

SKYNEWS



Star Trails by Charles Banville, taken at Gatineau, Quebec over period of 9.5 hours on December 2-3rd, 2019

Roaring Twenties 2.0

As we come to the end of a decade, we are faced with the fact that the goal posts are always moving in the way we perceive time, both literally and figuratively. As was pointed out in Bill Kunze's essay, from last month's issue of *SkyNews*, the ocean's tides are slowing the rotation of our planet and the days are getting longer over the eons. Officially, the last year of a decade ends with a "0" and the first year of the next decade has a "1" at the end of the year. This is because the monk who split the millennia between BC and AD didn't stick a year "0" between the years 1 BC and 1 AD. In our common usage, most people think of the decade having the same number at the end the whole way through. As celebrities and media icons throw better parties than monks, most people follow the pop culture convention, because they don't want to be lonely. Sure, you could have spent the entire night of December 31st, 1999 telling everyone that they're doing it wrong, but you would quickly be the person nobody wants to talk to and people would start asking who invited you anyways. If they're taking requests for music to celebrate the decade and you call in to the radio station to tell them they're wrong and oh, could you play your favourite song, you should know that they're not going to play your favourite song. Yes. It's important to stand up for critical thinking, but you should probably pick your moments. In a landscape of urban myths, political and societal lies, and public figures openly disregarding science is this the battle ground you should choose to die on? The answer is obviously yes, because the line of truth must be held no matter the cost. Wait a minute. Isn't this article titled the Roaring Twenties 2.0 and featuring a look back on the decade? Wow. Someone doesn't get invited out to a lot of parties.

For the RASC Victoria Centre some things changed a lot and other things only a little over the last ten years. Up on Observatory Hill, the volunteer experience has seen the most changes. After years of volunteering up on the Hill at the National Research Council's *Centre of the Universe*, it was abruptly closed in 2013. RASC Victoria representatives spent a lot of time, working alongside the NRC, to get Observatory Hill and the Plaskett Telescope back to doing public outreach again. The biggest problem for RASC Victoria was that with all the administrative and volunteering demands of *Summer Saturdays* on the Hill, our ability to organize and participate in all our other events in the Greater Victoria region (2010 *Saanich Fair volunteers seen below-right*) were pushed to the breaking point and volunteer burnout was quickly becoming an issue. There was the option of it becoming the sole focus of RASC Victoria and going all in, the way some other RASC Centres have run observatories and public outreach centres that have fallen into their hands. However, given the amount of grants, large sums of money, and amount of volunteer time required for non-astronomy activities that wasn't what we wanted.

The answer was the creation of the Friends of the Dominion Astrophysics Observatory: a society specializing in the public outreach at the Plaskett Telescope and *Centre of the Universe*. RASC Victoria would continue to volunteer with our telescopes in the Plaskett Telescope's parking lot, but the newly formed FDAO would handle the administration and a lot of the other non-telescope volunteer duties. The *Summer Saturdays* have coincided with an increase in centre membership, but the lion's share of our volunteer effort has still been diverted there, and we've had to cancel a lot of events that we used to regularly organize and attend during the summer. Many of our most active members have also become very active members in the FDAO, instead of being freed up to volunteer for RASC Victoria events elsewhere. The ever expanding number of days that the Hill is open



to the public continues to put a strain on our volunteers and divert them from other events, but it has been a very successful public outreach effort by both societies. The most unfortunate thing about the *Spring-Summer Saturdays* is that it happens in a place that isn't accessible for anyone without a vehicle, as evening public transit options are essentially non-existent on West Saanich Road.

In the last decade, RASC Victoria has enjoyed having an observatory of our very own up on Little Saanich Mountain. Until the opening of the VCO in 2008, RASC observers bounced between various private observatories and the beachfront at Cattle Point, which was designated as an Urban Star Park in 2013. We've gone through a number of treasured instruments up on *the Hill*, added many new telescopes and equipment, and will continue to do so again in the years to come. During this last decade, our Victoria Centre has seen seven different secretaries, six presidents, and four *SkyNews* editors. Of treasurers and librarians, only three people have held either of those jobs this decade. I'd say something about how many vice presidents we've had or should have had, but that's a touchy subject these days. We started the decade with our first RASC Victoria star party in Metchosin, but in the last two years we've relocated to St. Stephen's churchyard in Central Saanich. Astro Café has remained in the same location, with the same offerings of coffee and cookies, although in recent years the Monday night event has become a bit more structured. And now we prepare ourselves for the Roaring Twenties 2.0 and the unwritten future that comes with it.

Bruce Lane

Editorial Remarks



While most of our cover photos are chosen from images taken by local members from local locations, this month's cover photo, by Charles Banville, was taken by a RASC Victoria Centre member whose job has taken him to the other side of the country for the last few years. It's a lovely circular panorama of star trails, taken in colder temperatures than we're used to in the Greater Victoria area. This winter, we've been treated with the kind of gloomy, dark skies that cry out for one of the Dutch masters to do a landscape painting. While the rest of Canada is shoveling snow, our weather preparations are mostly about deciding which rain jacket to wear for any given day. As a Wetcoaster, these are the long stretches of weather that make me wish I'd been dipped into vat of Gortex, like Achilles. Clearer skies will be coming. Just make sure your astronomy equipment and enthusiasm are ready for it when it happens.

In this issue of *SkyNews*, we'll have more recaps from our Centre's activities, a story about Milton La Salle Humason, as well as all the astrophotography and articles you've come to expect from the *Victoria Centre SkyNews*.

Bruce Lane: SkyNews Editor

President's Message for January

2020 Happy New Year, RASCals! As we slide into a brand new decade it is a good time to reflect on astronomical accomplishments and events that have taken place over the last 10 years. It has been an amazing period for the field of Astronomy and I will list some of the significant stories that enjoyed widespread attention.

Within the Solar System: in 2011 the Messenger spacecraft went into orbit around Mercury, while in July 2016 Juno went into orbit around Jupiter. In September 2017, Cassini crashed into Saturn ending an amazing 13 year exploration around the ringed planet. A number of other spacecraft went into orbit around Mars, comets and asteroids during the decade. The New Horizons spacecraft captured fascinating imagery as it whizzed by Pluto in 2015 and managed a follow

up flyby of Kuiper belt object 2014 MU69 (Arrokoth) on Jan. 1, 2019. In August 2012, the Curiosity Rover made a spectacular landing on Mars and detected evidence of ancient stream beds and the potential conditions for life. It continues a fascinating survey on the slopes of Mount Sharp.

On February 15th, 2013 a large meteor exploded over Chelyabinsk Russia and caused significant damage.

Beyond the Solar System: the Kepler mission discovered over 2600 exoplanets and the TESS satellite is currently conducting a wider search for more nearby exoplanets. ALMA, the Atacama Large Microwave Array, became operational and detected protoplanetary debris disks around nearby stars. ALMA also combined forces with other instruments, as the Event Horizon Telescope, and in 2019 captured the shadow of the supermassive black hole in M87.



In 2016, the LIGO interferometer measured gravitational waves for the first time and in August 2017 it detected a collision of neutron stars that was also confirmed by optical instruments.

In 2014, the GAIA Space telescope began a remarkable survey, which has already mapped the position and brightness of 1.7 billion stars with unprecedented accuracy, and measured the parallax and proper motion of 1.3 billion stars. The survey may continue until 2022 and has already had a major impact in many astronomical fields. Within the Victoria Centre, the membership grew from 166 in 2010 to over 280 in 2018, and is currently around 265. Why the significant increase? Well, the membership began to skyrocket in 2014. Two major things occurred that year. In June 2014 the Victoria Centre hosted the RASC General Assembly, which celebrated the centenary of the Victoria Centre. President Nelson Walker rallied the RASCals, with Mark Bohlman and Paul Schumacher organizing a wonderful event which re-energized the membership. The Victoria Centre also hosted 7 Summer Star Parties at the Dominion Astrophysics Observatory that year. This was in response to the closure of the Centre of the Universe in August 2013. The strong public interest in these star parties fostered the formation of the Friends of the DAO in 2015 and the number of star parties increased to 12 in 2015, to 13 in 2016, and 20 events for 2017, 2018, and 2019. These Saturday night gatherings provided a rich outreach experience and also presented a great opportunity to recruit new members. During the past 3 years, star parties were also held at Fort Rodd Hill to coincide with the Perseid meteor shower in August. The public were welcome to pitch tents in the field and this contributed to a joyous atmosphere for astronomical outreach.

Attendance at our informal weekly Astro Cafe increased from about 10 to 25 or 30 over the decade. The acquisition of a large monitor facilitated the display of astrophotos and presentations, and may have helped boost attendance.

A review of past issues of *SkyNews* suggests that the Transit of Venus on June 5th, 2012 and the Solar Eclipse of August 21st, 2017 were the premiere observing events of the decade. At the Victoria Centre Observatory, the 14 inch SCT and 127 mm refractor were sold in 2018, and replaced by a 16 inch RC reflector. The family of Jan James generously donated his wonderful 20 inch Obsession Dobsonian telescope. The performance of the 16 inch scope continues to be refined and digital setting circles will be added to the 20 inch scope. So as we move into the next decade, the VCO will be well equipped to support both visual and photographic astronomy.

During the last decade the Victoria Centre grew and became more engaged in promoting astronomy. In order to maintain this momentum as we enter the next decade, please consider stepping up as the Vice President or Second Vice President at the February 22nd AGM. It will help share the load and provide a source of both enjoyment and satisfaction.

Useable Skies

Reg Dunkley



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2010 Star Party at Metchosin, by Joe Carr

Astro Café: Monday Nights, 7:30-9:00pm



Astro Café is a weekly astronomy gathering for both RASC members and the public alike. It runs on Monday nights, finishing up at the end of May and returning again in September. Astro Café is primarily a social gathering, with presentations of recent observing sessions, astronomy gear show and tell, discussions about astronomy, and of course coffee and cookies (please remember to bring a reusable mug...perhaps even an Astro Café mug). It's located at the Fairfield-Gonzales Community Association, in one of the portable classrooms tucked in behind the main administration building, at 1330 Fairfield Road. Astro Café is a nice introduction to the amateur astronomy community of Victoria. The lights will be on and a sandwich board out front to let you know where we are.

We kicked off December with a visit from Alister Ling (Edmonton Centre) and a Handbook 101 lecture by Chris Purse. For the second Monday, Mark Lane (RASC Calgary) had a presentation of his 2017 solar eclipse photos, taken from Idaho, and Ken Atkinson shared his experiences from a visit he had at a German observatory. The last Astro Café of the calendar year was on December 16th. The festive season was celebrated with an abundance of treats brought in for the occasion, as well as a feast of astrophotography to summarize the year.

Bruce Lane

Monthly Meeting Speaker: Dr. Gerald Schieven, NRC Herzberg From Baby Planets to Black Holes: ALMA Explores the Cold Universe

7:30 PM, Wednesday, January 8th, 2019 in Room A104, Bob Wright Centre; University of Victoria

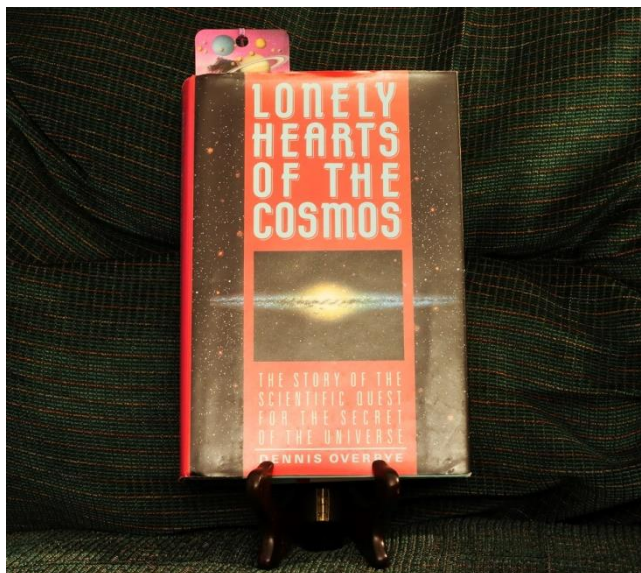
Abstract: the ALMA Observatory is a billion dollar multi-national astronomy facility located at high elevation in the Atacama Desert of northern Chile. Its 66 antennas work together as if it were one giant telescope 16 km in diameter, to give us unprecedented images of the cold, dark universe, including the birth of planets around other stars, organic molecules in the early universe, and the first image of the event horizon of the super-massive black hole at the centre of the M87 galaxy. Gerald will talk about the observatory, what it's like to work there, and some of the astonishing discoveries being made by this facility.



Bio: Dr. Gerald Schieven has been a staff astronomer at NRC – Herzberg for 24 years (11 of them in Victoria), and is responsible for managing Canada's support of the ALMA Observatory. After obtaining his PhD in Astronomy at the University of Massachusetts, Gerald worked at Queen's University in Kingston, NASA Jet Propulsion Lab in Pasadena, Dominion Radio Astrophysical Observatory in Penticton, and the James Clerk Maxwell Telescope in Hawaii, before moving to Victoria.

Gerald Schieven

From the Library



After our monthly meeting, feel free to join your fellow RASCals socializing up in the astronomy faculty lounge on the 4th floor of the Elliott Building, where we have coffee, juice, and cookies. It's also where the RASC Victoria Library is housed, with over 500 titles, curated by Diane Bell, our RASC Victoria Librarian.. Our library covers many aspects of astronomy: observing, astrophotography, telescope construction, space exploration, astrophysics, and much more. Every month, *SkyNews* will be featuring a new selection from our Centre's library, complete with a brief book review.

This month we're taking a closer look at *The Lonely Hearts of The Cosmos: the story of the Scientific Quest for the Secret of the Universe*, by Dennis Overbye. This book was recommended to me by our Centre's president and I'm thoroughly enjoying it. It's a historical view of modern astronomy, focusing on the people who

were the giants in their field, even if some were less well known than others. *The Lonely Hearts of Cosmos* is an excellent read and it's available at our Victoria Centre Library; at least it will be after I'm finished reading it.

Bruce Lane



North American Nebula, by Daniel Posey

Hill and Dale (Observing on the Island)

December is rarely the best month of the year for amateur astronomers in Victoria - unless they get something special under the tree - and this year was no exception. The ever present *pineapple express* has made for some mild temperatures, but very poor conditions for astronomical observations. A few of us managed to get a peek or two at the night sky, during the rare partial clearings. This includes Daniel Posey, who captured an image of the North American Nebula on Christmas night (*seen above*). This was his first time, using his new Canon Ra; the first astrophotography camera made by Canon since the 60Da they released in 2012. It's a mirrorless camera with a built in IR cut-off filter, so it can better image hydrogen-alpha (red). This makes it less useful for general photography, but amazing for astrophotography.

The Pearson College Observatory got a big upgrade in optics, with a TEK 140 refractor and 15" Obsession Dobsonian reflector telescope among the new resident instruments. Despite the long drive out to Pearson College, for observing sessions there hosted by Bill Weir, no doubt this windfall of fine optics will make many consider joining Bill more often. They have a very nice view of the southern sky horizon out there.

A reminder that although the VCO belongs to and is for the use of the members of the RASC Victoria Centre, with both weekly scheduled and unscheduled sessions run by our MiCs (Members in Charge). 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) membership@rasc.victoria.ca and we'll see you up there on the Hill some night soon.

Bruce Lane

Aperture Fever: Help Wanted



While Hale and Ritchey were planning the future of astronomy that would take shape atop Mount Wilson, they could be forgiven for not noticing that one of the most important astronomers of the century was watching all the commotion on the mountain with the wide eyes of a young teenager. Milton La Salle Humason lived a remarkable life, with one foot in the rapidly vanishing Old West and the other foot stepping into the future of astronomy. He was born and raised in Minnesota, where he spent an idyllic childhood with his younger brother, Lewis, fishing on the shores of the Mississippi River and sneaking aboard river boats to watch the gamblers. His middle name, La Salle, was in memory of the man who had rescued his father, after he'd been injured from falling down a well.

His father, William Humason, was a bookkeeper who enlisted to fight in the Spanish-American War. Like most American casualties of the conflict he was stricken by typhoid, while training at the infamous Camp Thomas, in Georgia. The large numbers of deaths from typhoid at Camp Thomas did spur research into a developing a vaccine, but there wasn't one available for those who had gone to war.

Not long after returning home to convalesce there was a great flood over the banks of the Mississippi, which heavily damaged the town they lived in, and things went from bad to worse for the Humason family. A lifeline came from the sister of William's wife, Laura. Her sister, Alice, had married a millionaire in California who invited the family to head west. They would have a chance to start over and it was felt that the warmer climate might help restore William's health. Milton Humason was just ten years old when he boarded a train with his family for a new life in California.

Henry Witmer was a Los Angeles banker who had invested wisely in real estate that other people wanted. For young Milton Humason, moving from the small town of Winona, Minnesota to LA must have been a culture shock. He was fortunate the Witmer family shared his love of the outdoors and operated a ranch in the hills outside of Los Angeles. Milton spent almost every weekend he could at the ranch, learning to work with horses. He was only 12 years old when he attended his first summer camp at Strain's Camp, on a ridge between Mount Harvard and Mount Wilson. Meanwhile, as Milton Humason was falling in love with the mountain wilderness, George Hale was falling in love with the seeing atop Mount Wilson.

Things on the mountain were already undergoing a lot of change when Milton rode a mule up the long trail to Strain's Camp for his second summer camp. Hale had led an expedition to survey the mountain top and work began on an observatory that would house the Snow Telescope for solar observing. The trail was widened to make it easier for the mules to haul up supplies and the hiking lodge was expanded to become the Mount Wilson Hotel. This was Hale's most ambitious project to date, and he called in John Adams, his chief lieutenant, and George Ritchey, the telescope builder, to help. The building of the observatory was big news in the area and Milton Humason made up his mind early on that he was going to be a part of it.

Milton's father, William Humason, recovered his health and he earned a good living as Henry Witmer's bookkeeper. The family began to pressure Milton to spend more time on his studies and less time in the wilderness - since the family could

now afford to send him to college - so it came as a bit of a shock to his parents when Milton announced that he was quitting school, after completing grade 8. There was a job waiting for him at the Mount Wilson Hotel. Milton was persistent enough for his parents to agree to let him try it for one year. Milton spent the next six months as a bellboy and soon found himself also employed as the resident handyman. At the age of 15, he hired on as one of the mountain's full time muleskinners, while also doing work around the hotel in return for free room and board. Despite being the one of the youngest muleskinners, he quickly became regarded as one of the best, thanks to all the time he had spent with horses on his uncle's ranch. Living the life of a cowboy on Mount Wilson, complete with a six gun on his hip, was living his perfect life. He was a quick learner and well liked. The natural charisma that had helped him charm his way into sitting on the knee of Mississippi riverboat gamblers so that he could watch them play cards, also made life easier for him on Mount Wilson. It was those same charming ways that changed his life forever when he fell in love with Helen Dowd, after meeting her at a dance at the Mount Wilson Hotel. Helen's father, Merritt "Jerry" Dowd was the Wilson Observatory's electrical engineer and made it abundantly clear that his daughter wasn't going to marry a muleskinner anytime soon. As much as he loved being a muleskinner, Milton quit his job and moved to the Witmer ranch to learn how to run the place from Letha Lewis, his older cousin. By the age of 20, he became the ranch foreman and was finally allowed to marry Merritt Dowd's daughter. From the Witmer ranch, Milton Humason could see the observatory domes of Mount Wilson and he made a point of visiting the mountain whenever time allowed. A couple years later the young couple's first and only child was born, a son they named William. By 1916, they had saved enough money to buy a ranch of their own. Meanwhile, the trail up to Mount Wilson continued to be widened and improved, making way for a proper road for trucks. The days of muleskinners working the trails of Mount Wilson were quickly coming to an end.

The Observatory might no longer need the muleskinners but Mount Wilson wasn't done with Milton Humason. His father-in-law let him know about a janitorial job available at the observatory. A janitorial job wouldn't have been enough to dislodge Milton from his ranch, but the job also included being the night assistant to astronomers at the 100" Hooker Telescope. The young couple decided they would try it for a year and moved into a small cabin on the mountain. Milton's familiarity with the mountain, the friendships he'd already made working as a muleskinner and at the hotel - as well as being married to Merritt Dowd's daughter - gave him a head start to making a home for himself on Mount Wilson. He was very good at his job and his personality won over the staff. Whenever his father-in-law was installing state of the art electronic systems at the observatory, he'd get Milton to help him. It didn't take long before he was made a full time night assistant to the astronomers using the Hooker Telescope.

Milton Humason became close friends with astronomer Victor Benioff, who loved the wilderness as much as he did. Benioff had Milton do some imaging with a camera, using a 10" refractor telescope, and was impressed with the results. Benioff recommended the night assistant to Seth Nicholson, an astronomer who specialized in the moons of Jupiter and solar astronomy during his career at Mount Wilson. Nicholson was impressed enough with Milton Humason's work to take the time to tutor him in the mathematics necessary to becoming an astronomer. After imaging a comet for Nicholson, Humason made his first astronomer report to the Astronomical Society of the Pacific in 1919. When Victor Benioff mentioned Humason to Harlow Shapley, the senior astronomer taught him how to do photometry: measuring the brightness and variations of brightness of objects in the night sky. Humason was now working for one of the dominant minds in the field of cosmology, assisting him in the search for Cepheid variables. He was doing just that when he observed a supernova in the Andromeda Galaxy and made his 2nd report to the ASP. Walter Adams began to receive glowing reports about Humason's work from the observatory's astronomers. He promoted him to assistant observer and just as importantly gave him more time on the telescope. Adams took the time to personally teach him how to do spectroscopy and Humason continued to publish more astronomer reports. Walter Adams wanted to make Milton a full time astronomer, but George Hale balked over his lack of formal education.

He was basically a journeyman astronomer who was a fast learner. He was also colour blind. There are many types of colour blindness and in Humason's case it allowed him to see the contrast of the stars against the night sky better than normal eyes. It meant that he could see faint stars that other astronomers couldn't. For many of the astronomers at Mount Wilson he was their first choice when they wanted an observing assistant. In the age of manually controlled telescopes, night assistants were well regarded by astronomers. If you treated them poorly, they would generally find a way to make your life miserable. Henry Russell was already one of the most accomplished astronomers in his field when he came to

Mount Wilson, although he was a bit rude to the lower ranked staff. Milton might have been a likeable guy, who kept his ego in check when it came to his scientific accomplishments, but Russell's rudeness wasn't going to go unpunished. When the senior astronomer demanded that his toast and eggs be ready at the exact moment he began his evening's work and the telescope readied to his exact specifications, Milton did as he was told. He also poured the water the eggs were cooked in into Russell's drinking cup. Russell had nothing but good things to say about the Hooker Telescope, but complained a lot about the water quality on Mount Wilson. Milton was still the same mischievous muleskinner who would mount someone he didn't like on a hard to control mule and then be there to rescue them, after they went on an unplanned adventure through the underbrush.

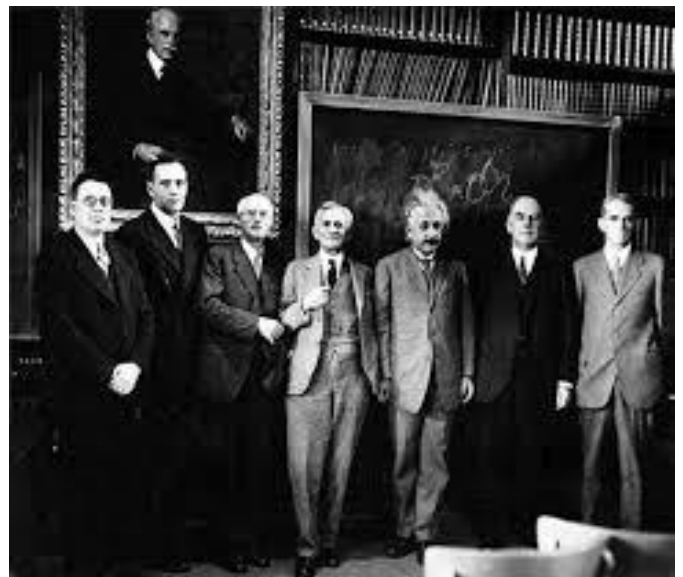
Paul Merrill specialized in spectroscopy and asked for Humason as his observing assistant for his study of long period, variable stars. Merrill was impressed enough to ask Walter Adams to give Humason his own time to work with the 100" Hooker Telescope. Once again, Adams went to Hale to get Milton promoted and once again George Hale wasn't interested. For Humason, it looked as though his career on Mount Wilson might be coming to an end. His son was nearly old enough to go to school and that meant relocating their family from the small mountain cottage to a home in the valley. It wasn't something he could manage on the salary of an observing assistant. Then, as it often did, chance smiled on him once again. With major repairs to the Hooker Telescope about to be underway, it looked as though the observatory would be closed for a significant period of time. Humason stopped by a group of senior staff, including Adams, who were discussing the problem. Milton gave it some consideration and then pointed out how when the telescope was raised and locked into place, it was still possible to align the dome for observing in a fixed direction during the repairs so astronomers could still continue to work. After saving the observatory from a lengthy shutdown, Walter Adams again confronted George Hale about promoting Humason and this time his boss relented. Hale's mental health was deteriorating and it wouldn't be long before he retired as the Director of Mount Wilson. Working under Alfred Joy, allowed Humason to take his stellar astrophotography to the next level. He wasn't just relying on technique and his sharp eyes; he was learning to work the imperfections of the mirror to get the most out of the Hooker Telescope. In 1926, he imaged the spectra of Wolf 359, a red dwarf star in the Leo constellation. At that time Wolf 359 was the faintest star known to astronomers, with an apparent magnitude of 13.54. Milton's younger brother Lewis got a job at the observatory as a machinist. Soon afterwards, Lewis Humason married Beatrice, a Stamford graduate working in the computer department at Mount Wilson. Astronomy was starting to become the family business.

As for Victor Benioff, the astronomer who started Milton Humason on his path to becoming a journeyman astronomer, he decided that he really didn't like working nights. He left Mount Wilson and enrolled at Caltech, to become a seismologist instead. During his exceptional career he invented the Benioff seismograph and later an improved version of his seismograph; the Benioff strain instrument, which measures the stretching of the Earth's surface; developed a number of electrical musical instruments; and was one of the two scientists credited with independently discovering the Benioff-Wadati zone. Astronomy's loss was clearly Geology's gain.

Edwin Hubble came to Mount Wilson in 1919; just as the Hooker Telescope was ready for use and its creator George Ritchey was being fired. Hubble had done his PhD at the Yerkes Observatory, using the 24" reflector that Ritchey had built as a proof of concept for the new age of observatories using reflector telescopes. Edwin Hubble was practically a character foil for Milton Humason, in that he was socially off-putting, made enemies more easily than friends, was academically boastful, had poor technical skills, but he was a big idea cosmologist. Despite being born in Missouri, Hubble cultivated an English accent after his three years spent studying at Oxford. He often insisted on being referred to by the rank of major, despite having never seen any action during World War I. As a coping technique for dealing with groups, Hubble would study obscure facts from the encyclopedia and make that the topic of conversation in whatever social setting he found himself in. No doubt, the other astronomers at Mount Wilson were thankful that Wikipedia hadn't yet been invented. Edwin Hubble was above all an ambitious astronomer. In 1923, when he found a number of Cepheid variable stars, used by astronomers to measure distances, in both the Triangulum and Barnard's Galaxies he effectively destroyed the idea of the Milky Way Galaxy being an island universe. It was also found that he had earlier discovered a Cepheid variable star in the Andromeda Galaxy, but at the time he had mislabelled it as a super nova. He immediately sent letters to Henry Russell and Harlow Shapley, by fastest post, to inform them of his discovery. Shapley was less than pleased, having vigorously championed the Island Universe Theory. Four years earlier, when Milton Humason was

working for Harlow Shapley, he'd brought him a glass plate with two suspected Cepheid variables he'd spotted in the Andromeda Galaxy. Humason had circled the two Cepheid variable stars and Shapley's response was to dismissively wipe Milton's markings off of the glass plate. Edwin Hubble would present his findings to the American Astronomical Society in 1925. It expanded on the earlier presentation made to the AAS made by Vesto Slipher in 1914, showing that the spiral nebulae (as galaxies were then known) were predominantly red shifting away from us at high velocity. Hubble would go on to make extensive use of Slipher's data in a book he published in 1929, giving the other astronomer no credit for his work. Only much later, when he was using Slipher's data for a paper on the rotation of galaxies, would he finally give Vesto Slipher credit for his observations.

Having slain the dragon that was the Island Universe Theory, Edwin Hubble set his sights on an even larger target. Georges Lemaitre was a Belgian Catholic priest and part-time professor at the Catholic University of Louven. While trying to reconcile the trend of red shifting in the Universe with General Relativity, Lemaitre published a paper on an expanding universe that existed within Einstein's theories, but rejected the static universe and even hypothesized about what would later become known as the Big Bang Theory. Georges Lemaitre's idea of an expanding universe excited Hubble and he decided to prove it with the mighty Hooker Telescope. To do this he would need the best stellar photographer on Mount Wilson and that was Milton Humason. Edwin Hubble might be a revolutionary cosmologist, but his astrophotography skills were very poor. Hubble initially balked at the idea of working with Humason. Milton had been trained by and worked alongside his despised rival, Harlow Shapley, and Hubble was generally suspicious of his fellow astronomers to begin with. Some excellent images by Humason finally won him over. The first target that Milton Humason imaged for Hubble was NGC 7619 in the constellation Pegasus. Humason did one 33 hour spectrum image and then a 45 hour image on glass plates. Edwin Hubble now had red shift velocities that were more accurate than those achieved by Vesto Slipher, using the smaller telescope at the Lowell Observatory. Hubble was quickly becoming a rock star at Mount Wilson, with the media expecting something new and amazing at every press conference and interview. Humason took a break from the gruelling imaging runs to go prospecting in the mountains of southern California for the site of Hale's 200" telescope, accompanying astronomer Ferdinand Ellerman. When he returned to work at Mount Wilson, it was Milton Humason's turn to put his foot down. Humason really didn't want to return to work for Hubble. He got along fine with Edwin Hubble, but the equipment he was using for this ambitious imaging project was pushing the limits of human endurance. Telescope operators at Mount Wilson worked 10 meters above the observatory floor, often contorted in uncomfortable positions to manually control the telescope, dome, and camera for the entire night. The Hooker Telescope's massive mount wasn't capable of the kind of automated tracking later astrophotographers would take for granted, while imaging from control rooms. They were exposed to the cold mountain air and worked in complete darkness. It was also dangerous. Later, at Palomar, Alfred Joy was passing the night assistant on the narrow walkway in the dark and fell to the concrete floor far below. Joy was considered lucky to have only broken both his arms and legs. Walter Adams knew that Humason was essential to the success of Hubble's project and ironically asked George Hale to convince him to continue. Humason made it clear that he had reached the limits of the imaging equipment at Mount Wilson and George Hale promised him a new camera. The new camera, with an improved lens, was designed by John Anderson, the CEO of the Palomar Observatory project. The much faster camera used by Humason created dramatically better images and didn't take a week to make a single glass plate. In 1931, Hubble published a paper with Humason. For his part, when Humason published his 10 page paper on his observations, he remembered his roots and thanked his night assistants for their work. Albert Einstein visited Mount Wilson to see the work being done by Hubble and Humason. One of Milton Humason's proudest moments was posing for a photo in the observatory's library beside Einstein, Hubble, Charles St John, Albert Michelson, WW Campbell, and Walter Adams (*see photo to right*).



Edwin Hubble and Milton Humason were becoming close friends, during a time when Hubble was creating a lot of animosity both by his courting of the media and his attack on the static universe model. They tested their own observations against the *Shapley-Ames Catalogue of Galaxies*, testing their data against the data of Hubble's rival and of course looking for errors. Harlow Shapley had taken part in the Great Debate, taking the side of the Island Universe Theory. While he accepted Hubble's findings that the Milky Way was one of many galaxies, he wasn't ready to concede that the Universe was expanding. Even with all the data collected by Humason, all Edwin Hubble was able to state publicly was that yes the Universe was probably expanding. They were going to need a bigger telescope to answer the question definitively and were fortunate that was being built at Palomar. Nick Mayall was a young astronomer who had hoped to find a position at Mount Wilson, but ended up at the Lick Observatory. After building a spectrograph to use with the Crossley Telescope, he was given permission to begin doing images to assist in Hubble's project. In 1936, Milton's son William graduated from Caltech, while his father continued to labour on Hubble's massive project.

In 1938, Milton Humason was invited to the conference of the International Astronomy Union in Stockholm, Sweden. George Hale had died early that year and events in Europe were taking a turn for the worst. The early years of World War II were more personal for Milton than for many Americans. His sister, Virginia, was living in Holland and was hiding Jewish people from the Nazis. When the US finally joined the war, Milton became an optics consultant for MIT and worked on aerial photography at Wright Field Airbase. Edwin Hubble became the Chief of the External Ballistics Branch of the Ballistics Research Lab at the Aberdeen Proving Ground. Milton Humason was at the Palomar Observatory, recording the seeing conditions, when he witnessed the green flash in the sky from the detonation of the Trinity device in New Mexico, over 1200 km away.

After the war, Baade and Hubble, the two star astronomers at Mount Wilson, were vying to become the first director of the new Palomar Observatory. Walter Baade was from Germany and was allowed to spend his time during the war at Mount Wilson, collecting data on Type 1 and Type 2 stars in the Andromeda Galaxy. The discovery that there were two different types of Cepheid variable stars not only allowed him to recalculate the size of the Universe – doubling the result by Hubble in 1929 – but opened up the scientific field of stellar evolution. He benefitted from the lack of light pollution, due to the wartime blackouts, becoming the first person to resolve the stars in the middle of the Andromeda Galaxy. To keep him from being interned as an enemy alien during World War II, Walter Adams enlisted the country charm of Milton Humason to persuade the Provost Marshal to allow Baade to continue his work at Mount Wilson. And now, faced with the choice between the two dominant astronomers, it was decided that a compromise candidate would be the only way to keep one of the two astronomers from leaving if the other was chosen. The new director, Ira Bowen, was a long time physicist and astronomer at Mount Wilson. Milton Humason's easy going days as the everyman astronomer were submarined when the new director gave him the unenviable job of secretary. He would now be in charge of allocating telescope time for both Mount Wilson and Palomar. Milton really didn't like the job because it meant making astronomers resentful whenever they didn't get as much telescope time as they demanded.

Hubble and Humason returned to their work. One of the first tasks awaiting Milton was checking all the red shift velocities measured with the 100" Hooker Telescope against results using the 200" Hale Telescope. One of the nice surprises for telescope operators at Palomar was that they got to wear heated vests that were developed for air force crewmen during the war. Edwin Hubble wasn't the same man who left Mount Wilson to work for the US Army. He was haunted by his work in the war and became a vocal opponent of the atomic bomb. His health began to deteriorate and he suffered a heart attack. Hubble hired Allan Sandage to assist him in interpreting the data collected by Humason. Allan Sandage was a follower of Hubble, from the time he read *The Realm of the Nebulae* as a teenager, inspiring him to become a cosmologist. Meanwhile, Humason continued working and began receiving much deserved accolades from the international community. He was given an honorary doctorate from the University of Lund, in Sweden, where he had attended the IAU conference before the war. The Royal Astronomical Society made him a member.

After Edwin Hubble died in 1953, Humason called Sandage into his office. The project wasn't finished. They would be the pallbearers to carry Hubble's lifelong work to completion. Allan Sandage would now stand in for Hubble. Nick Mayall would continue working on the brighter galaxies with the Lick Telescope, while Humason imaged the fainter galaxies from

Mount Wilson and Palomar. Walter Baade's work was continuing to change astronomy and errors found in Hubble's estimated distances to some stars didn't make Sandage's job any easier. The goal posts of the Hubble Constant were moving, along with the size and age of the Universe dramatically increasing. It was a big win for the Big Bang theorists, a theory Edwin Hubble was never a fan of. In 1956, a paper titled, *Redshifts and Magnitudes of Extragalactic Nebulae* was published. It was a monument to the decades of work at Mount Wilson, Palomar, and the Lick Observatory to prove Georges Lemaitre's expanding universe. Milton Humason finally felt like he could retire after 35 years in astronomy and 80 published papers, working alongside many of the most accomplished astronomers on the planet. Fritz Zwicky refused to let him retire right away and convinced him to work on a supernova project with him. Milton Humason's last task was to work alongside Allan Sandage to complete the *Hubble Atlas of Galaxies* in 1958.

Unlike so many astronomers who reached for the stars at Mount Wilson and Palomar, Milton La Salle Humason achieved his goals in his lifetime and was able to enjoy his retirement, spending time with his family and fly fishing with friends. It's hard to believe that a middle school dropout could somehow rise up through the ranks of academics, in a field where the class system and academic elitism were already so well entrenched. Nowadays, he would have also been faced with the realities of degree inflation, where even the job of park ranger requires a bachelor's degree, let alone anyone wanting to be an astronomer working at a world class observatory. Besides his charm and technical ability, Humason's greatest skill was navigating the feuds between the likes of Hubble, Shapley, Ritchey, Hale, and Adams, to remain on friendly terms with everyone. Milton Humason died suddenly in his home at the age of 80, in 1972. The Humason crater on the Moon is named after him and Subdwarf B stars are called Humason-Zwicky stars, from their collaboration in their discovery.

Bruce Lane

2010 Astronomy Day, at the Swan Lake Nature Sanctuary



Astronomical Term of the Month: Binning

When photographing in good light, the only problem with having a lot of megapixels is that it can cause storage issues because of the size of the image files. A lot of CMOS or CCD Digital Cold Cameras that are made specifically for astronomy or even some of the higher resolution DSLRs, have a lot of megapixels. In low light conditions, where you're doing longer exposures, this can result in a new problem. There is only so much room to put all those pixels into the same space, so when you have more megapixels you also tend to have smaller pixels. These smaller pixels are struggling to collect as much light as the larger pixels, so you'll need longer exposures or shoot at a higher ISO to compensate. To cope with this you can bin multiple pixels together to form a single, larger pixel. By binning you're essentially choosing the size of your pixels.

By binning you lose some resolution but make dramatic gains in the light gathering ability of your camera. A 2X2 binning setting is very common, turning 4 pixels into one much larger pixel. With a 4X4 or larger binning setting you can start becoming capable of doing live video astrophotography. When you're using a CCD camera, there are additional benefits to binning. Because CCD cameras do most of the binning before they read any digital noise, you get some added noise reduction because you've increased the signal to noise ratio. This added benefit doesn't apply to CMOS cameras because they are doing the binning digitally after the signal has been read, based on the native size of the pixels. When you're using an astronomy digital cold camera, you're usually given the option to do binning in the same software you're using to control every other aspect of your camera. With DSLRs binning is done in post-production and the binning pixels together can mess up the way your camera processes RGB colours. Because of this the best use of binning with a DSLR would be when you were shooting through a narrow band filter, when this is less of a concern. Binning can be a bit complicated and technical, but it's one of the many options for imaging the night sky, especially when you're using a CCD digital cold camera.

Bruce Lane

In Closing



The weather phenomenon known as the *pineapple express* has been hanging around so long that it's become the *pineapple parking lot*. As we move into the New Year, we'll hopefully see some clearer and colder nights for the astronomy community. That or next month's *SkyNews* might end up having an article about the merits of umbrellas versus raincoats. Until the clear skies do find us, it's a good time to familiarize ourselves with any shiny, new toys or re-familiarize ourselves with neglected equipment we should really be using more. It's also a good time to do some reading. RASC Victoria even has a library you can borrow books from if you're looking for some new reading material.

The Annual General Meeting will be coming up on February 22nd, so mark that date on your calendars or tell whatever robot device you have to remind you. Our RASC Victoria Centre AGM will once again be held at Cedar Hill Golf Course. It is also our monthly meeting for February and a dinner all in one. With the change in our financial year end - to be more in keeping with the rest of Western civilization - it means having the annual meeting at a different time of year. With the last AGM dinner in November 2017 it's been a while since we've all sat down and broke bread. As that was the last meeting I was treasurer for, I'm looking forward to not being the one giving a financial report or chasing people down for their dinner fees.

Bruce Lane: SkyNews Editor

Photography Credits

Cover: Star Trails by Charles Banville, taken at Gatineau, Quebec over period of 9.5 hours on December 2-3rd, 2019.
Optics: Canon EF 8-15mm f/4L Fisheye USM; Camera: Canon EOS 5D Mark III; Exposure: 1073 exposures of 30 sec, f/4, ISO 500

Page 2: Saanich Fair 2010, from the RASC Victoria Zenfolio archives, photographer unknown, taken with a Nikon Coolpix L3

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

Page 4: Crop of Reg Dunkley (RASC Victoria President) at 2018 AGM, by Joe Carr

Page 5: 2010 Star Party in Metchosin; taken August 13th, 2010, by Joe Carr

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

Page 6: Eight ALMA antennas in operation at the 5000-metre-altitude Array Operations Site on the Chajnantor plateau in the Chilean Andes. This photograph was taken on 28 September 2010. Credit: ALMA (ESO/NAOJ/NRAO)

Page 6: Posed Book, *"The Lonely Hearts of The Cosmos"*, taken in Editor's living room on Jan 5, 2020, by Bruce Lane

Page 7: North American Nebula by Daniel Posey, Dec 25th, 2019 using Canon Ra and Sigma 105 1.4 Art Lens on iOptron tracking mount; 10 minutes of imaging (21x30second exposures at ISO 200) without guiding or use of dark frames.

Page 8: Portrait of Milton Humason, circa 1930; from the Observatories of the Carnegie Institution for Science Collection at the Huntington Library Holdings (COPC 2927)

Page 12: Milton Humason posing with Hubble, Einstein, Adams, Charles St John, Albert Michelson, and WW Campbell in the Wilson Observatory library. January 29th, 1931; from the Observatories of the Carnegie Institution for Science Collection from the Huntington Library Holdings (COPC 2806)

Page 13: 2010 Astronomy Day at the Swan Lake Nature Centre, from the RASC Victoria Zenfolio archives, photographer unknown, taken with a Nikon D70

Page 14: "Mammoth", Light Brahma chicken in the garden bed the chickens have converted into a dust bath; Dec 25, 2019; by Bruce Lane

Page 16: Michael Collins in the command module simulator, 1969; scan courtesy of the NASA Johnson Space Center.

Call for Article and Photo Submissions for February Issue

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

RASC Victoria Centre Council 2020

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Michael Collins training in the command module simulator for Apollo 11. He retired from NASA and the Airforce in January 1970