lunar module for separation, they started the task 40 minutes early and were still only finished 10 minutes early. During their inspection, they found that the LM's moveable computer antenna was jammed, meaning that Mission Control would be unable to use their radio link to remotely update the LM's computer. If they didn't come up with a solution to this problem, the crew would have to manually update the computer from information received by Mission Control over their communications system, which would be less than ideal. One of the lunar module's RCSs (Reaction Control Subsystem) was also over pressured. Once things were satisfactory to the crew and Mission Control, the lunar module separated from the command and service module.

Thomas Mattingly began maneuvering the CSM into its lunar orbit, while John Young and Charles Duke prepared the LM for descent to the surface of the Moon. After separation, the CSM would adopt the call sign *Casper* and the LM would be referred to as *Orion*. That's when the mission was very nearly aborted. The Command and Service Module had a gimbal failure in its service propulsion system, critical for the correct orientation of the spacecraft for re-docking with the LM. It also resulted in the spacecraft being violently shaken when the engine was fired up. The back-up system was currently working, but if that failed there would be no way for the LM to safely link up with the CSM again to return to Earth. The CSM orbited the Moon within 150 meters of the LM, while NASA scrambled every available engineer and simulator to figure out if they could still proceed with the mission and if not, how to safely dock the two spacecraft and return to Earth. Meanwhile, the helium pressure on the LM tanks built up to unsafe levels and they were forced to do a short fuel burn. Mission Control talked Mattingly through the process of fixing the stuck gimbal and afterwards he needed to do a visual navigation sighting to reorient the CSM. Unfortunately, he couldn't use the stars, because the paint debris cloud was still obscuring his view around the spacecraft, but he was able to orient the spaceship using the Sun. After consultations that included the factory that built the command and service module, it was finally decided that the severe vibrations on the CSM were still within safety limits and they were clear to proceed with the rest of the mission.

During the descent, it was decided to angle the LM twenty degrees to one side, to maneuver the jammed computer antenna in a more favourable position and allow Mission Control to continue to send telemetry to the LM's onboard computer. Other than a malfunctioning fuel indicator, giving results that showed that their fuel was 2% lower than it was, the descent went smoothly. The LM landed close to the target site, becoming the first Apollo mission to land in the central lunar highlands.

After landing, the first EVA (extravehicular activity) to explore their landing site was cancelled and forced rest was ordered, due to the 6 hours spent dealing with command module crisis. After that it was time to go outside and set up the ALSEP (Apollo Lunar Surface Experiments Package), which included: passive and active seismic experiments, lunar surface magnetometer, and a heat flow experiment. The heat flow experiment was ruined by wiring accidentally ripped loose while it was being set up and there was no feasible way to repair it. The area around the landing site was dotted with many additional experiments, to the point where the ground around the lander must have resembled a NASA Science Fair. There was even a far-ultraviolet camera/spectroscope set up to collect data about the Earth's atmosphere. When testing out the rover, initially it wouldn't steer while in reverse, but the problem soon corrected itself, and was put down to just another visit by the *gremlin* of Apollo 16. After everything was in place, John Young and Charles Duke took their rover for a drive, to a pair of nearby craters and gathered mineral samples. At Plum Crater, under the guidance of excited geologists at Mission Control, the astronauts collected the largest rock of the Apollo program. The rock was given the moniker of *Big Muley*; named after the Apollo 16 lead geologist, William Muehlberger. During a road test of the rover, executed near the LM landing site to avoid any long and unpleasant walks home, the off-road lunar buggy survived being clocked at a speed of 18km/hour. The typical speed the rover traveled at during the longer EVAs was closer to 10km/hour.

The command and service module was also conducting experiments, observing, and sending data to Mission Control. Problems aboard the orbiting spacecraft continued to pile up. When the panoramic camera was turned on it triggered a low voltage alarm, due to an excessive power drain of the CSM's electrical system. The camera was deactivated to ensure the safety of the mission, already plagued by technical issues. The mapping camera didn't work properly. The laser-altimeter, necessary to gauge the altitude of the spacecraft over the Moon's surface, was also faulty and eventually stopped working altogether. Fortunately, Apollo astronauts were trained to make sketches of the lunar surface.

On EVA 2, the astronauts drove through the highlands to Stone Mountain and visited a couple of craters, to gather additional mineral samples. EVA 3 took them to North Crater, where they examined a boulder the size of a house, to which they gave the imaginative designation: *House Rock*. After that it was time to park the rover and break camp, to get ready to depart the Moon

for a rendezvous with the command and service module in orbit. The docking was a planned televised event, spoiled by a faulty antenna on the lunar module ascent stage. An inspection of the AS (ascent stage) by Mattingly revealed that the outer thermal blankets on the back of the AS were badly damaged during takeoff from the Moon's surface. After docking the crew did their best to not mess the place up with space dust, but the vacuum cleaner wasn't up to the task. When the lunar module ascent stage was ejected, because a switch was in the wrong position, it failed to fire its thrusters prior to the engine burn allowing it to move away in a controlled maneuver. Instead the ascent stage flew wildly off course and finally crashing into the Moon a year later. Before making their journey back to Earth, the Apollo 16 crew released a small satellite (PFS-2) into lunar orbit, to collect data on charged particles and the Moon's magnetic field. The satellite was supposed to be in long-term orbit around the Moon, where it could be monitored by NASA, but was unwittingly placed into an unstable orbit. At that time, NASA did not fully appreciate the instability of LLOs (low lunar orbits). As a result, the satellite crashed into the Moon after only 35 days. *Space is hard*.

Despite the earlier problems, the CSM's service propulsion system functioned properly and things went a lot smoother on the return flight. The Apollo 16 mission recorded the first spacewalk during a return trip to Earth, when Ken Mattingly collected the film from the cameras that were mounted on the scientific instrument module. On April 27th, the astronauts returned to Earth, after a mission filled with glitches, trouble shooting, and minor repair jobs. It's a testament to the training and professionalism of the astronauts and support staff on the ground that the mission was completed at all.

After splashdown, when Thomas Mattingly opened the capsule door for the rescue diver, the smell inside was so bad that the diver initially slammed the door shut again. *Welcome to Earth*. The command capsule was recovered by the *USS Ticonderoga* and delivered to a US Navy base in California, but the *gremlins* of Apollo 16 apparently weren't quite finished messing around with NASA and the US government. While the ground crew were emptying the fuel tanks of the spacecraft, they exploded. Forty-six personnel were sent to the hospital. The explosion blew a hole in the top of the massive hanger they were in, as well as shattering dozens of windows, although the capsule itself suffered only minor damage. The Apollo 16 *Casper* capsule is currently on display in the US Space and Rocket Center. I haven't been able to find any reports of any accidents or injuries to museum staff over the years, resulting from interacting with the exhibit, but I have my suspicions.

During his distinguished career with NASA, John Young flew on two Gemini, two Apollo, and two Shuttle missions. Young passed away in 2018. James R. Hansen, the author of Neil Armstrong's authorized biography (*First Man*), also co-wrote John Young's autobiography: *Forever Young*. After the Apollo 16 mission, Thomas Mattingly went on to command two shuttle missions, one for NASA and one for the Department of National Defence, with many of the details of the second mission still classified. After retiring from the Navy in 1986, at the rank of rear admiral, Mattingly went to work in the private aerospace industry. Charles Duke retired from the Reserve Air Force as a brigadier general in 1986. He left two items on the lunar surface: a picture of his family and a US Air Force commemorative coin. He brought back a second coin from the Moon and donated it to the Air Force. Charles Duke was the youngest astronaut to walk on the Moon and *he still is*.

Bruce Lane

In Closing

The weather has been a bit cold but somewhat bearable; especially if this was January. For our *garden city* things are less than beatific right now. We have been getting some clear skies, but you'll need to dress for the worst of Victoria's winters to stay warm or better yet the winter that happens elsewhere in Canada. If you like gardening and have a greenhouse, you've made a good decision. Snow in April just seems to fit the pattern of what seems to be our nearly monthly occurring, scheduled strange weather event. I can't wait to see what May has in store for us.

The sixth wave of the Pandemic has arrived, featuring the BA2 sub variant of Omicron, with a not unexpected rise in hospitalization cases among its victims. Some of us will be confused that there has been no rush by governments to reinstate any public health mandates or ramp up testing to protect our communities. What this means is that you're basically now on your personal recognizance to *choose your own pandemic adventure*. Enough people making good choices will ensure no more lockdowns, while enough people making bad ones will have predictable results. Meanwhile, due to industry pressure to open our ports or be shutout from future visits, cruise ships have started to visit our cities again. We do have much more experience treating this virus, new treatments, and great vaccines available, but for whatever reason many people still aren't getting their booster shots. As much as we're all tired of the inconveniences that from come from living during a pandemic, for the many variants of the covid-19 virus it would appear that there are still good days ahead.

RASC Victoria has scheduled events for Astronomy Day on May 7th! It's been a while since we've done a major public outreach event like this, for obvious reasons. During the daytime, RASC and other astronomy organizations in the Greater Victoria Area will be setting up on main floor of the Royal BC Museum, offering a series of lectures, demonstrations, and displays. In the evening, we'll switch venues and head up to Observatory Hill, home of the Plaskett Telescope. This will mark the resumption of in-person public outreach, which will hopefully be accompanied by some clear skies and warmer weather than what we're currently experiencing.

Bruce Lane: SkyNews Editor,

M63 (Sunflower Galaxy), March 5th, 2022; by Scott Garrod

Photography Credits

Cover: Thor's Helmet - NGC 2359, Mar 5, 2022, by Dan Posey. Imaged from downtown with 415mm focal length telescope. This is 10h16m (22x8m of Ha, 27x8m of Oiii and 28x8m Sii) with the typical Hubble palette mapping. OIII is the strongest signal for this target, which is also the weakest signal downtown, adding to the challenges. Calibrated with bias, dark, and flat frames (flats for OIII/Ha only, Sii still has issues).

Page 2: Apollo 16, Charlie Duke reviews the flight checklist during suit-up for launch. Apr 16, 1972. Scan by Ed Hengeveld. Courtesy of NASA.

Page 3: Crop of Bruce Lane (SkyNews Editor) at 2013 RASCal Star Party in Metchosin, by Chris Gainor

Page 3: M78 (Reflection Nebula in Orion), Mar 10, 2022, by Scott Garrod. 66X300 seconds, AT130ED/ asi2600MC/ CEN60

Page 4: Horsehead and Flame Nebulae, Mar 9, 2022; by Martin Gisborne. Nikon D850 (unmodified) attached to William Optics ZenithStar 80 II ED (older doublet apo) mounted on iOptron CEM25P, with ZWO mini (guide scope) and ZWO ASI120MM (guiding camera). 87mins of data (29 x 3min subs), processed with PixInsight, Lightroom, and Photoshop.

Page 5: Photograph and Design of Astro Cafe Mug, by Joe Carr

Page 5: Apollo 16, post-flight CM interior inspection photo. Note the decal showing *Casper, the Friendly Ghost*. Scan by J.L. Pickering. Courtesy of NASA.

Page 6: The Moon, taken on Mar 8, 2022; by Lucky Budd.

Page 7: NGC 2264 Cone Nebula, Mar 9, 2022; by Brock Johnston. This image includes NGC 2264 The Cone Nebula near the bottom and the Christmas Tree Cluster at the top (a group of young stars largely obscured by dust). Imaged with Celestron EdgeHD SCT 925 with 0.7 reducer, an ASI 2600MC Pro colour camera, and no filter. 50 x 300s subs with 4:10 total exposure time and processed with Siril, Starnet, and GIMP. 46.7% Moon made it a challenge.

Page 8: Apollo 16 (146:18:18), *Locator* to the Rover from the white soil location at Station 6. John is using the scoop to collect a sample. The tongs are in the foreground. Courtesy of NASA.

Page 9: Posed Book, “The Realm of the Nebulae”, taken in Editor’s home on Apr 10, 2022, by Bruce Lane

Page 10: Hickson 44, Mar 5, by Dan Posey, using the Plaskett Telescope at the Dominion Astrophysical Observatory.

*“Hickson 44 is a group of four member galaxies (NGC 3190, NGC 3193, NGC 3187, and NGC 3185). This is 61x30s GPrime, 61x30s RPrime, and 61x30s IPrime shot at 9250mm fl through the Plaskett 1.8m telescope at the DAO. CCD temp -110*C. We weren't able to fit NGC 3185 into the frame, but we captured the other three. There is a lot of detail in the main galaxies and some incredible background features. I used a Hubble image of NGC3190 to look for some familiar features, and a lot of those subtle background galaxies make their appearance (albeit without Hubble's razor sharp clarity).*

Based on my experience with the Plaskett, most of the images that we capture could be replicated with a smaller telescope (like the reflector at the VCO) given enough time (and by this I mean 20+ hours). This is because resolution on both telescopes will be limited to about the same due to the atmosphere and the depth of each frame is limited by our light pollution. The big advantage of the Plaskett is of course the incredible efficiency offered by the 1.8 meter mirror, as it captures roughly 50x as much light per second as a typical 10". This is the first image that I have shot with the Plaskett that I don't know if we could replicate with a smaller tube. The depth on this is just incredible, particularly given it only has

about an hour and a half of total exposure. We might be able to get there with the new camera and 75 hours of exposure from our smaller site, but I'm not volunteering to try!

To give an idea of just how deep this goes, I am reasonably sure that the frame includes objects well past 25th magnitude. I'm still trying to pin down some absolute measurements (for example, I located [ACN2006] HCG 44-ES11 with a magnitude in blue of 28.25, but as an emission object it might just be weak in blue - and the other filters weren't recorded). The SDSS data runs out of steam at 23rd magnitude, and this is well past that, so it likely falls between those extremes."

Page 11: Cone Nebula and Christmas Tree Cluster, imaged on Mar 3-8-9, 2022; by Lucky Budd. Evolution 8, idas NBZ, Hyperstar 4 and asi294mc pro. I took 700 25 second subs, stacked in APP with SHO pallet, Starnett++, Photoshop, Lightroom

Page 12: Apollo 16 Lunar Module Orion after undocking. Scan by Kipp Teague. Courtesy of NASA.

Page 13: Apollo 16 (122:46:09), John is bagging a sample from a small crater behind the Rover at the ALSEP site. Courtesy of NASA.

Page 14: Apollo 16 (144:57:16) Charlie's Station 4 pan, rightward from 17959, showing John working at the back of the Rover. Note that the "gate" is open. Ravine, the large crater punched into the side of Smoky Mountain facing us on the far horizon on the left, is about 8 km from Station 4. North Ray Crater, House Rock, and the LM are out of the field-of-view to the left. Courtesy of NASA.

Page 15: Apollo 16 (170:17:37) Charlie took to show how dirty John's suit has become. John is working at the LMP seat. Note the bright, rectangular pattern on the high-gain antenna. The pattern is sunlight reflected by the mirrored tiles on the top of the TV camera. Because the frame is sun struck, Kipp Teague has produced a processed version of it with the orange glow in the upper half removed. Courtesy of NASA.

Page 16: Ameraucana Chicken (Pre-Pullet), Apr 7, 2022; by Bruce Lane

Page 16: M63, Sunflower Galaxy, Mar 5, 2022, by Scott Garrod. 60x420 seconds, AT130ED/ asi533MC/ CEM60

Page 19: Apollo 16-25, Charlie Duke (left), John Young, and Ken Mattingly in the recovery raft. Research by Frederic Artner / Didier Capdevila. Courtesy of NASA.

Call for Article and Photo Submissions for the May Issue

SkyNews is looking for submissions of astronomy photos and articles for the May issue of our Victoria Centre's magazine. Send your submissions to editor@victoria.rasc.ca

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