

Nova Notes

The Newsletter of the Halifax Centre of the Royal Astronomical Society of Canada



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Front Page Photo: Paul Gray
The Virgo cluster of Galaxies.

Details on page 3



From the editor

Quinn Smith

Welcome to the RASC Halifax Centre newsletter, or as we now call the Centre, the Halifax Cloud (non) Appreciation Society. It has been quite the spring in terms of cloud cover. Whatever happened to 1 night in 3 being clear? All I can assume is that all the clear nights are being saved for August and our Nova East Star Party Aug 26 - 28 (see page 3). Having said that, the Canadian Hurricane Center has predicted a greater number of storms heading our way this year and as I prepare to head to Europe there is another Icelandic volcano erupting (I hope this is not history repeating itself)

I am very glad to include a product review in this newsletter (Celestron CGE mount - page 10). Many of our members acquire new pieces of astronomical equipment through the year and I assure you we would all like to hear how well (or not) that piece of equipment worked out. So I encourage all of you out there to submit a review of your experiences. I have several regular contributors to Nova Notes and would love to include a few more names. And don't forget there is always the possibility of receiving the Burke-Gaffney Award for contributions to Nova Notes (<http://halifax.rasc.ca/documents/bgaward.txt>).

I have done little very observing myself this year and so it was by personal choice that I included Paul Gray's photo of the Virgo Cluster on the front page. While I was completing my Messier list a few years ago, these galaxies were my greatest challenge. Finally, after many attempts, I was able to identify them. It feels good to see them again in all their splendor. Thanks Paul!

St Croix Observatory

Part of your membership in the Halifax RASC includes access to our observatory, located in the community of St. Croix, NS. The site has grown over the last few years to include a roll-off roof observatory with electrical outlets, a warm-room and washroom facilities.

Enjoy dark pristine skies far away from city lights, and the company of like minded observers searching out those faint “fuzzies” in the night. Observing nights (Fridays close to the New Moon) are open to members and guests.

If you are not a key holder and would like to become one, or need more information please contact the Observing Chairman, John Liddard (see below).

Upcoming Observing Nights: 2011

July	1st and 29th
August	Nova East 26th—29th
September	2nd and 30th
October	28th

Meetings begin at 8 p.m. at Saint Mary's University in the Atrium, Room AT 101. Please note that there are no meetings in July and August.

June 17th 2011 - Room AT 101
“Who Wants to be a Gazer?” - An astronomical quiz hosted by Ian Anderson (yes there are prizes!)

September 16th 2011 - Room AT 101
A regular meeting - "An Astronomical Tour of New Zealand" by Dave XVII Chapman

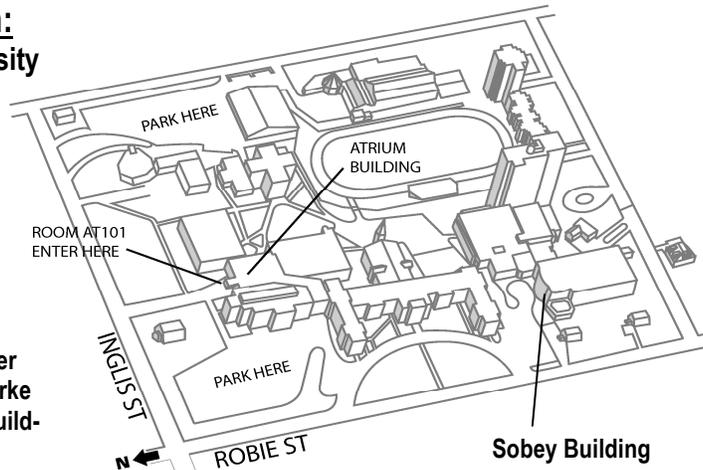
October 21st 2011 - Room AT 101
Speakers night with a very special guest speaker (we hope) Watch this space for more details.

[The content of all meetings is subject to change]

Meeting Location: Saint Mary's University

Atrium Building Room AT 101

The Atrium is located in front of the Patrick Power Library, between the Burke Building and Science Building.



Meetings are usually held on the third Friday of the month, except for the months of July and August, when there are no meetings.

The Nova program (an introductory course in astronomy) starts one hour before the main meeting. Room number will be posted.

Executive meetings begin at 7:00 p.m., in room AT 306, and all members are welcome to attend.

Halifax RASC Executive, 2011:

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Nova East Update

August 26th - 28th 2011

It's that time again: your Nova East Committee has been hard at work planning for this year's hurricane! The very loose theme this year is: "Canadian contributions to space science and research".

The agenda is now up on the Nova East web site as well as the registration form. Register early to ensure your t-shirt and reserve one of the choice camping spots. **DEADLINE FOR T-SHIRTS IS JUNE 30th**

<http://halifax.rasc.ca/ne/>

We also are planning quite a few workshops focusing on several aspects of amateur astronomy, ranging from building solar filters to telescope collimation.

This year we open the event with a talk from Dr. James Drummond, of Dalhousie University, about the Canadian contributions to an upcoming ESA-NASA Mars orbiter, scheduled to launch in 2016.

Other speakers are our own Quinn Smith (How High is the Sky?), Paul Heath (Extra-solar Planets) and last, but certainly not least, Dr. Roy Bishop on the physics of the rainbow.

Workshops will be held on telescope collimation (Tony McGrath), solar observing (Karl Penny), lunar observing (our resident lunatic Dave Chapman), the making of a solar filters (Quinn Smith) and image processing (Blair MacDonald). A nature walk, tidal bore tour, night sky tour and a tour of the St. Croix Observatory rounds out the event.

The dates for this year's event are August 26th to August 28th (unless interrupted by a passing hurricane) and as usual we have some great door prizes.

***Come to Nova East
you'll be blown away!***

Front Page Photo

Paul Gray

Date: April 9, 2011

Here is another image from the past week. This image of the heart of the Virgo Cluster of galaxies was exposed during one evening. The one-hour exposure is a total of twenty 3-minute sub-frames. I had issues with tracking so I limited sub-frames to 3minutes.

Also it was my first time shooting an object in my southeast sky towards the light pollution. These two factors meant I have more noise and a less

black sky than I am used to, so I had more trouble getting the balanced image that I like. This will have to do for now.

Images were taken with the HEQ5 mount, Tele Vue Genesis telescope, Canon XSi and Qwik Guider, and then stacked in DSS, stretched in IRIS, levels and curves adjusted in Photoshop, and cropped in Photoshop.

In this image I counted 23 galaxies. The large galaxy in the lower left is M87. In the upper right is M84/M86, below them is the edge-on NGC 4388 with small NGC 4387 in the middle of a triangle formed by the previous 3.

To the left of NGC 4388 is NGC 4403, then another small edge-on NGC 4425. Above M86 is edge-on NGC 4402. Moving left we have NGC 4438 and 4435 (The Eyes!). Turn your head 90 degrees or rotate the image and look at them, are they looking back at you?

The eyes are the start of Markarian's Chain that leads left and up off the image with galaxies, NGC4461 and 4458 as a pair, NGC 4473, and then larger NGC 4477 with a smaller NGC 4479 at the lower left of the latter.

Enjoy the hunt. Galaxy season is here!

The logo for the Halifax Centre, featuring the word "HALIFAX" in a large, serif font above the word "CENTRE" in a smaller, sans-serif font, both centered within a white rectangular box.

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Nova Notes is published 5 times a year, in February, April, June/July, October and December.

The deadline for the next edition is September 20th 2011

The opinions expressed herein are not necessarily those of the Halifax Centre.

Articles on any aspect of Astronomy and Allied Sciences will be considered for publication.

Astronomy Outreach in Cuba: Trip 2

Dave Chapman

Last year, my wife and I delivered 12 Galileoscopes to Cuba and took part in workshops with young people at the National Museum of Natural History in Havana, hosted by my new friend Alejandro Jiminez (Nova Notes, July, 2010). This year we returned to continue the collaboration, taking more astronomy materials generously donated by fellow Halifax RASCals. In most demand were tripods for the Galileoscopes, star atlases and charts, and astronomy books. I also delivered a donated laptop PC, which was not requested, but which will be a tremendous asset for the amateur astronomers of Cuba. These gifts were received gratefully, followed by serious discussions on how the Cuban amateurs must organize themselves and build their network.

We visited the observatory at the University of Havana, where Monica de la Guardia Duran (a science outreach



Alejandro, Monica, and Dave

officer) is leading a refurbishment project. The observatory is in a sad state of repair, but there are some wonderful vintage instruments there, including a 150mm Perkin-Elmer refractor.



Las Terrazas, a potential Dark Sky Preserve

One day, we visited a potential dark sky site, Las Terrazas, about 90 minutes drive from Havana. It was not possible for our group to go at night, but we were able to see the layout and assess the lighting situation. The site already contains a camp for the Pioneers (a Cuban youth organization) and is a UNESCO Biosphere Reserve. Alejandro now has a Sky Quality Meter to document the sky glow at that site and other locations.

On this trip, we also hiked up a 400m hill in sweltering heat, enjoyed some Cuban bird life, and discussed the ins and outs of the Cuban revolution while we sat under a monument to Che Guevara, gazing at the Caribbean Sea on the one side and the Gulf of Mexico on the other.

Back at the Museum, Alejandro and I

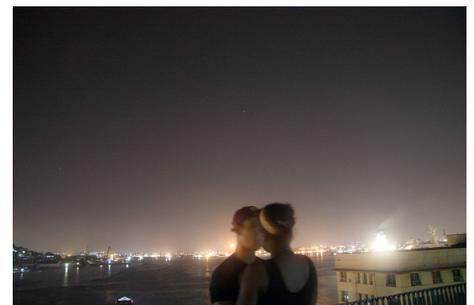


Alejandro and Dave discuss the Revolution

jointly presented "Responsible Night-time Lighting for Protected Areas" There was a varied audience of 30 persons, including Oscar Alvarez, Museum staff, some Cuban amateur astronomers, some Pioneers, and representatives from CNAP (essentially Cuba's equivalent to Parks Canada). This presentation was received very well and there was a vigorous discussion afterwards, not all of which I followed!

Also at the Museum, on a Sunday morning (!) Alejandro and I presented "Explore the Universe-Cuba" to the crowd of 40, including amateur astronomers and Pioneers. There was considerable interest in the EU Observing Program with lots of detailed questions. I made a "motivational" speech about the value of astronomy and the benefits of following a structured observing program. We showed the EU pins, the certificate template, and the observing logs. We were presented with a beautiful photographic book on the Cuban landscape (now in the Halifax Centre library, inscribed).

That night, we participated in a public observing session on the roof of the Museum. It is very social, and I helped



Light pollution, Havana style!



University of Havana Observatory



150mm Perkin-Elmer refractor

with the Galileoscopes. I also demonstrated the SQM in the light-polluted skies (18.4, worse than Halifax!), demonstrated my MusicBox EQ mount to the astrophotographers, and took sky glow photos.

The events on this trip extended and deepened the collaboration with Cu-

ban amateurs, and broadened the involvement of the Halifax Centre. (Thanks to John Jarvo, John Liddard, Alex Lecreux, Roy Bishop, Dave Lane, Mike Boschat, Chris Young, and Wes Howie for their donations!) The manner in which we were welcomed back by the Cuban amateurs was heartwarming, and I feel that an

unbreakable bond has been formed with these proud and courageous people. Astronomy without borders! The experience has motivated my wife, Chris Hanham, to look into forming a charitable organization to extend the work even further. Stay tuned for developments!

Astro Photos

Mat Nightingale: M81

March 30th 2011



The sky was beautiful last night. I took a little longer than usual to get my drift alignment and it proved a success as I was happy with 120 seconds unguided images compared to 60 seconds previously. I set the camera taking images for an hour at a time and finally packed up around 2:30 A.M. Thankfully, as I was imaging from my deck the time from packing up to getting to bed was about 10 minutes.

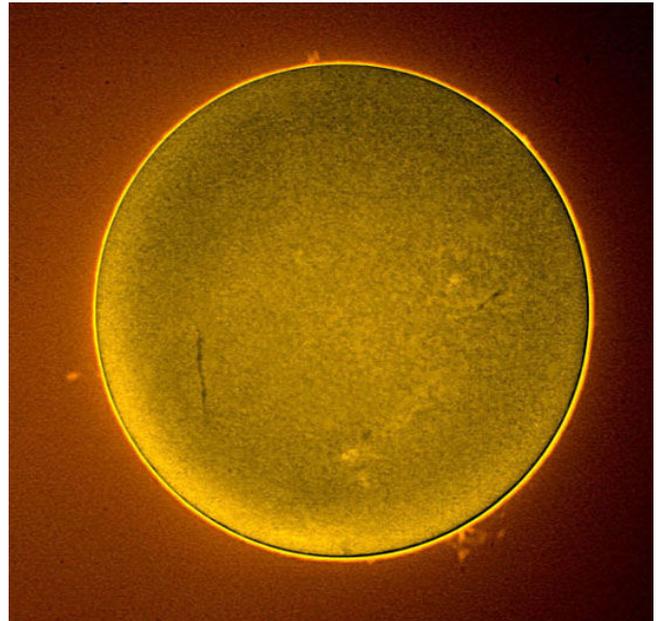
I decided to concentrate on two favourite galaxies of mine (M81 & M82). I took a total of 39 120-second exposures, and combined them with 22 60-second exposures from a previous night. This gave a total exposure of just over 100 minutes to produce the above image.

As I'd never been able to get 120-second exposures before, I only had 10 dark frames to work with, I'm hoping to shoot more this evening and maybe I can improve the image further.

The images were stacked in Deep Sky Stacker, and I adjusted the levels and the luminance settings. That was about as far as processing went. I just used Photoshop to resize it. I may have been able to push the processing a bit but I couldn't get anything to look good.

Michael Boschat: Sol

April 12th 2011



Observation made at 1400 UT

Two nice long sunspot groups, a new spot on the east limb and a fainter group near the central meridian. In the C8 at 80x I counted 41 spots and 4 groups for R= 81.

H α not bad, a couple of nice prominences and a big long filament!

Clear skies

Answers to questions from May meeting:

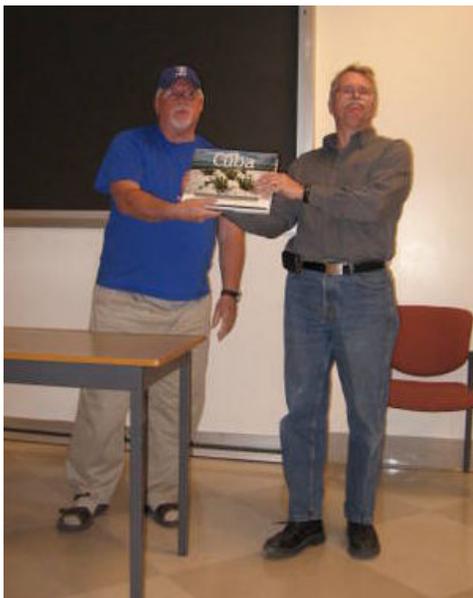
1. Neptune
2. 12
3. Trojans
4. Subrahmanyan Chandrasekhar
5. Kathryn Aurora Gray

April Meeting Report

Chris Young

We chaired the meeting and welcomed the 51 members and guests who were in attendance. We invited members to volunteer for the upcoming Saltscapes Show on April 29, 30 and May 1st. Jim Dorey read a thank you note for the Halifax Centre's donation of a Galileoscope as a prize to the Science Fair.

Dave Chapman, wearing his Havana baseball cap, expressed thanks from the Cuban amateur astronomers for the support our Centre and National had provided to them. Dave presented a gift from the Cuban amateurs to our library, a large format book of the Natural History of Cuba. Dave reported a gratifying and successful trip which included a presentation to the Cuban equivalent of Parks Canada on light pollution and a donation of a Sky Quality Meter to support their efforts. Dave also presented some Cuban newspapers to Mike Boschat who has had a long interest in the communist viewpoint!



Dave Chapman presenting librarian Robert Bussieres a gift from Cuban astronomers (see inset right)

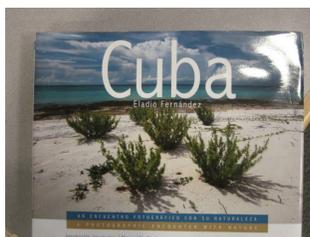
Blair announced that Nova East, August 26 to 28, is now taking reservations - see the RASC Halifax website for information!

The speaker for the evening was Taro Sato who is doing post doctoral astrophysical research at SMU. The topic for the evening was "Gone With the Wind: What Scarlett O'Hara has been Hiding about Galaxies".

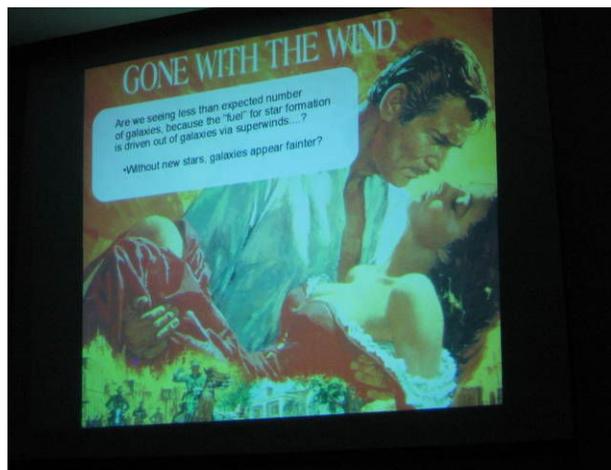
Taro provided an overview of the research process describing the tools, types of data, methods and models that research scientists use. Studying phenomena at vast distances is difficult and one cannot do controlled experiments. Computer simulations are used and a YouTube video of galaxy formation and evolution was presented.

What you observe is also not all that is out there as the mass of the galaxies is dominated by dark matter. Taro presented a predicted galaxy mass distribution function, a straight line function with a curved line beneath it indicating the "observed" mass which is a lesser amount than expected.

Why is there less observed mass? Two possible activities were suggested as explanations - superwinds of dust and gas expanding out from exploding stars (with the expanding nebulae of Messier objects as an example) and secondly the jets of material ejected along the poles the accretion disk of a super massive black hole. Both of these violent activities may provide the



*Above: Taro Sato talking to Paul Heath
Below: The opening slide of Taro's talk*



escape velocity necessary for material to escape the gravitational pull of individual galaxies and spread stellar material into the universe for star formation elsewhere.

Taro had the candour to point out that these explanations are theories which may or may not be real case. It is an exciting time for astrophysical research and the audience was pleased to be taken on a guided tour of the research process.

After Taro's talk Mike Boschat gave "What's Up" advised of the upcoming meteor showers, planet gathering and provided star maps for April and May.

The meeting drew to a close about 10 p.m. with refreshments and discussion, another enjoyable evening!

May Meeting Report

Quinn Smith

The meeting was opened by our President, Richard Vanderberg. Richard greeted the 34 members who were in attendance and introduced the Executive. He then welcomed the two guests who were also at the meeting and briefly outlined the benefits of RASC membership.

There was little Centre business to conduct, other than Quinn Smith who reminded the members about Nova East, and that the deadline for T-shirts was June 30th (see page 3).

Pat D'Entremont had some spare Astronomy calendars to give away and these were presented to those who could correctly answer the following questions:

1. Next solar planet larger than Earth?
2. How many people have walked on the Moon?
3. What are the asteroids called that share Jupiter's orbit?
4. What is Cassandra short for?
5. Who is the youngest person to have discovered a supernova?

(Answers at the bottom of page 5)

Richard then introduced our speaker for the evening, Paul Heath. Paul's topic was "Extrasolar Planets—Are we alone?"

Paul began his talk with the famous Drake Equation, introduced by Frank Drake. This equation gives us the number of planets in our galaxy that could currently contain intelligent life.

$$N = R^* f_p n_e f_i f_c L$$

where:

- N = the number of civilizations in our galaxy with which communication might be possible.
- R^* = the average rate of star formation per year in our galaxy
- f_p = the fraction of those stars that have planets
- n_e = the average number of plan-

ets that can potentially support life per star that has planets

- f_l = the fraction of the above that actually go on to develop life at some point
- f_i = the fraction of the above that actually go on to develop intelligent life.
- f_c = the fraction of civilizations that develop a technology that releases detectable signs of their existence into space
- L = the length of time for which such civilizations release detectable signals into space.

Since its introduction in 1961, scientist have gained a greater knowledge of many of the parameters within this equation, especially with the probability of other planetary star systems.

Paul went on to discuss the current state of knowledge of extrasolar planets, pointing out that the current confirmed count of extrasolar planets is 552 and increasing almost daily!

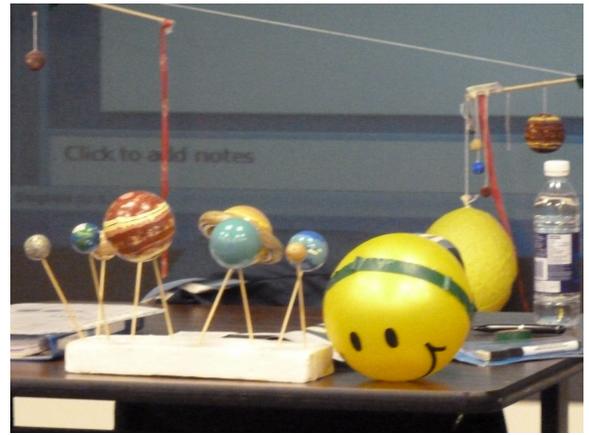
Paul explained the primary factor in deciding if a planet could sustain life was the presence of liquid water—or at least the conditions where water would be liquid if it was present.

Paul described the various techniques astronomers use to discover extrasolar planets.

- Radial velocity / Doppler
- Direct visual measurement
- Transit method
- TTV—transit timing variation
- Gravitational micro-lensing
- Pulsar timing

Of these techniques, Radial velocity (measuring the "wobble" of a star caused by its associated planet/s) was by far the most successful.

Paul noted that the incidence of planet detection was increasing as our tools and techniques improved and that with the addition of both existing and future



Paul always has great props at his talks. This talk was no exception!

space telescopes the discovery of extrasolar planets was going to "explode".

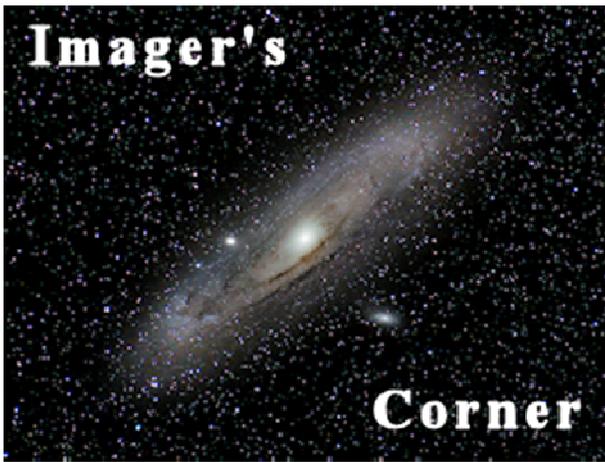
Paul concluded his talk by discussing two extrasolar planetary systems that possibly contain planets that could support life. Paul had brought some models of these systems and used them to explain the relative positions and sizes of the planets as well as the concept of the "life zone" (also call the Goldilocks zone) around the host star.

Paul ended his talk by answering several questions. All in all a very well presented and informative talk. Thank you Paul.

The meeting concluded with our monthly segment "What's up?" presented by Michael Boschat. Mike reminded us of the planetary conjunctions occurring in the eastern sky just before dawn (Venus, Mars, and Jupiter) and that Mercury was well positioned as an evening "star" in the west.

Michael also gave us a brief update on the status of solar activity with the possibility of some good auroral activity by the end of the week. He also gave us a brief account of the trials and tribulations of finding a suitable RF source for radio meteor observing.

The meeting concluded with our usual munchies and pop, before several of us retired to the Henry House for "further



Part 8 in a series by Blair MacDonald

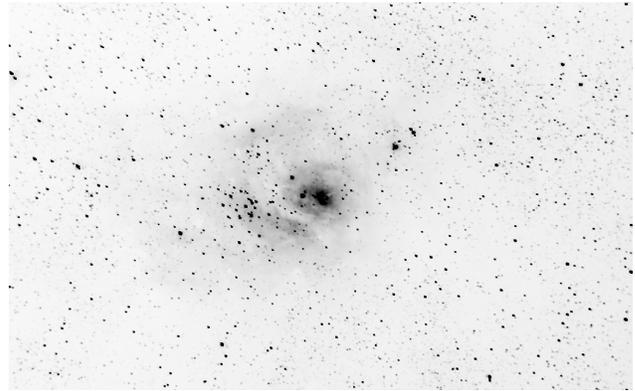
This edition continues a group of Imager's Corner articles that will focus on a few techniques that are useful in processing astrophotos. Over the next several editions of Nova Notes I'll attempt to give a guide to image stretching, background correction, SIM processing and any other technique that I happen to find useful. All the techniques discussed will be useable with nothing more than a standard image processor that supports layers and masks. No special astro-image processing software is required.

This edition will deal with SIM processing. SIM stands for screen inverted mask and is a way of greatly enhancing faint detail. It can be used iteratively to increase the effect. It works best on emission nebula where the data slowly fades into the background.

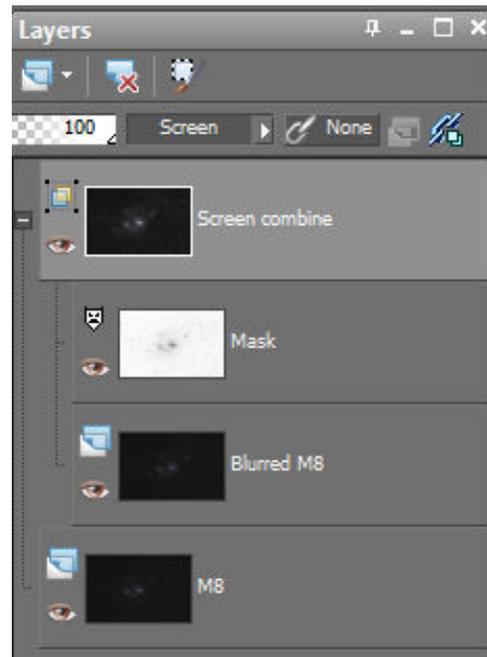
Let's start with the M8 image below. There is lots of faint detail not yet visible so we will use several iterations of SIM processing to make it visible.



Start by duplicating the image on a new layer. Blur this duplicate with a Gaussian filter with a radius of one or two pixels. Finally place a mask over the blurred layer made from the inverse of the luminance of the blurred layer. The mask is shown below to show what it looks like.



The mask and blurred layer are then screen combined with the original image using the following layer stack.



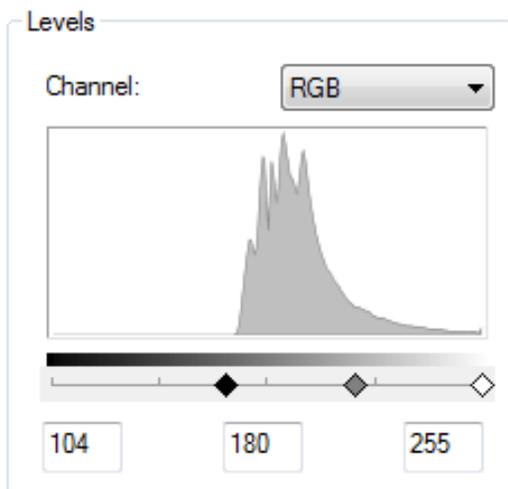
The resulting image after the layer stack is merged or flattened shows enhanced dim detail.



Repeating the process twice and adding a levels adjustment layer to darken the background produces the following image.



As you can see from the above image, not only has the nebula been enhanced but the faint dust surrounding the nebula is now visible. The levels adjustment and the histogram of the SIM processed image is shown below. This sets the black point for the image.



SIM processing will enhance faint background detail and increase the SNR of the faint detail because of the blurring. There is some minor loss of detail in the faint areas, but the results are worth it. SIM processing will make the final image look a little washed out, thus the requirement for the levels adjustment as a final step.

Remember, this column will be based on your questions so keep them coming. You can send them to the list at hfxrasc@lists.rasc.ca or you can send them directly to me at b.macdonald@ns.sympatico.ca. Please put "IC" as the first two letters in the topic so my email filters will sort the questions.

Photo and Text: Roy Bishop

Canon XTi, 400 mm, f/6.3, 1/40 s, ISO 800, 2011 April 18, 3:52 and 3:53 UT

The difficulty with such photos is the large luminance range, from the Moon itself to the much dimmer luminance variations in the adjacent clouds. It is hard to capture the play of light in the clouds without totally overexposing the Moon. The human visual system has a far greater dynamic range than a camera, so a photo cannot match the spectacular view available in binoculars. Nevertheless, the visual experience is fleeting, whereas a photo preserves a memory.

While capturing lunar images that night I was reminded of Longfellow's poem "Moonlight":

Moonlight

As a pale phantom with a lamp
Ascends some ruin's haunted stair,
So glides the Moon along the damp
Mysterious chambers of the air.

Now hidden in cloud, and now revealed,
As if this phantom, full of pain,
Were by the crumbling walls concealed,
And at the windows seen again.

Until at last, serene and proud
In all the splendor of her light,
She walks the terraces of cloud,
Supreme as Empress of the Night.



Celestron CGE mount review

Blair MacDonald

Well the big day finally arrived and my shiny new Celestron CGE-Pro telescope mount arrived. I had finally taken the plunge and replaced my Meade LXD-650 mount that has served me well for many years and right from the start of the process things went better than my previous large astronomy expenditure.

I was delighted to be able to purchase the mount locally thinking that if anything went wrong at least I'd have someone to yell at. I went down to visit Brian at Atlantic Photo Supply and paid my deposit. Brian told me it would take about ten days for the mount to arrive, but when I got home there was a message on our answering machine letting me know that there was a slight backorder of a week. This news although somewhat disappointing was rather nice to hear considering when I purchased my Meade mount years ago I was repeatedly told that it would ship "tomorrow", ten times over the period of three months! The good folks at APS kept me informed via emails as to the status of the shipment



and thirteen days after I made the down payment the new toy arrived.

That evening I headed into the wilds of Halifax to pick it up and since I had read several reviews I knew it was rather large so I took our van as I was sure to have enough room for it in the back. The mount came in two large well packed boxes, one for the tripod and one for the equatorial head. There were two additional small boxes for the counterweights I had ordered. After loading everything into the van, I headed home for what I was sure would be several nights of frustration trying to get the thing together and working properly. I still had vivid memories of the weeks spent shaking the gremlins out of my Meade mount.

When I opened the boxes I found that the mount was well packed and did not appear to be any worse for wear from shipping so I started to assemble the beast. Even though I had read the specs, my first impression is that this thing was **big!** It took a little over a half an hour to un-crate everything and find the manual (I had downloaded a copy just in case - you gotta love the Internet!). My wife was kind enough to feed the kids so I got to work on assembly. All in all it took about another hour and I had a fully assembled mount in my garage. The manual was easy to follow and rather well-written (compared to my older Meade product) and the fit and finish was first rate. It even came with extra hardware, just in case.

And now for my second impression, this thing is **BIG!** I had read the specs before, but at over 115 pounds and five and a half feet tall the mount is both heavy and stable. The design is well thought out and breaks down into three pieces with the heaviest being about 57 pounds. Not a light-weight but manageable. The software seems to be reasonably well designed with t-point-like error modeling built in for outstanding all-sly Go To accuracy. In my testing, after performing a two-star alignment and using three additional calibration stars, the mount was con-

sistently able to place a star in the center of a medium-power eyepiece operating at 100 times magnification even after repeated all-sky slews. This is substantially better performance than my older mount which was barely able to place a star in the finder after an all-sky slew.

This mount was purchased for astrophotography and it seems to have been designed with that purpose in mind. There is a surprisingly accurate polar alignment routine (*all-star* alignment) that takes advantage of the very accurate Go To capability. After doing a two-star alignment and adding three additional calibration stars, you simply instruct the mount to go to any convenient star and tell it you want to use that star for polar alignment. When you do, the mount moves to where the star should be if you were polar aligned and you simply adjust the altitude and azimuth of the mount until the star is centered and that's all there is to it. After using all star alignment I had no drift in a five minute tracking test. Finally a true polar alignment in less than five minutes!

There is software correction for backlash in both RA and Dec and of course periodic error correction. As for the periodic error, this is always the primary concern of any mount used for astrophotography; on this mount it is low +/- 8 arc seconds and very slow and smooth. It is free of any abrupt jumps making the system a cinch to guide. The image below is a magnified view of the tracking when the mount was purposely misaligned to produce Dec drift. In the image the horizontal axis is declination and the periodic error can be seen as the sine wave like movement of the star.



So what is the mount like under the stars? After a few false starts I finally made it to some dark skies at the St. Croix Observatory and carted 200 pounds of gear from my car to the roll off and started to set up. Initial assembly took about five minutes, alignment another ten, polar alignment took five minutes and PEC training took another

six. That means a total of 26 minutes of setup before beginning focusing. Even though my old mount was much smaller and lighter, setup took at least an hour using the drift method and the Go To accuracy was OK but not up to the CGE Pro standards. Guiding was smooth and accurate as well as plug and play with a ST4 guider port. The

mount was rock solid and continued to guide accurately even with a 10-20 km/h breeze.

The Celestron CGE Pro is not a mount for the weak of back, but if you are up to the task of transporting it, it is one of the most stable and accurate portable mounts in its price range.

No Suggestion too Crazy

John Liddard

The Executive of the Halifax Centre is always trying to best represent the wishes and needs of the membership.

There is always a lot of day-to-day issues that are taken care of by the Executive, but there are many issues for which we need feedback from the membership. A case in point is ongoing maintenance and upgrades to the St. Croix Observatory.

The Observatory represents the most significant asset that the Centre has and also represents one of the largest expenses that the Centre is responsible for on an ongoing basis.

There have been no major upgrades, or new equipment purchases for the Observatory for some time, and we (the Executive) would like to hear from the members as to what additions or improvements they would like to see at the Observatory.

Obviously the cost of any suggestions is an important feature but we would still like to hear them. No suggestion or idea is too crazy.

Be it new equipment (solar telescope?), improvements to the observing area (better power and data connectivity?), additions to the warm room (a bunk?) or any other improvement we would like to hear from you.

We're holding an informal meeting at the Henry House on Barrington St in Halifax on Saturday June 18 @ 1:00

p.m. for those interested in discussing and presenting their ideas on SCO. Please come and participate.

We really want to know what you think. For those not able to attend we'd still like to hear your ideas. Anyone can post an idea to the mail list, email it directly to myself (jliddard@gmail.com) or feel free to contact me via telephone at 902 865 7607.

The Centre's money is your money and we want to spend it wisely.

Sincerely,

John Liddard
Observing Chair- SCO Caretaker
Royal Astronomical Society of Canada - Halifax Centre



Cosmic Debris

Odds and Sods from the World of Astronomy and Cosmology.

Free-Floating Planets May Be More Common Than Stars

May 18, 2011: NASA Science News
Editor: [Dr. Tony Phillips](#) | Credit: Science@NASA

Astronomers have discovered a new class of Jupiter-sized planets floating alone in the dark of space, away from the light of a star. The team believes these lone worlds are probably outcasts from developing planetary systems and, moreover, they could be twice as numerous as the stars themselves.

"Although free-floating planets have been predicted, they finally have been detected," said Mario Perez, exoplanet program scientist at NASA Headquarters in Washington. "[This has] major implications for models of planetary formation and evolution."

The discovery is based on a joint Japan-New Zealand survey that scanned the center of the Milky Way galaxy during 2006 and 2007, revealing evidence for up to 10 free-floating planets roughly the mass of Jupiter. The isolated orbs, also known as orphan planets, are difficult to spot, and had gone undetected until now. The planets are located at an average approximate distance of 10,000 to 20,000 light years from Earth.

This could be just the tip of the iceberg. The team estimates there are about twice as many free-floating Jupiter-mass planets as stars. In addition, these worlds are thought to be at least as common as planets that orbit stars. This adds up to hundreds of billions of lone planets in our Milky Way galaxy alone.

"Our survey is like a population census," said David Bennett, a NASA and National Science Foundation-funded co-author of the study from the Uni-

versity of Notre Dame in South Bend, Ind. "We sampled a portion of the galaxy, and based on these data, can estimate overall numbers in the galaxy."

The study, led by Takahiro Sumi from Osaka University in Japan, appears in the May 19 issue of the journal *Nature*. The survey is not sensitive to planets smaller than Jupiter and Saturn, but theories suggest lower-mass planets like Earth should be ejected from their stars more often. As a result, they are thought to be more common than free-floating Jupiters.

Previous observations spotted a handful of free-floating planet-like objects within star-forming clusters, with masses three times that of Jupiter. But scientists suspect the gaseous bodies form more like stars than planets. These small, dim orbs, called brown dwarfs, grow from collapsing balls of gas and dust, but lack the mass to ignite their nuclear fuel and shine with starlight. It is thought the smallest brown dwarfs are approximately the size of large planets.

On the other hand, it is likely that some planets are ejected from their early, turbulent solar systems, due to close gravitational encounters with other planets or stars. Without a star to circle, these planets would move through the galaxy as our sun and others stars do, in stable orbits around the galaxy's center. The discovery of 10 free-floating Jupiters supports the ejection scenario, though it's possible both mechanisms are at play.

"If free-floating planets formed like stars, then we would have expected to see only one or two of them in our survey instead of 10," Bennett said. "Our results suggest that planetary systems often become unstable, with planets being kicked out from their places of birth."

The observations cannot rule out the possibility that some of these planets may be in orbit around distant stars, but other research indicates Jupiter-mass planets in such distant orbits are rare.

The survey, the Microlensing Observations in Astrophysics (MOA), is named in part after a giant wingless, extinct bird family from New Zealand called the moa. A 5.9-foot (1.8-meter) telescope at Mount John University Observatory in New Zealand is used to regularly scan the copious stars at the center of our galaxy for gravitational microlensing events. These occur when something, such as a star or planet, passes in front of another more distant star.

The passing body's gravity warps the light of the background star, causing it to magnify and brighten. Heftier passing bodies, like massive stars, will warp the light of the background star to a greater extent, resulting in brightening events that can last weeks. Small planet-size bodies will cause less of a distortion, and brighten a star for only a few days or less.

A second microlensing survey group, the Optical Gravitational Lensing Experiment (OGLE), contributed to this discovery using a 4.2-foot (1.3 meter) telescope in Chile. The OGLE group also observed many of the same events, and their observations independently confirmed the analysis of the MOA group.



This artist's concept illustrates a Jupiter-like planet alone in the dark of space, floating freely without a parent star.