

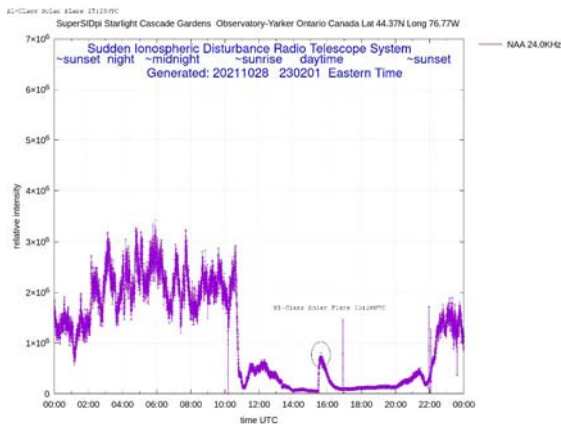
# Regulus

2021 November

Newsletter of The Royal Astronomical Society of Canada - Kingston Centre  
Celebrating our 60<sup>th</sup> anniversary 1961-2021 [kingston.rasc.ca](http://kingston.rasc.ca)

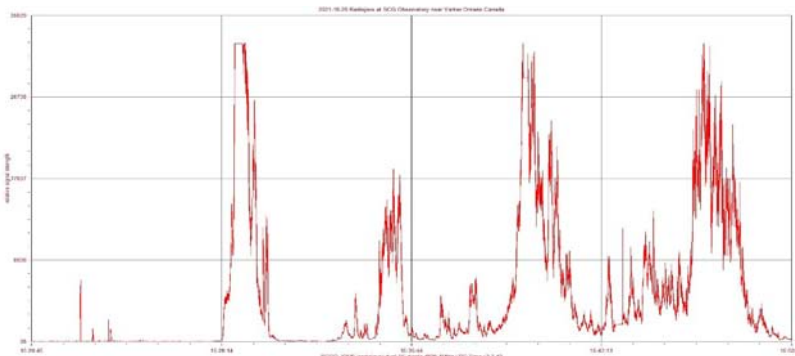


The remnants of AR2887 CME and X1 flare – Kim Hay



In addition, the SCGO Supersid system detected the event in what would normally be the radio quiet daytime.

As did the SCGO Radiojove system, needing a data recalibration as it went off the scale! Radiojove shows it started around 15:28 and concluded around 15:50 UTC



## MEETINGS

**RASC-KC Wednesday Weekly Social** videoconference. 7pm Eastern all weeks except the 2<sup>nd</sup> Wednesday of the month. For members and their guests. Email list subscribers receive the link weekly 1 or 2 days beforehand. Next Social: Wed 2021 November 17<sup>th</sup>

**RASC-KC Regular Monthly Meeting** - Wednesday 2021 November 10<sup>th</sup> a virtual Zoom meeting at 19:00 EDT with the Annual General Meeting, followed by the Regular Meeting. Members will be emailed a zoom registration link, others may watch on our youtube channel.

## In This Issue

- \* X1 class solar Flare – Kim Hay & Kevin Kell
- \* President's Tidbits – Kim Hay
- \* In The November Sky - Rick Wagner
- \* Annual General Meeting Agenda
- \* Treasurer Financial Report – Susan Gagnon
- \* Skyward for November – David Levy
- \* Noise – Rick Wagner
- \* Historic list of invited speakers to RASC Kingston 1963-2021– Kevin Kell
- \* RASC-KC Solar Cycle 25 Monthly Review - Hank Bartlett
- \* RASC-KC September Meeting Minutes – Kim Hay
- \* National Council Notes-John Hurley
- \* SCGO Radiojove detection of Jupiter-Io-A Event – Kevin Kell
- \* A Galaxy a Day Images – Stephen Craig



## ***President's Tidbits for November 2021- Kim Hay***

A week away from the time change back to Eastern Standard Time, and it will be darker for earlier observing at night. This can be great for those who want longer telescope runs, or want to observe more without being up all night. Of course this means the temperatures are going to get colder. Dress in layers, keep your feet dry and stay warm!

This month we have our Annual Meeting on November 10th. Minutes and Election positions are posted on the website. You must be a paid up member to vote. Our Regular meeting will be held right after the Annual meeting. We will have Richard Wagner speaking on " Noise" , and What's Up in the Sky for November. Hank Bartlett will present Hank's Sunspot and we will have member time. On November 18-19 we will have an almost total lunar eclipse, but it is called a partial eclipse. Get your cameras ready for imaging, or you binoculars ready for observing.

December will highlight the liftoff of the James Webb Space Telescope on December 18, 2021. The November/December issue of SkyNews main story is on the JWST. Of course we have Christmas, and if one is lucky enough and not on back order, astronomical goodies will be under the tree.

Remember if you have any suggestions for talks, speakers, or presentations do not hesitate to send a note to [kingston@rasc.ca](mailto:kingston@rasc.ca)

### **In the November Sky – Rick Wagner**

03 Nov - daylight occultation of Mercury by the Moon; disappearance about 15:35EDT, low in the SW and quite near the Sun. Extremely challenging. Be very careful observing near the Sun!

04 Nov - extremely thin crescent just a few degrees above the ESE horizon just before sunrise. This is the second-most favourable chance this year to see the Moon about 10 hours before new. Extremely challenging, requiring perfectly clear skies and very low horizon.

04 Nov - New Moon 17:14EDT

05 Nov - Uranus at opposition, mag 5.7 - try to see it without optical aid!

05 Nov - South Taurid meteor shower peaks (minor shower <10 meteors/hour)

07 Nov - Daylight Saving Time ends at 2:00AM.

11 Nov - First Quarter Moon

12 Nov - North Taurid meteor shower peaks (minor shower <10 meteors/hour, Moon interferes)

15 Nov - Algol at minimum for about 2 hours around 02:00EST

17 Nov - Leonid meteor shower peaks - nearly Full Moon interferes seriously

18 Nov - Algol at minimum for about 2 hours around 10:40EST

19 Nov - Full Moon 03:57EST

**19 Nov - nearly total lunar eclipse between Pleiades and Hyades, Moon enters the umbra at 02:18EST, max eclipse at 04:03EST , last of the Moon exits the umbra at 05:47EST**

27 Nov - after spending the month transiting through the Hyades star cluster dwarf planet (1) Ceres reaches opposition, mag 7.0 - the only dwarf planet visible in small-medium amateur telescopes.

27 Nov - Last Quarter Moon

**NOTICE: Annual General Meeting  
Wednesday 2021 November 10th, 7pm  
EST via Zoom videoconference**

Register in advance for this meeting: (to be emailed to each member in November). After registering, you will receive a confirmation email containing information about joining the meeting. Voting will be done within the zoom environment.

**AGM AGENDA**

1. Welcome. Notes on videoconferencing and voting procedures (rasckc members only, show of hands in video or participation windows)
2. Approval of Agenda
3. Approval of 2020 AGM 20201111 minutes (later in this newsletter)
4. Approval of Secretary's Annual Report
5. Approval of Treasurer's Annual Report (including auditors report)
6. Centre Elections:
  - President
  - Vice-President
  - Treasurer
  - Secretary (one year term)
7. Election of Auditor
8. Questions regarding other published reports: President, Vice President, Librarian, Editor, NC Rep, Webmaster, Equipment Loan,
9. Adjourn with thanks

**The Board structure consists of seven positions of two year terms. The terms are staggered with the President, Vice President and Treasurer's terms being up in odd numbered years and the Secretary, Librarian, Editor and National Council Rep being up in even numbered years. Source: RASC-KC Bylaws (2006). The Executive consists of the Board, and other appointed Officers.**



**Benefits of Membership to the RASC-  
Kingston Centre**

**National based benefits:**

- \* annual print edition of the Observers Handbook
- \* bi-monthly digital edition of the RASC Journal
- \* monthly digital edition Bulletin of the RASC
- \* 6 issues of Skynews Magazine (paper)

**Centre provided benefits:**

- \* monthly Centre Newsletter – Regulus
- \* weekly social videoconference chat
- \* monthly Meetings
- \* equipment loan program

**RASC Kingston Centre Treasurer Financial**

**Report for Executive Board and Auditor,  
October 11, 2021.**

**Summary:** Income \$3254.65, Expenses \$2235.23 for a net gain of \$1019.42, Total assets \$33895.81.

**Fund Status: Spreadsheets, Open Office (4.1.3)**

|                  |            |
|------------------|------------|
| Cash             | \$46.00    |
| Fall'n'Stars     | \$448.08   |
| Observatory      | \$22785.90 |
| Operating        | \$8615.83  |
| Reserve          | \$500.00   |
| Special Projects | \$1,500.00 |

**Membership at the time of reporting is 80.**

The fiscal year was fairly quiet as it was a full year of pandemic lock-downs etc. Outstanding liabilities total \$78.25 in uncashed cheques. After the Auditor's review and the passing of this report at the AGM there will be a balancing of the Fall'n'Stars account to \$500. RBC statements show \$5 more in the bank than on the Treasurer's books.

**Income**

As is often the case in the Kingston Centre membership income (\$1480) is almost matched by the generous donations of members (\$1191). Calendar sales (\$110) and GIC income (\$183) complete the major sources of income in any given year and this year in particular.

**Expense**

Zoom has cut our meeting space expense. For a comparison with our in-person past this is how the costs compare. Queen's meeting rental \$362 (\$45 per meeting, 8 events), vs Zoom fees per year \$226 (\$4.35 per meeting, 52 events minimum as there were executive meetings, committee meetings and trouble shooting sessions carried out with Zoom).

Director and Officer insurance (\$432) is unchanged. Invited speakers for regular monthly meetings (\$200). Outreach spending remains limited to SkyNews (\$170), a virtual Science fair (\$103), and kit handouts from our stock of star finders etc. for isolated school requests.

**Banking details.**

We remain with the RBC branch on Gardiner's Road, hours are good and the location convenient.

We save fees by downloading e-statements. We do not however conduct any business online.

### **Future fundraising.**

Binoculars and tripod regifted to Kingston for future fundraising remain in limbo. The executive will have to decide how to move forward on this issue.

Running a lottery is time consuming and an outright sale may be in order. In 2021-02 an account was set up to receive donations through Canada Helps. This will place our name on the list of Charities offered to people wishing to donate. It is to raise the profile of the Centre only, donating through Canada Helps has always been possible. E-transfer of funds to the Centre has also been arranged.

### **Notes for the Auditor**

Financial year October 1 to September 30 (2020-2021)

Treasurer: current Susan Gagnon (2015-2021), past Kevin Kell (2010-2015)

**Records:** within the 2020-2021 Treasurer Deposit and Expense Binder please find the following,

- Executive Meeting motion of 2021-10-12 appointing Michael Bird Auditor.
- General Ledger: Central spread sheet, all transactions.
- Payments, all cheques (#310-#328) issued and deposit slips.
- Reports: all monies received through RASC national through direct deposit to the Centre.
- Bank: All e-statements received from RBC.
- Investments: all statements referencing GIC status.
- Papers submitted to the Canada Revenue Agency and the Province of Ontario.
- Equipment: inventory to be presented at the AGM November 10, 2021.

In addition to the binder I have included: Profit and Loss (1 page), a sorted Ledger account (all transactions separated by Income vs. Expense), Balance Sheet reconciling the General Ledger accounting and the RBC chequing and GICs as well

as the cash on hand.

### **Process**

Three members of the executive have signing authority for the Centre. Two signatures are required for every cheque and one must be the Treasurer's. The only snag, which should be temporary, is getting the appropriate reports from National's new database, Driven. I apologize to the Auditor for the 4<sup>th</sup> quarter reports and my less than elegant extraction of detail from the said database. I look forward to the report from the Auditor and any feedback from the executive or membership.

Susan Gagnon

Treasurer

Royal Astronomical Society of Canada  
Kingston Centre

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### **The Fine Print:**

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### ***RASC-Kingston Center Board of Directors***

\*President: Kim Hay

\*Vice-President: Laurie Graham

\*\*Secretary: vacant

\*Treasurer: Susan Ganon

\*\*Librarian: vacant

Editor: Kevin Kell

National Council Rep: John Hurley

Appointed Officers:

Past President: Rick Wagner

Webmaster: Walter MacDonald

Equipment: Kevin Kell

\* Position up for election in 2021Nov

\*\* additional offcycle position up for election in 2021 Nov

## Skyward for November 2021 by David H. Levy



### Galaxies, just for the sake of argument

A few weeks ago, I received a message from Cameron Gillis, an amateur astronomer who wrote that he liked galaxies. Just for fun, I decided to take the opposite approach, a philosophical reversal. If he likes galaxies, then I hate them. As we prepared for our meeting I began to explain the various reasons why I hate them. When, for example, I am observing with a telescope and the Andromeda galaxy enters my field of view, I quickly leave the telescope and ride my bicycle to the end of our driveway and back. The more I stretch the story the greater the laughter becomes. I especially get annoyed by the dark Hydrogen-II regions that stretch across its hideous girth. The cluster of galaxies in the Virgo cluster, particularly Messiers 84 and 86, are so bland that I sometimes have to leave the telescope altogether!

The worst galaxy is our own. When I look up at the evening sky, the Milky Way obstructs my view as it straddles the night from Cassiopeia all the way down to Sagittarius. The stars are so thick that I can hardly see black sky between them. Except of course, when I come across Baade's window. This area of sky rattles me because there, some darkness appears. Discovered by Walter Baade, this window allows us to see almost to the center of our galaxy. It is an awful sight. The majesty of the night is nowhere more apparent than when I am viewing the center of our galaxy, in Scorpius and in Sagittarius, through my telescope. It is wondrous. So wondrous that I still hate it. Because it wastes my time when I am mesmerized by it, the emotion of viewing the galaxy from my backyard is so strong that it strengthens my heart and pierces my soul.

The worst part of seeing our own galaxy on a clear autumn night is that the dark lanes of hydrogen dust straddle its length. Dark areas are called giant molecular clouds. They are not lit by nearby stars; they just are there. In the far distant future, they will

generate new systems of stars and planets like our Earth. They are called giant molecular clouds or Hydrogen (H II) regions.

In distant external galaxies, dark clouds like these can straddle their whole length. The Andromeda galaxy has several of these H II regions that one can observe through a small telescope if one looks carefully enough.

Deep in the southern sky, but still visible from most of North America, lies Caroline Herschel's galaxy. It is No. 253 in the NGC, the New General Catalogue. Under a bright sky it is hardly anything, but from a dark site it resembles a long resting caterpillar. It has a most prominent dark hydrogen lane running across its length.

Along with globular star clusters, those round conglomerations of hundreds of thousands of stars that orbit the outskirts of galaxies, including our own, galaxies are the oldest structures in the Universe. The oldest ones started to build within half a million years of the Big Bang, when the Universe was in its infancy.

So much for hating galaxies. When I say that I hate them, I write merely for the sake of argument and humor. Galaxies are almost like people, each one different, each one with its special characteristics. One way of looking at them is to compare their gigantic sizes with our puny selves. But there is another way. Small as we may be, each of us is unique. Galaxies are huge, but aside from their differing shapes, they are still much alike. But in all this Universe, among all these galaxies, there is just one, only one, of each of us. Our ideas, our personalities, are precious.

## Noise – Rick Wagner

### A Whole Lotta Noise

The astrophotographer, whether doing deep sky pretty pictures, lucky imaging of planets, the Moon or the Sun, or scientific imaging for photometry or spectroscopy, is always trying to deal with noise. Even when imaging the Sun and the Moon we use the shortest exposures possible to 'freeze' the seeing so we must deal with low light levels. The noise is what we commonly experience as speckles or grain in our astrophotos or random scatter in photometric and astrometric measurements.

But what is noise really and whence does it arise? Part of the problem is that many astro-imagers, from the rankest beginners to advanced professionals, often confuse unwanted signals with noise, or are just careless with the terminology.

A CCD (or CMOS) camera is a rectangular array of picture elements or 'pixels'. Each one is like a little bucket which will collect photons from a small patch of sky and convert most of them into electrons. These electrons will be held within the pixel by electric fields until it's time to read out the image. At that time the electric fields are rippled down the chip to move the little buckets of electrons to an amplifier and an analog to digital converter to measure the amount of electric charge (effectively 'count' the electrons) collected in each pixel during the duration of the exposure. Unfortunately there are more electrons in the pixels than just those resulting from photons of our target nebula or galaxy.

The electrons in a pixel come from several different sources, all mixed together. The camera electronics add a small voltage to each pixel to ensure that random fluctuations in the read process don't

result in any pixels with negative values. This is the bias. The atoms in the sensor chip have random thermal motion from the warmth of the chip and these motions generate electrons which also get collected. This is the dark current. The sky background (light pollution, sky glow, unresolved stars and galaxies) contributes photons, and hence electrons, to each pixel. Finally our target, star or nebula, adds its small flow of electrons. Of course we can't distinguish the electrons by where they came from, they all look identical.

In a perfect world, the bias voltage and the electronics would respond identically for every pixel in every image, the dark current would be consistent from image to image, and the sky background should change little from image to image. We can measure the bias by taking a zero (or as short as possible) length exposure. A long-duration exposure in complete darkness will give us a measure of the dark current. The sky background we obtain from sky pixels near our target in the image. So we can just measure each of these unwanted signals and then subtract them off, leaving only the pure signal from our target. Beauty!

Except for noise. Astroimaging is a hunt to catch a tiny trickle of photons, individual photons arriving at random times like raindrops. We may imagine that they arrive at a constant average rate – multiply this rate by our exposure duration gives the (dark, sky, or target) signal. But, because they actually arrive at random times, when we take an exposure we may catch a few more or fewer electrons than the

average rate. It is this variation in the number of photons that is the noise. Importantly, the signals that we saw above, dark current, sky background, and target, are all subject to this noise.

Noise that results from random arrival times like this is called Poisson or shot noise. The noise is proportional to the square root of the signal. If we think of a pixel collecting 10 electrons per second (on average), a 100s exposure should total 1000 electrons. But if we take many 100s exposures we will find that we get 1000 plus or minus the square root of 1000 = 32 electrons. In fact, about 69% of our images will have between 968 and 1032 electrons (1 sigma), 95% will have between 936 and 1064 electrons (2 sigma) and 99.7% will have between 904 and 1096 (3 sigma.) If we take a thousand 100s exposures we would expect about 3 images to report a signal more than 10% different from the actual average! To emphasize – our target, the sky background, and the dark current are all subject to this noise.

If we try to increase our signal by taking longer exposures or by adding together multiple subexposures we also increase the noise! It looks like a losing battle. But it isn't: if we double the exposure we get twice the signal. But the noise only increases by the square root of 2. So the ratio between the signal and the noise, the signal to noise ratio S/N or SNR, has improved. The noise in a pixel with 100 electrons is  $\sqrt{100} = 10$  electrons, or 10% of the signal. The S/N is  $100/10 = 10$ . The noise in a pixel with 200 electrons is  $\sqrt{200} = 14$ , 7% of the signal and a S/N of 14. Better. If we have 10,000 electrons we get a S/N of 100. Much better! (Although we've had to expose 100 times as long!)

We cannot get rid of the noise in an

image! We don't know its value – it's noise after all – so we can't just subtract it off. In any given exposure we don't know if a particular pixel received more or fewer dark electrons than the average, a slightly higher or lower read noise, slightly more or fewer sky photons, or indeed more or fewer photons from our target object. The noise is an integral part of every image! What happens if we actually subtract a single dark frame from our picture? Any time we combine images (add, subtract or average) the noise in the images adds "in quadrature." In quadrature relates to our old friend Pythagoras's theorem: if we have a noise of 20 electrons in a dark frame and 35 in our picture then the noise when we subtract the dark frame will be  $\sqrt{20^2+35^2}=40$  electrons. By subtracting the dark frame we've got rid of the dark current signal but we've made our image noisier! The same would happen with subtracting the bias or the sky background.

The read noise arises from a different mechanism. As its name implies the read noise occurs when we read an image out. It doesn't matter how long the exposure was or what it is an image of, the read noise will always be the same. The read noise of CCD cameras is usually around 10 electrons, but is only 1-3 electrons for modern CMOS cameras. If we divide a long exposure up into many subexposures (for easier guiding, to avoid saturation, whatever) we add (in quadrature) the read noise for every one of those subframes.

If we can't get rid of the noise we can reduce its impact by not adding even more noise from our bias and dark frames. In the example above if we take 25 dark frames and average them

together that average dark frame would have a noise of only  $20/\sqrt{25}=4$  electrons. Subtracting the averaged dark frame from the light frame would give us a noise of  $\sqrt{4^2+35^2}=35.2$  electrons. By (dramatically) increasing our dark frame effort we have increased the noise in our picture only very slightly, by less than 1%. What we did by increasing the number of dark frames is make a much more accurate measurement of the true dark signal.

So a single image has a certain amount of noise in it from the target, the sky, the dark current, and the read noise. We can't reduce that noise. Much as we are trying to 'measure' the brightness of our target, we need to measure the average bias signal, dark current, and sky background as accurately as possible. The best way to do that is take many exposures – bias, dark, and light frames. That way we can subtract these signals with a minimum amount of additional noise.

To measure the average bias we take a long series of bias frames. These are zero-length (or shortest possible) exposures in the dark. If we average 9 bias frames the resulting master bias has  $1/3$  (=sqrt 9) the noise, 16 gives  $1/4$ , and 25 give  $1/5$  the noise. I generally shoot 25. They are easy to do and can be done on cloudy nights.

To measure the dark current we do the same thing. Take lots of dark frames and average them together. A dark frame is a long exposure (at least as long as your longest 'light' or science image) in the dark. (Because many cameras have light leaks of varying severity it is important that bias and dark frames be taken in the dark.) Again, I generally shoot 25.

We've discussed how to minimize the

impact of these various noise sources on our images. But what about actually reducing the noise? The bias is fixed and can't be reduced. The dark current comes from thermal motion of the atoms in the chip so cooling the camera will reduce it. The dark current decreases by a factor of 2 for every temperature drop of about 6C. Cooling by 12C drops it a factor 4 etc. Most cameras will cool to at least 30C below the ambient temperature which will reduce the dark current by 32 times and reduce dark current noise by  $\sqrt{32} = 5.6$  times.

The sky background is a little harder to reduce. We can image from darker skies. A sky one magnitude darker contributes  $1/2.5$  as many photons so has only  $\sqrt{1/2.5} = 64\%$  as much sky noise. We can also image through filters, particularly narrow band filters, as they will reduce the apparent brightness of the sky. However, they may also reduce the brightness of the target thereby increasing its noise somewhat, offsetting the gain from the darker sky background.

Finally we can reduce the (relative) noise in our light frames by increasing the total signal. We can use cameras with higher quantum efficiency, shoot unfiltered, or, most easily, shoot longer exposures or more subframes. This gives us a better measurement of both the target and the sky background. Ah, but what about read noise you ask. More subexposures increases the total read noise. So we want to balance the length of the subexposures against the number of subexposures to get the best result. We could shoot one single long exposure and not stack. The trade-off of course is that if anything happens to that single exposure (a brief tracking error, satellite or

airplane, cosmic ray hit) you've lost the entire data set rather than just one subexposure. And you can't dither a single long exposure to get rid of hot and cold pixels, nor can you extend a single exposure beyond the limits of darkness at your site.



**Some notes from the weekly Youtube.com broadcast from Skywatcher-USA 2021Oct22 - Building a Backyard Observatory**

<https://www.youtube.com/watch?v=ox7FkczQO84>

- how much space do you have?
- What do you want to put in it?  
Consider the future
- how permanent do you want it to be?
- how much visibility do you want or need (ie trees?)
- actual location

Designs: Dome, roll off roof

Domes: small footprint, no extending parts, structures, more compact, reduces stray light, wind protection, kits or custom.

Limited to one pier/mount, dome rotation needs motorization/automation, pier not centered, telescope is centered. Dome is great for solar, shade. Skyshed pod about \$2k USD,



Eastern Veil Nebula by Mark DesLauriers  
Shot with 6 inch SCT using Zwo 294 camera. 31 stack at 8 seconds, IRUV cut filter. Lots of noise and hot pixels, should use darks. A work in progress.

**Historic list of invited speakers to RASC Kingston 1963-2021 –**

compiled by Kevin Kell

In general these are "invited" or "keynote" speakers from outside the Centre or of particular note from inside the Centre. Compiled from Annual Reports, Regulus and email archives.

1963

Dr. Peter M. Millman  
Miss Ruth J. Northcott  
Dr. A. V. Douglas (Queen's) demonstrated a series of moving coloured slides of the solar system which were made in England in 1860.

1964

February 27 - P. A. Jolliffe: "Associations of Stars."  
October 27 - R. Flynn Marr: "The 15-inch Telescope at Queen's."  
November 7 - R. C. Roeder, Ph.D.: "Cosmology."

1971

November 16 Kenneth Chilton, discussed planetary observations.

1972

February 15 – Richard Henriksen (Queen's) "Pulsars Present and Future".  
G. H. Chapman (Queen's) Interstellar Space Travel (Pt 1).  
S. Retallack (Queen's) - recent developments in Radio Astronomy.

1973

January 15 Dr. A.H. Bridle (Queen's) on "Some recent observations of Extra-Galactic X-Ray Sources."  
March G. H. Chapman (Queen's) Interstellar Space Travel (Part 2).  
October 30 Geoffrey Wyght - The Algonquin Radio Observatory  
November 13 Dr. W. Y. Chau (Queen's) – Black Holes

1976

Dr. A.H. Bridle (Queen's)

1977

Dr. A.H. Batten (RASC President)  
Dr. John R. Percy (RASC)  
Dr. A.H. Bridle (Queen's)

1978

Jan 24 David Levy (RASC-Kingston) "Great Comet of 1861"  
Feb 07 Leo Enright (RASC Kingston) – The Astrolabe  
Feb 21 Dr. A.V. Douglas (RASC-Kingston) The history of the I.A.U.  
March 7 David Levy (RASC-Kingston) The observation of variable stars  
Oct 5 Peter Jedicke (RASC-London) The colonization of space

1979

February Dr. John Percy (RASC President) - the evolution of stars  
April Dr. A. Vibert Douglas (Queen's) - The work of Sir Arthur Eddington.

1980

February 21<sup>st</sup> Peter Jedicke and Tom Glinos (RASC London) their cable television programme and their trip to Tucson.  
March Angelika Hackett (RASC Kingston) Tucson and the

Kitt Peak Observatory.

May 29th, Dr. A.V. Douglas (Queen's) her expedition to India to observe the February 16th total solar eclipse.

November 13 Arthur Covington (RASC Kingston) Radio Astronomy

December 11th, Andrew Ager - NASA.

1981

February 27 Peter Jedicke and Tom Glinos (RASC London)  
May 8 Leo Enright (RASC Kingston) "Observatories on Kitt Peak"

August 14 David Levy: "Observing and Other Astronomical Work in Tucson".

October 30 Gerald Schievan: "Degenerate Stars".

November 13 Leo Enright: "Astrophotography: A Basic Introduction".

December 11 Angelika Hackett (RASC Kingston): "Sunspot Observing".

1982

January 8 Leo Enright, Observatory Building Project.

January 22 David Stokes, Scandinavian Eclipse of 1954.

February 12 Leo Enright, memorable aurorae.

February 26 Gerald Schievan, stellar formation.

March 12 Leo Enright, Comet Bowell.

April 2 Dr. Vibert Douglas, "Astronomy in the Bible".

April 16 Dr. Ian Halliday, "Canadian Contributions to the Field of Meteor Research".

April 30 Terry Hicks, determining latitude.

May 14 Leo Enright, astrophotographs.

May 28 Peter Jedicke, RASC events.

June 25 Gerald Schievan, recent observing in Arizona.

July 9 Leo Enright and Andrew Skelly, astroslides.

July 23 David Stokes, Arabic Star Names.

August 27 David Levy, "Observing in the shadow of Kitt Peak".

September 10 David Levy, "Astronomical Experiences".

October 15 Leo Enright, "A Tour of Astrophotography".

October 29 Leo Enright, "Useful Math Formulae for Amateur Astronomers".

November 12 Terry Hicks, "Calculating the Position of the Sun".

1983

Leo Enright, Astrophotos, Modes of Astrophotography, Libration of the Moon, Locating Beales Crater.

Gerald Schievan, "The Hidden Universe", Tides and Rainbows.

Martyn McConnell and Leo Enright, General Assembly and travelogue.

Tim Gladwin, Scopes and Observatories made from Scrap Material.

Mark Sorensen, Meteorite Craters of the Canadian Shield.

Hugh Thompson, The Speed of Light.

Klaus R. Brasch, Astronomical sights in southwest USA with a C-10.

David Stokes, Slides on Mont Mégantic and Video Computer Uses.

Jocelyn Boily, Radio Waves from Nebula, Galaxies and Quasars.

Dr. John Coleman, Eddington: Astronomer and Theoretical Physicist.

Peter Jedicke, (London Centre), Infrared Astronomy-IRAS.

David Levy, (Tucson, Arizona), My Comet Hunting Programme.

Angelika Hackett, Astronomical and other Marvels of the West.

1984

Leo Enright, Lunar Astrophotography, Crater Beals; Safe Solar Observing and Demonstration on How to Use the Telescope for New Members; G.A. Report and Travelogue; Observing Sunspots; Amateur Planning to Observe Comet Halley; The 1985 Handbook: A Wealth of Information; Conjunctions of the Last Five Years.

Martyn McConnell, Possibilities of Interstellar Flight, Extraterrestrial Civilizations

Sue Knight Sorensen, Women in Astronomy from 5th Century B.C. to 1872; Report on Canadian Women Astronomers.

Terry Hicks, Principles and Uses of the Sextant as Used in Marine Navigation

Mark Sorensen, The Shape of the Universe

David M. Stokes, Probability of Viewing the Northern Lights During Magnetic Midnight

Franklin Loehde, The Edmonton Space Sciences Centre

Richard Henriksen (Queen's), Theories of the Early Universe

Peter Jedicke, Io

Terence Dickinson, Canada-France-Hawaii Telescope

1985

Murray Anderson, Interplanetary Trajectories and the Rocket Equation; The Rocket Equation -- Part II.

Hein van Asperen, Determination of Sunspot Latitudes; Travelogue of GA. in Edmonton.

Jocelyn Boiley, Space Ships and Travel.

Leo Enright, Slides of Aurora and Zodiacal Light;

Travelogue of G.A. in Edmonton; Stellafane 1985;

Satellites of Saturn; The Recording of Observations; The Observer's Handbook 1986.

Robert Heaton (Queen's) The Neutrino Problem.

Terry D. Hicks, The Astronomical Position-Marine Navigation Part II.

Martyn McConnell, S.E.T.I.

Dr. Chau Wai-Yin, Mysteries of the Universe

Peter Jedicke, The Canadian Participation in the American Planned Space Station.

Rolf Meier, Galaxies and Supernovas.

David Levy, The Discovery of Comet Levy-Rudenko 1984t.

Dr. David Hanes, Globular Clusters and Intergalactic Distance Scale.

Peter Broughton, Historical Aspects of Comet Halley.

1986

MURRAY ANDERSON: Mars

HEIN VAN ASPEREN: Optics; Astronomical Position Line; Travelogue Winnipeg G.A.; New Stepper Motor.

LEO ENRIGHT: Champlain's Astrolabe; New Superfast

Fujichrome Film; Travelogue G.A. 1986; Stellafane 1986; Solar Eclipse Slides; Greenwich Observatory.

TERRY AND RUTH HICKS: New Zealand and Comet Halley.

MARK KAYE: Barnard's Loop Photographs.

LARRY MANUEL: Optical Glass; Building a Refractor.

MARK SORENSEN AND LARRY MANUEL: Stellafane 1986.

DAVID M. STOKES: Gravity of Orbits; A clock for all

Occasions; Computer Program for Moonrise and Moonset. DR. ROY L. Bishop: "SS 433 C A Stellar Spectacle."

PETER CERAVOLO (RASC Edmonton): "Optical Design and Manufacture for Telescopes."

MARGARET COHOE: "The Kingston Observatory in 1855."

ARTHUR E. COVINGTON: "Radio Astronomy - 40th Anniversary."

DOUG GEORGE (RASC Ottawa): "Deep Sky Observing Techniques."

PETER JEDICKE (RASC London): "Fun with Ellipses".

DR. B. R. K. KASHYUP: "Indian Astronomy and Astrology."

MARK LEVISON AND SCOTT MURRAY: "Computer Space Simulator."

1987

February Warren Morrison (RASC Kingston) - the final resolution of Comet Halley

LEO ENRIGHT: Toronto G.A. Travelogue 1987; Stellafane

1987; Syracuse Summer Seminar 1987; Slides of

Sunspots, Moonshots and the Milky Way.

RUTH HICKS: Toronto G.A. 1987 Report.

TERRY D. HICKS: Gregorian Calendar.

DAVID STOKES: Journey into Darkness -- The Eclipse of 1973 off the Coast of Africa.

HEIN VAN ASPEREN: Toronto G.A. and National Representative Report.

DONNA WHITTAKER: Astronomy at Queen's University.

MARY GREY: "History of the Dominion Observatory".  
DAVID LEVY: "My Observing Program".  
WARREN MORRISON: "Observing Variable Stars".  
LUC SIMARD (RASC Quebec) : "Radio Astronomy for Amateurs"  
ROY SUTTON: "Satellite and Digital Planetarium".  
DR. GUNTER WESSEL: "Evolution of Stars".

1988

Effie Ginsburg - NetNorth Communication System  
April Tom Dey (Rochester Astronomical Society), his astrophotographs  
May Dr. Victor Hughes (Queen's) - star formation  
July - Terence Dickinson Moon/Jupiter conjunctions, Moon shots and constellations.  
September Ruth Hicks (RASC Kingston) some Jack Newton's astro slides brought back from the General Assembly  
October John W. Griese III (RASC Kingston) - variable stars  
November Walter MacDonald (RASC Kingston) - the construction of his observatory on the family farm.

1989

Michael Csuzdi - his theory on Repulsion Forces in Planetary Landmasses,  
Terence Dickinson - a recent visit to Australia and showed slides taken from the southern hemisphere.  
March Denise Sabatini (RASC Kingston) a winter trip to the Kennedy Space Centre.  
April Denise Sabatini (RASC Kingston) the ancient cultures of the Mayas with regard to astronomy.  
May Walter MacDonald (RASC Kingston) astronomy program with the N.G.C. & S.A.O. catalogues.  
July, Leo Enright (RASC Kingston) - the Voyager fly-by of Jupiter & Saturn  
August Mike Jefferson (RASC Hamilton) tips on buying a telescope  
October - Joady Ulrich (RASC Windsor) "Astronomy on Canvas",  
Clyde Tombaugh -the discovery of Pluto. November Dr. Lloyd Higgs (RASC President) - Radio Astronomy.  
December John Griese III - two recent visits to Hungary

1990

January Terence Dickinson the Voyager 2 flyby of Neptune.  
Feb Gerald Moriarty-Schieven (RASC-Kingston) - star formation and protoplanets  
March Ian Levstein (RASC-Kingston) - the role of astronomy in science fiction films.  
April Dr. Philippe Baillie - the great men of astronomy from ancient times to 1700.  
June Walter MacDonald (RASC Kingston) 12" Questar  
July Terry Hicks (RASC Kingston) - Where will the sun set?  
September Arthur Covington (RASC-Kingston) radio astronomy  
October John Griese III the July 1989 total solar eclipse  
November David Levy (RASC-Kingston) just discovered, photographically, his seventh comet - Comet Shoemaker-Levy 1990o  
December Terry Hicks (RASC Kingston) - the problems faced by navigators in finding longitude prior to the invention of the Harrison Chronometer"  
Ruth Hicks (RASC Kingston) an overview of Stonehenge

1991

March Alister Ling (RASC Edmonton) - deep sky observing.  
May Dr. Martin Duncan (Queen's) "Chaos in the Solar System"  
September Damien Lemay (RASC President) "Astronomy, Hobby or Science"

1992

John Myrtle (RASC Calgary) astrophotography  
Dr. Kennedy (RASC Saskatoon) "The Great Moon Hoax"

1993

Jack Newton CCD imaging.

Dr. Hamish Leslie (Queen's) - The Sudbury Neutrino Observatory  
Dr. Richard Heinrickson (Queen's)

1994

Dr. Judith Irwin (Queen's) Outflow from Spiral Galaxies  
Rob Dick and Glen Ledrew (RASC Ottawa) Astronomy and Videography  
Dr. Richard Henriksen (Queen's) - The Expansion of Galaxies

1995

Dr. Martin Duncan (Queen's) - Origin of Comets  
Leo Enright (RASC Kingston) - All About Comets and How to Observe Them  
Dr. David Hanes (Queen's) - Globular Clusters  
Paul Boltwood (RASC Ottawa) - The Boltwood Observatory  
Peter Ceravolo, (RASC) Through the Glass Clearly: Getting the Most Out of Your Telescope  
John Gaurvreau (RASC Hamilton) Atmospheric Phenomenon  
Rob Dick (RASC Ottawa) - Skies Over Parinacota: Eclipse Trip November 1994

1996

Judith Irwin (Queen's) -Tracking a bright local fireball

1998

February Doug George (RASC President) - CCD imagery techniques  
April: Christine Marton (SEDS-Canada) - the future of Canadians in Space.  
June: Dr. Martin Duncan (Queen's)  
September Dr. Jill Tarter SETI Institute via teleconference.  
December Joady Ulrich (RASC Windsor) - the Hubble Space Telescope

1999

January Peter Ceravolo - the Trials and Tribulations of filming "Comet Odyssey"  
Richard Henriksen (Queen's)  
Michael Watson (RASC) - Red Shift 2 & 3 compared with Earth Centered Universe

2000

January Judith Irwin (Queen's) - working at the Giant Metre-Wave Radio Telescope Array and a visit to the Ooty Radio Telescope at Ootacamund.  
February Walter MacDonald (RASC Kingston) - amazing CCD images  
March Roger Hill (RASC Hamilton) - building a backyard observatory for very little money and a lot of mooching.  
April Randy Attwood (RASC president) - engineering breakdown of a lunar mission.  
June Ray Berg (RASC Kingston) - observing tour of Australia and New Zealand.  
August Marc Castel (NYAA) - remote/robotic observatory set-up  
Kathy Perrett (Queen's) - refurbishing of the Queen's Observatory  
J.J. Kavellaars (Queen's)- new methods of finding extra-solar planets.  
October Bill Broderick (RASC Kingston) - the murky world of Astrology

2001

February Bob Garrison (RASC) "The Nstars Project"  
April Alan Ward "Moonward Vacuum Coatings"  
May Dr. J. Saikia "Active Galaxies"  
June Terrence Dickinson "Mars 2001 Observations and Expectations"  
July: Richard Schmude (RASC Kingston) "Mars: 10 Years of

## Photometric Observations"

November Dr. Barry Robertson (Queen's) Sudbury Neutrino Observatory

## 2002

February 8: Dr. Tom Dean (RASC Kingston) "Introduction to Predicting Satellite Apparitions using Orbital Elements"

March 15: Rocky Persaud (Mars Society Canada) "Mars on Earth, the Devon Island Research Lab"

April 12: Dr. Brian Hunter (Queen's) "Observing Earth Satellites"

May 13: Dr. David Levy (RASC Kingston) "What the RASC-Kingston Centre Tucson Branch has been up to"

July 12: Fred Barrett (RASC Kingston) "Observatory Building and Other Projects"

August 16: Dr. Larry Widrow (Queen's) Dark Matter Research: M31

Sept 13: Attila Danko (RASC Ottawa) "How to Forecast Observing Conditions - the Sky Clock"

## 2003

February 14: Jan Wisniewski (RASC Kingston) "How to do a Messier Marathon."

April 11: Dan Falk "The Quest for the Theory of Everything." Dan presented a historical overview and latest theories of the unified field theory.

May 7: David Levy (RASC Kingston) "Shakespeare's King Lear and the Comet of 1605: A cosmic union of Science and Art."

June 13: Dr. Rajiv Gupta (RASC) "Astro Imaging Techniques."

July 11: Dr. Richard Jones "Amerigo Vespucci's Measurements of Longitude."

August 8: Geoff Gaherty "Observing under Urban Skies"

September 12: Leo Enright (RASC Kingston) "Transits of Mercury and Venus."

November 14: Gregg Wade (Queen's/RMC) "Magnetic Activity of the Sun and Stars"

November 29: David Turner (RASC Halifax) "Will Polaris stop Pulsing?";

## 2004

Steve Barnes - introduction to webcam astrophotography

Antonina Vassilieva-Durham (RASC Belleville) - her memories of her father working on the Great Tunguska Mystery, June 30, 1908.

John Crossen, (Peterborough Astronomical Association) - the Observatory that went Wonderfully Wrong".

## 2005

January 14: Dr. Sun Kwok (U Calgary)"Cosmic Butterflies"

March 11: Melissa Ruiters (Queen's) "The Globular Cluster Systems of selected Virgo Galaxies: What do they tell us?"

April 8: Peter Jedicke (RASC London) . "Astronomy in Hawaii: Research, Outreach, Observing - and Politics"

May 02: Dr. David Levy (RASC Kingston) "I'm Dreaming Of A Moon Shadow: My Adventures With Eclipses"

July 8: Richard Schmude (RASC Kingston) "Photoelectric photometry of Jupiter"

November 25: Dr. Bryce Bennett (RMC) "Tracking Objects in Space: Orbit Determination from Kepler to CASTOR"

December 9: Paul Mortfield "The Sun and Space Weather " .

## 2006

January 13 Walter MacDonald (RASC Kingston), "A Dome on a Home: The Story of Winchester Observatory"

March 10 Dr. Bryce Bennett, "Copernicus, Kepler, and the Mystery of the Analemma"

April 14 Peter McMahon, "Marshmallows on Venus: A backpacker's guide to wilderness stargazing"

May 12 James Silvester (Queen's) "Solar Astronomy and the Pic du Midi observatory"

June 9 Dr. Douglas Welch (McMaster) , "Revolutions Amateur and Professional Optical Astronomy in the 21st Century"

July 14 Guy Nason, "IOTA: the International Occultation Timing Association"

November 4 Dr. Ross Kilpatrick (Queen's) , "Gustav Klimt and the Stars: A Dionysian Iconography for The Kiss"

December 8 David Kirsh (Queen's) "Extra-Solar Planets: From Formation to Detection"

## 2007

April 13 Dr. Judith Irwin (Queen's) : "Smog and the Galactic Environment: The Discovery of PAHs in Galactic Halos"

May 11 Dr. Terry Bridges (Queen's) "Extrasolar Planets: From Hot Jupiters to Earth-like Systems"

June 8 Mark Coady (PAA): "Reclaiming Our Night Skies: Fighting Light Pollution"

September 14 Laura Gagne (RASC Kingston): "Sex and Violence in the Night Sky"

October 12 Dr. Ross Kilpatrick (Queen's) : "Klimt's Kiss and the Corona Borealis"

November - Dr. Brian Hunter (Queen's) "Hermonceux Castle and Observatory"

## 2008

March 14 Dr. Joseph Buckley(RMC) "RadarSat 2"

May 9 Dr. Kristine Spekkens (RMC) "Shedding Light on Dark

Matter in Nearby Galaxies"

October 10 Paul Mortfield "California Dreaming—Remote Controlled Astrophotography"

November 14 Dan Falk "In Search of Time

## 2009

January 9 Kim Hay (RASC Kingston) & Stephan Courteau (Queen's) "International Year of Astronomy"

February 13 Dr. Gregg Wade (RMC) ""Large Programs at the Canada- France-Hawaii Telescope"

March 13 Frank Roy "The One Metre Initiative: A New Major Observatory in Canada"

April 10 Dr. Wolfgang Rau (Queen's) "The Search for Dark Matter: A New Role for SNO"

May 8 Marcus Leech (RASC Ottawa) "Amateur Radio Astronomy"

December 11 Raymond Francis "A Perspective of Space Programs Beyond North America"

## 2010

February 12 Dr. Daryn Lehoux "The Antikythira Mechanism"

June 11 Randy Attwood (RASC) "The Apollo 11 Landing - and How It Nearly Failed"

September 10 Terence Dickinson "A Personal Quest for the Finest Stargazing Location in the World"

December 10 Dr. Rachel Kuzio de Naray "Revealing the Dark Side of Spiral Galaxies"

## 2011

February 11 Professor Larry Widrow (Queen's) "The Tangled Past of the Andromeda and Triangulum Galaxies"

April 8 Larry Hum (RASC Belleville) "Total Solar Eclipse Trip to China in 2008"

October 22 Brian Hunter (Queen's) "Telescope Seminar"

October 22 50th Anniversary Banquet; Patrice Scattolin (RASC Montreal) "Space Exploration From The Ground Up: With Reality And Fiction"

## 2012

January 14 James Silvester (Queen's/RMC) spoke on: New analysis of stellar magnetic fields, rotational velocities and the distribution of rare elements.

October 15 Dr. Jean-Marc Noel (RMC) spoke on: Northern Lights: everything you've always wanted to know about aurora.

## 2013

January Nathalie Ouellette (Queen's) Nature vs. Nurture—

the Role of the Cluster Environment in Galaxy Growth.  
March Tom Field - RSpec Spectroscopy. videoconference  
June Dr. David Levy (RASC Kingston)

2014

January 9 Brian Hunter (Queen's) the March 20th occultation of Regulus  
February 13 Dr. Bruce Macintosh (Stanford U) spoke about "Pictures of Other Worlds: Directly Imaging Extrasolar Planets."  
March 13 Dr. John Percy (RASC Toronto) gave a talk "Understanding Variable Stars: How the AAVSO and You Can Help."  
October 4 Randall Rosenfeld (RASC Archivist) "What's in the Constellation Crater, How Newton Got 500 Bottles of Champagne and When Halley Drank Brandy and Swore: The Surprising History of Astronomy and Alcohol."

2015

January 8 Brian Hunter (Queen's) 7 demonstration models of barn door trackers  
October 8 Lori Graham (Queen's) - Astrophotography focus,  
September 27th Lunar and Update on Pluto and the Deep Horizons Mission.

2016

January Malcolm Park - astrophotography  
February—Michael Earl (RMC) - Adventures with the VE3RMC Amateur Radio Station.  
May Matt Schultz (Queen's) - The Secret World of Spectropolarimetry  
October—Brain McCullough (RASC Ottawa) - Astronomical Snap Sketches.

2017

March Rob Dick (RASC Ottawa) - Light Pollution and Scotobiology.

2018

January Dr. Jennifer West (RASC Winnipeg) - all things happening in the Radio Astronomy world.

February Dr. Nathalie Oulette (Queen's) CPARC (Arthur B. McDonald Canadian Particle Astrophysics Research Centre) at Queen's University.  
June Nik Arora (Queen's) Colours of the Universe—a discussion on wavelengths of the spectrum.

2019

March 14 Dr Kristine Spekkens (Queen's/RMC) "Galaxies, Cosmology and the SKA."  
May 9 Brian Hunter (Queen's) - a recent trip to the Atacama Desert.  
September 8 David Levy (RASC Kingston) his autobiography "A Night Watchman's Journey—The Road Not Taken"  
October - Michael Adler (Wyoming) "Jupiter Re-Discovered, the Juno Mission to Jupiter."  
November 14 Patrice Scattolin (RASC Montréal) - The Florida Winter Star Party

2020

May 14 Phil Groff (RASC Executive Director) - The State of the RASC. videoconference  
September 9 Paul Gray (RASC Halifax) "Construction of a backyard observatory." videoconference  
November 11 Laurie Graham (Queen's) -How Old is Everything?  
December 9 Jenna Hinds (RASC) - the RASC Robotic Telescope Project. videoconference

2021

March - Dave Lane (RASC Halifax) - Robotic Telescopes. videoconference  
April - Laurie Graham (Queen's) "A Tale of Two Torqued Terrestrial Bodies"  
May - Mark Coady (PAA) "Light Pollution Victories in Peterborough" videoconference  
June - Dr. Doug Johnstone (Herzberg) - Up All Night: Life at the Summit of Maunakea. Videoconference  
September - Murray Paulson (RASC Edmonton) "My Prairie Meteorite Searches - Meteorite hunting in Alberta and Saskatchewan" videoconference

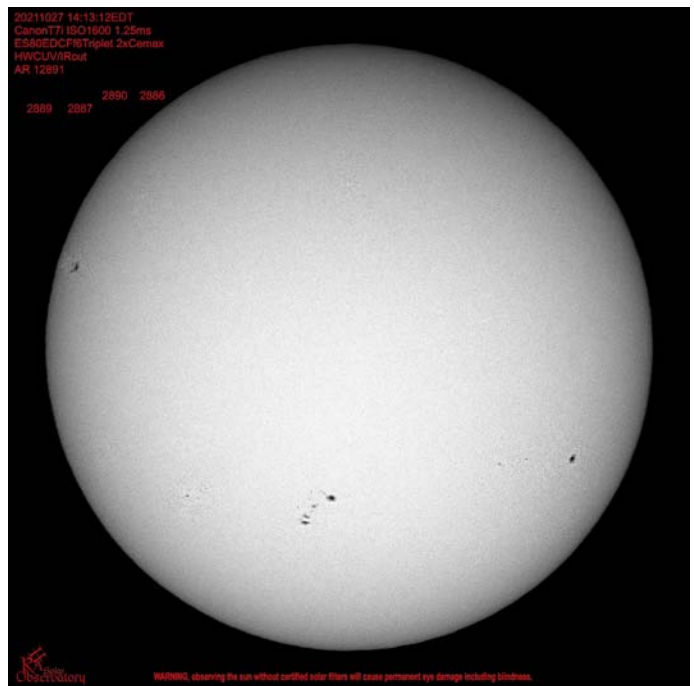
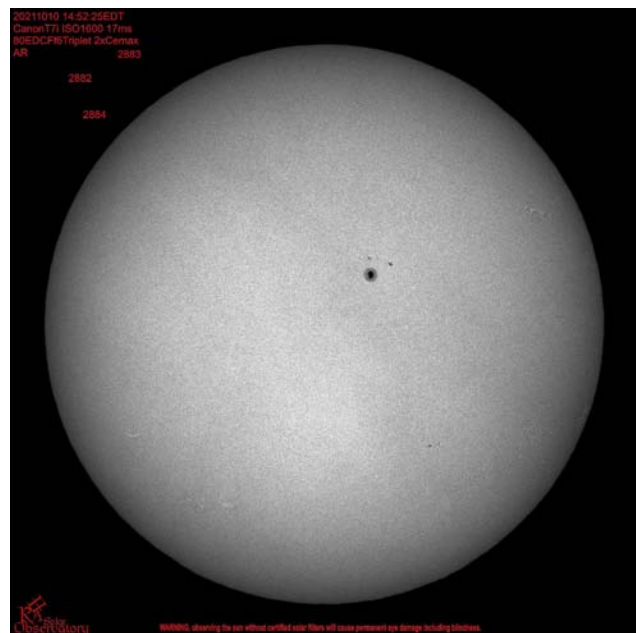


# RASC-KC Solar Cycle 25 Monthly Review

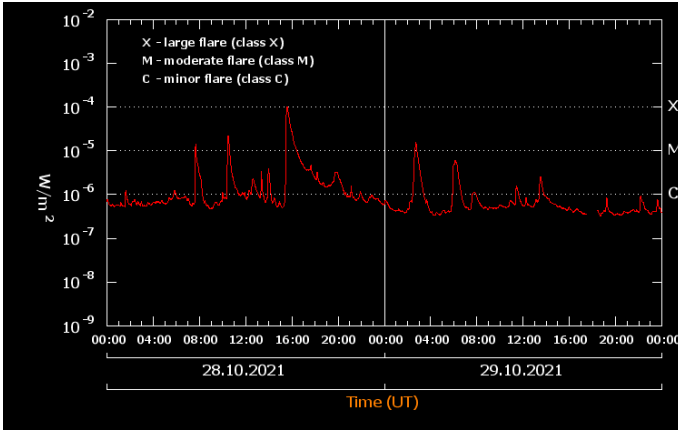
## A review of solar activity and images during the past month by RASC-KC solar observers.

The first two weeks of October saw sparse activity with the exception of an M1.6 flare (AR12882) on the 9th, by mid month of the 7 sun spots groups on the surface 12880 & 82 were the most substantial sized with only 77, 82 and 85 showing any flare activity. This has been another cloudy/hazy month and imaging has been low.

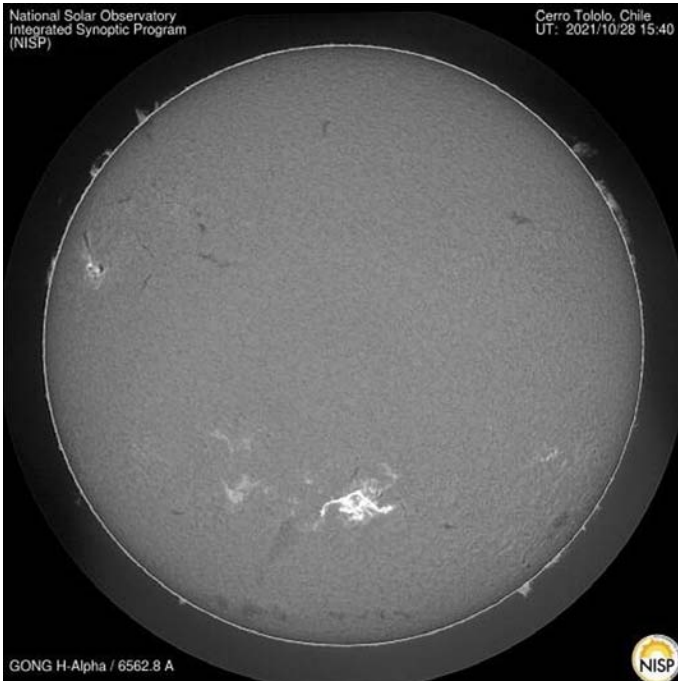
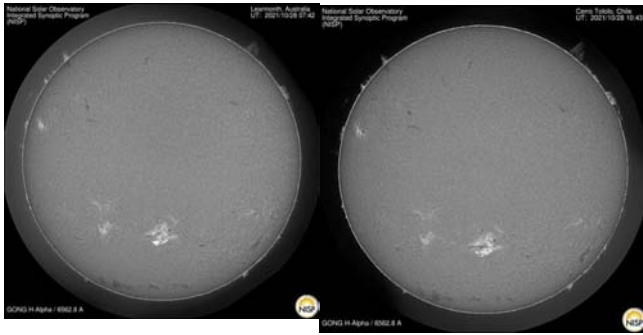
having 5 sunspot groups and an x-ray baseline just below 10-6.



The second half of October became more active toward the end of the month as did cloud cover! I have had only 5 sessions in 13 days with the latest clear day being the 27th with the sun



On October 28/29 in just over 19 hours there were 4 M and 1X flare as shown below on this x-ray graph and also 3 GONG images.



These images catch the eruptions as near maximum UT as GONG imaging displays all coming from AR12887, the fourth not shown here erupted from AR12891.

Tonight October 30 under cloudy sky we are awaiting the auroral storm the 4 CME

launched. Our roving member Malcolm P is sitting patiently somewhere north of the Soo under clear sky with equipment ready for action. So far at 10:45EDT nothing substantial has arrived and did not at all. However at 1:45UT on Nov 1 AR12887 erupted with an apparent M1.5 flare so it is not exhausted yet.

Other Member's images...



After the clouds parted. The remnants of AR2887 CME and X1 flare. Thank you Kim H.

Summing up the activity for October the sun produced " 1 " X class flare, " 6 " M class flares and " 63 " C class flares, a very good month! These flares were mostly produced by the sunspot active regions numbered AR12877 – 12893, with the exceptions of 78 & 79 which dissipated in September. October x-ray output baseline has been running in the 10-6 to range, but dipping to 10-7.5 on the 18/19th. Then suddenly on the 25/26th there were 15 flares above B class in a 28 hour period, 3 of those being M class. The 28/29th followed with four flares in just over 19 hours above the C class level 3 – M and 1 – X which propelled us into that failed aurora forecast for the 30/31st. For this observer this month of cycle 25 closed with my having only " 13 " observing/imaging sessions over 31 days due to what I will label as uncooperative weather.

Historically this following report (courtesy of spaceweather.com) was of particular interest to me and I hop it will be to you. My brother Andy and I witnessed a beautiful wall of red in the sky one night long ago. I did not log back then and have not been able to recall the date or year of this beautiful event. It took 20yrs to find out when it occurred, thank you spaceweather.com . I believe it would have been the first night of this

event, the 21st. Finally closure to a date that has been bothering me for 2 decades.



20 YEARS AGO, A SEVERE GEOMAGNETIC STORM: Paolo Bardelli will never forget Oct. 21, 2001. "The sky over my hometown in Italy exploded with intense red auroras," he recalls. "This happened exactly 20 years ago today."

Above: Red auroras over Tradate, Italy (latitude +45N), on Oct. 21, 2001. Photo credit: Cesare Guaita

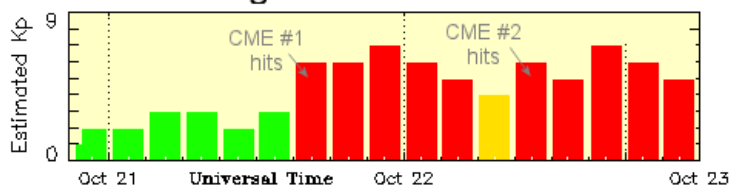
This image (from Spaceweather.com Oct. 2001 aurora gallery) represents almost exactly what we observed that night .

David Zelden, Thornhill, Ontario, Canada  
Oct.21 2001

D. Zelden: "At one point the entire northern horizon was ablaze in an eerie red and green curtain." Photo details: Canon EOS camera with 50mm lens, Konica 800 ASA film. Exposure time: 25 seconds.

A trip down memory lane: In 2001, Solar Cycle 23 was peaking and solar activity was very high. On Oct. 19th of that year, giant sunspot AR9661 erupted twice in quick succession, producing almost identical X1.6-class solar flares. The double blast hurled two CMEs toward Earth. The first CME arrived on Oct. 21st. Its impact jolted Earth's magnetic field and ignited a severe geomagnetic storm (Kp=8). Solar wind speeds in the CME's wake topped 700 km/s, keeping the storm going for more than 15 hours.

### Severe Geomagnetic Storms in October 2001



On Oct. 22nd, the second CME arrived, and it happened all over again! Red auroras were sighted in Germany, France, Italy, Spain, Australia, Japan, and in the United States as far south as the Carolinas. Browse our 20-year old aurora gallery for sightings.

"We are hoping for something similar for Solar Cycle 25, as the sun has recently had a good increase in its activity!" says Bardelli.

## Wednesday September 8, 2021 RASC Kingston Centre Meeting Minutes

Started at 7:00 pm,  
noted that we were live on YouTube & ZOOM  
Kingston Centre is celebrating its 60<sup>th</sup> Anniversary  
Reminder that Fall N Stars on Sept 10-12<sup>th</sup> at  
South Bay

David Levy started the meeting off with the note  
of the passing of Carolyn Shoemaker and a brief  
story. He said Solar Observing today had 56  
spots over 5 groups. The Poem intro was William  
Morris's Summer Dawn- in honour of their  
granddaughter Summer. David also stated in an  
email later this is the same William Morris of the  
Morris chair.

Next we turned to Murray Paulson our guest  
speaker. Kim Hay introduced Murray: His  
introduction:

Murray felt the starry sky's calling when I was 9  
years old and these many years later he finds it  
still fascinates him. Whether viewing the planets,  
a distant nebula, or a colourful double, the sky  
brings me home. In the 90s I discovered  
Meteorites and Eclipses, both of which he fell in  
love with. Neither of these activities is helping the  
Rasps along, but he didn't want to retire anyway.  
And then in 2008 the Buzzard Coulee meteorite  
changed everything and I became a meteorite  
hunter, and better yet, a Meteorite finder! Many  
chases and hunts later it still excites me to find  
that next meteorite.

Murray Paulson also writes the Planets section of  
the RASC's Observers Handbook and the  
occasional article on observing Mars.

Murray gave his talk "My Prairie Meteorite  
Searches – Meteorite hunting in Alberta and  
Saskatchewan" Buzzard Coulee – Alan  
Hildebrandt announced November 27, 2008 on  
the 1<sup>st</sup> finding of the Buzzard Coulee. Three  
people owned the land on which it fell, Lamb, Alex  
Mitchel and Ian Mitchel. Five people drove out to  
search the surface of Battle river. They all had a  
Meteor stick with a magnet (magnets purchased  
from Lee Valley- they have holes in the centre to  
screw into the pole). Also used a clawed hammer  
to dig out the meteorite, and a GPS locator. Brian  
Moore found 36 gm and 123 gms meteorite. Two  
people from Western Ontario Wayne Edwards &

Phil McCausland, and Ellen Millie U of C that found  
the first meteorite. Warren Wiley found an 8 kg  
meteorite stone. Was found half embedded in the  
ground. Last trip Dec 5, 2008. A guy on the oil  
field found a large piece and was selling it for  
\$4000. Selling price of \$35/gm a bit steep. A  
deal was struck with the land owners of 50/50  
split of any finds. Spring 2009 from April 1-May  
30 go up every weekend with friends for hunts.  
Son Conner found 30 and wife Joanne found 37  
stones. ( 90 gms best one found) . Other son's  
Sean & Daniel found about 10 each. There was  
over 70 different people at the end of May that  
could keep half the stones. The Dr. Alan  
Hildebrandt group could not keep any stones.  
Murray give Dr. Hildebrant all of his data, in which  
he found over 400 stones, it was announced the  
next day that the Buzzard Coulee surpassed  
recover at the Bruderheim Alberta site ( A.  
Hildebrant's location)- no mention of Murray's  
team. Biggest fall in Canada. Stones that were  
broken apart and found 1.14 kms apart shows  
that the hydrodynamic force on these fragments  
rips them apart. Shows the direction of travel of  
the meteorite. Showed maps of the area, and  
finds on Lamb' land. 18.7 kgs of 745 stones from  
in 2008 to 2009. 1726 hrs of hunting, Ordinary  
chondrite (H4) total weight of >41 kgs. Meteorite  
broke up about 30 kms in the atmosphere, based  
on the strewn field of the stones. Some SE wind  
moved stones over to Lamb's land. See statistics  
of the Buzzard Coulee at

<https://www.youtube.com/watch?v=HBbAkkjX1Ko&t=5586s>.

Spring 2010 went back with friends. Metal  
detectors was key.

In the summer of 2009 call from Dr. Chris Herd  
( Geology Dept of U of A) if he would like to  
explore Whitecourt strewn field?

History- 3 years ago Rod Stevens showed the  
bowl shaped depression to his brother James.  
This crater is in the woods. Rod Stevens passed in  
2008. The Whitecourt Meteorite is Iron Medium  
Octahedrite Type IIIAB 92% Fe/8% Ni + traces,  
mostly shrapnel, crater is dated about 1000 yrs  
AD. Specimens buried 5-25 cm in soil. Some  
have been found wotj, asses pf 0.5 gm to 31 kgs.  
Protected area under Alberta Historical Resources  
Act. Great pictures of showing the difference of  
Meteor Crater in Arizona to Whitecourt crater.  
Murray got to participate in an episode of

Meteorite Men, sent them to a different area because they were looking in the area for the Mayerthorpe Meteorite, which is Iron and AIB complex. First found in 1946 then lost. Rights to search property was obtained and searched for in 2011. Surveyed the fields with a flat trailer metal coil detector in behind a quad. Looked for 5 days dawn to dusk. Last day found one stone. Lots of farm scrap metal.

In fall 2018 there was a three province Whitecourt expedition. Used metal detectors. Everyone found a stone after three days. Stan Runge used a geologists pick with magnets. From a map of 2012 it shows about 2500 data points and about 120 kg found. Some small specimens 0.2- 2 gms. More statistics in the YouTube video.

Fall 2019 back to Buzzard Coulee. Grass everywhere, need a good metal detector. Conner found an 86 gm stone, Joanne 36.3 gms , then Ralph Croning found an 88 gm stone. See map in YouTube Video for finds and statistics. Murray thanked all his friends and helpers . Questions, and a few more slides.

Equipment- Metal Detectors – read up on what they are good for. Radio Shack not good, not recommended. Fisher Gold Bug II (\$850) finds Chondrites this is a dinosaur, but it works great. The Garrett Gold (\$700-900) has a higher frequency, and can detect the Buzzard Coulee stones. The Garrett 2500 (\$1100) best one for iron meteorites, cancels out ferrous rocks and chips. But cannot see the Buzzard Coulee meteorites. This one weighs 5 lbs.

- Day pack for meteorite hunting- GPS, Zip lock baggies, marker pen, gloves, Meteorite stick, shovel, bug spray, sun burn lotion, snacks/water, first aid, weigh scale.

Questions- Kim Hay asked if Murray had been down to SW Ontario for any hunts- No but would like too.

Kevin Kell- What do you need in a kit? Question was answered and is listed in the minutes. How do you store your meteorites? Since they all have iron , they will rust. Use silica gel to keep moisture out . Display Cabinet to show the meteorites.

Bruce Elliott- What portion of other rocks are picked up. Iron Oxide stones are picked up but these are not conductive . Kevin showed an image from the Lee Valley catalogue on the cupped magnet sets, as Murray was explaining.

Peter Hutchinson- Metal Detector Bounty Hunter- Murray stated to do the research and look for type of detector you need for what your looking for. Trial your detector with the meteorites to pick out the tone.

Stan Runge- When will you be going back out hunting? Buzzard Coulee Sept 2022, Whitecourt October 2021. Waiting for the first frost to kill the grass. Murray and Stan will connect off line for a type of meteorite that was found.

Hank Bartlett- Hank Sunspot- Reporting on solar Activity since last report. June-August 1 X class, 4 M class, 77 C class flares. AR12827-AR12862. Since Sept 1<sup>st</sup> 8 C class flares by AR12860,64,66,68. Showed images in H-alpha. Great montage of prominence on the NE on Aug. 14, 2021 that became a filament on Sun through the Aug.21, 2021. Surface features on the sun, all in Ha. WL images shows the phage, and Sunspots and groups. Solar Activity picture of the Day, August 15, 2021.

Rick Wagner gave us What's in the Sky for September. Also showed the daytime/nighttime split. Zodiacal light eastern sky (Sept 1-15) Gegenschein near Midnight . As well as Oct 5-20<sup>th</sup>. These are also in the September Regulus and on the website <https://kingston.rasc.ca/>

Comets (C/2017 K2 Pan STARRS, 15P/Finlay, Hartley, Comet 4P/Faye, Comet 29P/Schwassmann-Wachmann- outbursts, C/2019 L3 Atlas , 67P/Churyumov-

Gerasimenko .Asteroids- Pallas, Harmonia at opposition. Asteroid Occultations 1039 Sonneberga , 762 Pulchova#1, 365 Corduba.

Kevin Kell- Centre Meteorites- Showed the clip of Meteorite Men for the Whitecourt area. Centre has 6 meteorites, used for outreach. Showed the meteorites with the info on them. 1) NWA 869, 2) Gibeon, Nabibia, Iron Meteorite, 3) Northwest Africa 99# Martian Meteorite, 4) Compo Del Ciela, Chaco, Argentina. 5) Whitecourt plus certificate, 6) Ikhote-Alin Russia.

Floor was opened up to members and Youtube guests for questions. Next Meeting October 13<sup>th</sup>, 7:00 pm. Weekly Social on Wednesday nights at 7:00 pm.

Youtube meeting stopped at 1:48 pm. More discussion on the ZOOM channel with the meeting shutdown after 9:00 pm.

Kim Hay -President (wearing the Secretary hat)

## Notes from National – John Hurley

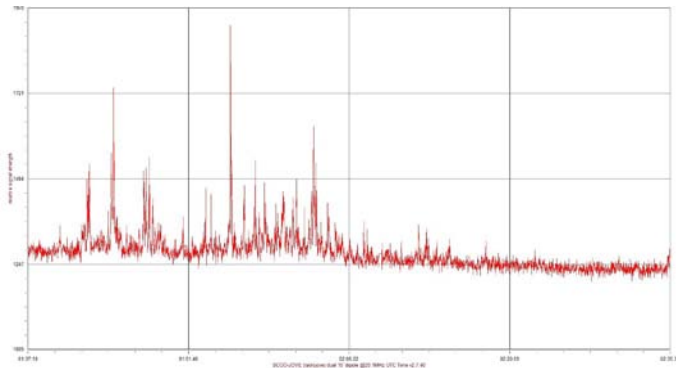
The next National Council Meeting is Dec. 05, 2021 at 1400 ET



### SCGO Radiojove detection of Jupiter-Io-A Event – Kevin Kell

We attended a virtual zoom Radio JOVE Help Session on Wednesday, Sep 29 at 9:00 pm EDT. "The reason for the odd time is that there is a predicted Io-A Jupiter radio emission event beginning at this time, and we will have live-streamed data to show. We hope to detect some Jupiter radio emissions during our call and discuss the sights and sounds of these emissions. This is a great opportunity to compare your radio observatory data with other observers. "

Our dual dipole Radiojove system picked up this event and we shared it with the other callers. We would not have known it just by looking at it.



20210929-2200-skypipepic eastern time 30 minute graph



### Jupiter, Saturn and the Milky Way over Desert Lake – by Bruce Elliott

September 1, 2021

10 mm Rokinon lens - Canon 60D, ISO 3200, f2.8, 8s.

Location: Desert Lake, western horizon at 9:30pm

Sagittarius and Scorpius are visible on either side of the Milky Way.

A lovely late summer Moon-less evening!



### Steve Craig's Galaxy of the Day for October

Day 187 NGC4064 is a barred spiral galaxy about 42 million light years away in Coma Berenices. It was discovered on April 29 1864 by Heicrich d'Arrest.

Day 188 NGC4088 (right) and NGC4085 (left) are a pair of interacting galaxies in Ursa Major. NGC4088 is catalogued as #18 in the Arp Atlas of Peculiar Galaxies,

noted as having a disconnected segment in a spiral arm. They were discovered on March 9, 1788 by William Herschel.

Day 189 NGC4096 is a barred spiral galaxy about 2 million light years away in Ursa Major. It was discovered on March 9, 1788 by William Herschel.

Day 190 NGC4100 is a spiral galaxy about 67 million light years away in Ursa Major. It was discovered on March 9, 1788 by William Herschel.

Day 191 NGC4102 is a spiral galaxy about 68 million light years away in Ursa Major. It was discovered on April 12, 1789 by William Herschel.

Day 192 NGC4111 is a lenticular galaxy about 50 million light years away in Canes Venatici. It was discovered on January 14, 1788 by William Herschel.

Day 193 NGC4127 is a spiral galaxy about 83 million light years away in Camelopardalis. It was discovered on December 12, 1797 by William Herschel.

Day 194 NGC4136 is a nice spiral galaxy about 28 million light years away in Coma Berenices. It was discovered on March 13, 1785 by William Herschel.

Day 195 NGC4144 is an edge on barred spiral galaxy about 35 million light years away in Ursa Major. It was discovered on April 10, 1788 by William Herschel.

Day 196 NGC4151 (upper) is a spiral galaxy about 62 million light years away in Canes Venatici. NGC4156 (lower) is a barred spiral galaxy about 308 million light years away. They were discovered on March 17, 1787 by William Herschel.

Day 197 NGC4157 is a nearly edge on spiral galaxy about 35 million light years away in Ursa Major. It was discovered on March 9, 1788 by William Herschel.

Day 198 NGC4173 (left) is a spiral galaxy about 51 million light years away in Coma Berenices. NGC4174 (right) is a lenticular galaxy about 190 million light years away. NGC4175 (bottom) is a spiral galaxy about 183 million light years away. NGC4169 (top) is a lenticular galaxy about 172 million light years away. Together they form Hickson Compact Group #90. They were discovered on April 11, 1785 by William Herschel.

Day 199 NGC4183 is an edge on spiral galaxy about 55 million light years away in Canes Venatici. It was discovered on January 14, 1788 by William Herschel.

Day 200 NGC4204 is a barred spiral galaxy about 40 million light years away in Coma Berenices. It was discovered on April 27, 1785 by William Herschel.

Day 201 NGC4208 is a flocculent spiral galaxy about 53 million light years away in Coma Berenices. It was discovered on April 8, 1784 by William Herschel.

Day 202 NGC4214 is a dwarf barred irregular galaxy about 10 million light years away in Canes Venatici. It was discovered on April 28, 1785 by William Herschel.

Day 203 NGC4216 (upper) is a spiral galaxy about 55 million light years away in Virgo. It was discovered on April 17, 1784 by William Herschel. NGC4222 (lower) is a spiral galaxy about 60 million light years away just over the line in Coma Berenices. It was discovered on April 8, 1784 by William Herschel.

Day 204 NGC4217 (middle) is a spiral galaxy about 60 million light years away in Canes Venatici. It was discovered on April 10, 1788 by William Herschel. NGC4226 (bottom) is a spiral galaxy about 333 million light years away. It was discovered on March 19, 1828 by John Herschel.

Day 205 NGC4236 is a barred spiral galaxy about 12 million light years away in Draco. It is part of the M81 group of galaxies. It was discovered on April 6, 1793 by William Herschel.

Day 206 NGC4242 is a spiral galaxy about 18 million light years away in Canes Venatici. It was discovered on April 10, 1788 by William Herschel.

Day 207 NGC4244 is a superb edge on spiral galaxy about 14 million light years away in Canes Venatici. It is part of the M94 group of galaxies. It was discovered on March 17, 1787 by William Herschel.

Day 208 NGC4274 is a barred spiral galaxy about 45 million light years away in Coma Berenices. It was discovered on March 13, 1785 by William Herschel.

Day 209 NGC4290 is a barred spiral galaxy about 138 million light years away in Ursa Major. It was discovered on April 17, 1789 by William Herschel.

Day 210 NGC4298 (upper) is a flocculent spiral galaxy about 53 million light years away in Coma Berenices. NGC4302 (lower) is an edge on spiral galaxy about 55 million light years away. They were discovered on April 8, 1784 by William Herschel.

Day 211 NGC4314 is a barred spiral galaxy about 53 million light years away in Coma Berenices. It was discovered on March 13, 1785 by William Herschel.

Day 212 NGC4319 (lower) is a barred spiral galaxy about 77 million light years away in Draco. NGC4291 (upper) is an elliptical galaxy about 85 million light years away. They were discovered on December 10, 1797 by William Herschel.

Day 213 NGC4340 (lower) is a barred spiral galaxy about 55 million light years away in Coma Berenices. NGC4350 (upper) is a lenticular galaxy also about 55 million light years away. They were discovered on March 21, 1794 by William Herschel.

Day 214 NGC4357 is a spiral galaxy about 188 million light years away in Canes Venatici. It was discovered on February 9, 1788 by William Herschel.

# Stephen Craig's Galaxy Image of the Day



NGC4064



NGC4088



NGC4096



NGC4100



NGC4102



NGC4111



NGC4127



NGC4136



NGC4144



NGC4151



NGC4157



NGC4173



NGC4183



NGC4204



NGC4208



NGC4214



NGC4216



NGC4217



NGC4236



NGC4242



NGC4244



NGC4274



NGC4290



NGC4298



NGC4314



NGC4319



NGC4340



NGC4357