

Nova Notes



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

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Front Page Photo: Bruce Hamilton

Venus and Moon taken from Litchfield NS
at 5:40 p.m. AST on November 26th, 2011.
The waxing crescent Moon was 1.8 days
old.



From the editor

Quinn Smith

Some of you may wonder what my criteria are for including articles in Nova Notes. Well, this edition is good time to tell you.

I often have difficulty in finding enough material to fill Nova Notes and have to rely on a small group of members who regularly supply me with articles. This edition, however, I was blessed with a plethora of material—so thank you all.

OK back to my criteria for articles. My primary goal with Nova Notes is to supply a record of the activities of the Halifax Centre. That is why I include detailed articles of the monthly meetings. After all, we have over 160 members of the Centre and only a third of them manage to make it to the meetings. My second criterion is to include articles that I think will be of interest to members, such as book and product reviews, technical articles (such as Imager's Corner), and story articles (such as the Starmus article in this edition). Finally I love to include members' photos. I know that these do not always show up well in print, but now almost everyone receives Nova Notes electronically so that problem has been partially resolved.

So thank you all for your interest in Nova Notes, and for your support over the years. Thank you to my regular contributors, to prospective contributors, and to all readers. May you all have a wonderful, peaceful, and joyous holiday season.

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 both 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 (for contact info, see below).

Upcoming Observing Nights:

December	holiday	- no observing night
January	27th	2012
February	24th	2012

Meetings begin at 8 p.m. at Saint Mary's University

Our usual room is AT 101 although check the web site (www.halifax.rasc.ca) for room changes.

December 16th 2011

The Annual General Meeting followed by our "Who Wants to be a Gazer?" quiz show: fun for all!

January 20th 2012

Saint Mary's Luigi Gallo will speak about the Japanese Astro-H project and general X-ray astronomy.

February 17th 2012

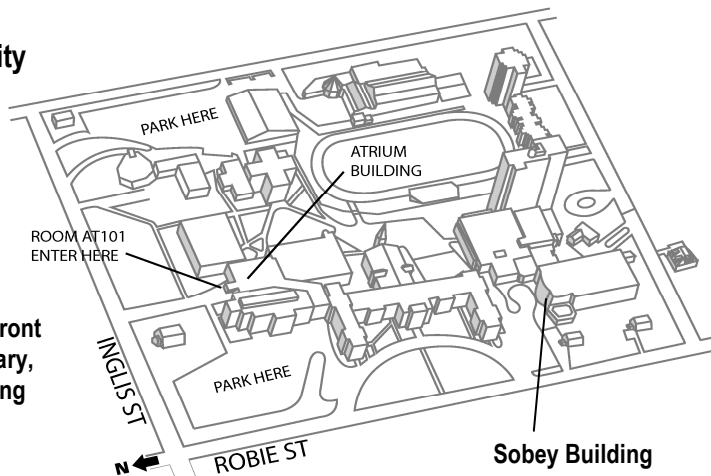
A regular meeting. Speaker and topic, yet to be chosen.

[The content and location 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 at 7:00 p.m., in room AT 305 (room subject to change).

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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Morning Glory

Pat d'Entremont

Morning Glory

- by Graeme Edge

Cold hearted orb that rules the night,
Removes the colours from our sight,
Red is gray and yellow white,
But we decide which is right.
And which is an illusion?

Pinprick holes in a colourless sky,
Let insipid figures of light pass by,
The mighty light of ten thousand suns,
Challenges infinity and is soon gone.

Night time, to some a brief interlude,
To others the fear of solitude.
Brave Helios wake up your steeds,
Bring the warmth the countryside needs.



Photo: Blair McDonald

Graeme Edge (b 1941) was, and still is, a member of the British rock band *The Moody Blues*. This appeared in their 1967 album *Days of Future Passed*.

November Meeting Report

Ian Anderson

President Richard Vanderberg, opened the November meeting in front of an assembly of about 50 people. He reminded us of elections next month to select the 2012 Executive, and noted that 1st VP and Librarian positions were still vacant. He also noted that any seat can be contested by members.

Richard observed that as a RASC Centre, Halifax "boxes far above its weight class". To illustrate this, Richard noted the Halifax members who have served in senior Executive positions at the National level over the years. Both the current and past National Presidents are Halifax members.

He also noted that three, of only handful of individuals who've known the trials of putting together the Observer's Handbook, were present this evening. Former long-standing editor Roy Bishop, recent editor Pat Kelly, and current editor Dave Chapman - all Nova Scotians living within an hour of

Halifax and all Halifax Centre members. Pat took the opportunity to present Dave with an "Editor" desk plaque and a mug decorated with stamps as both were into the hobby of stamp collecting.

Up next, Paul Heath made an in-depth "What's Up!" presentation, covering the dawn and dusk skies in the coming weeks. Paul's overheads were "feature talk" quality, and especially useful was the SCO weather conditions chart showing predicted trends for the weekend. His coverage was extensive. He discussed the Leonids, the coming Geminids, recent sunspot activity, Jovian satellite transits, and features of the late autumn sky.

Then, before the main event, Paul Gray asked to show some of his early attempts at astrophotography. He showed an impressive set of aurora stills stitched together to create a short movie showing curtains of aurora sweeping across the sky.

Paul then began his presentation on the 2011 Starmus conference by showing a video of his daughter Kathryn

declaring Starmus 2011 officially open in June. Kathryn Gray, "star" of international astronomical circles for 2011 who had only just turned 11 the day before, joined with her father presenting photos from her family's five days in the Canary Islands this summer. Their presentation lasted nearly an hour.

She has searched for a second supernova since her early find. Her patience and determination have surprised her dad as they have persisted beyond the two week period her father had guessed might be the case.

Barely able to see over the monitor at the podium, Kathryn fielded questions directed towards her after her presentation. She said she could not recall what she and Neil Armstrong spoke about, but she knows she talked with him for a quite a while.

Fudge sales ended the evening along with the usual cookies and drinks as Kathryn and Paul raised more money for yet another trip - this time for a class group to go to see a space camp in Montreal.

Who Wants to be a Gazer?

Ian Anderson

Answers to these four questions can be found within the text of the June Meeting Report (page 5)

☆ Vega



In the year 1500AD when the earth is tipped the other way, making Vega its (almost) north star, which well known celestial feature will never rise at Halifax's latitude? Is it

A) Orion's Belt



C) Scorpio's stinger



B) The moons of Jupiter

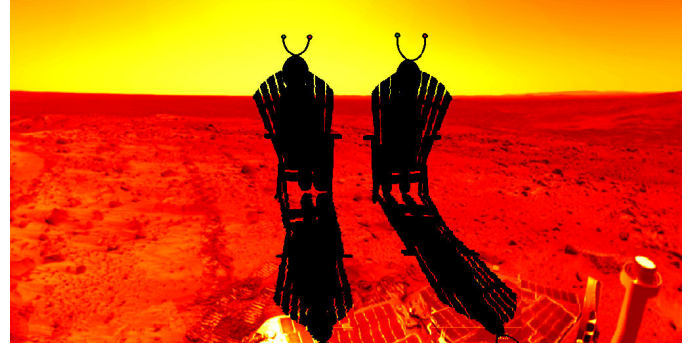


D) Rigil Kent



It's May 11, 1984. The Martians are viewing:

- A) Venus eclipsing Mercury in a perfect conjunction.
- B) a double Solar eclipse of Phobos and Deimos.
- C) a closest approach of Halley's Comet in 20k years.
- D) a rare double transit of Earth and Moon over the Sun.



We have been lucky enough to see some magnificent comets in the past 20 years. This photo, taken by Sherman Williams, appeared on the cover of Nova Notes a few years ago. Which comet was this?

- A) Hale Bopp
- B) Neat
- C) Bradfield
- D) McNaught



Which two well known constellations have been superimposed here?

- A) Andromeda & Cygnus
- B) Bootes & Perseus
- C) Cassiopeia & Leo
- D) Delphinus & Hercules

June Meeting Report

Chris Young / Ian Anderson

The meeting was chaired by Chris Young with 27 attending including 1 guest and our supernova hunter Kathryn Gray.

Jerry Deveau was presented with a RASC "Explore the Universe Certificate". This is a challenging introductory program for the new astronomer, covering all major astronomical objects including constellations, bright stars, the Moon, Deep Sky Objects, and Double Stars. (Suitable for both binoculars and telescopes!). Congratulations Jerry!

Pat D'Entremont presented the librarian with a book which his brother had donated "How I Killed Pluto, and Why It had it Coming" which was quickly borrowed. We had updates on Nova East and Mike Boschat provided a "What's Up". The presentation for the evening was "Who Wants to be a Gazer - The Ian Anderson Edition" complete with prizes!

Refreshments followed an excellent evening.



Jerry Deveau with his "Explore the Universe" certificate.

Quiz action (Ian Anderson).

Paul Heath was up first. He got off to a good start, with a run which was front-loaded with easy questions. He

knew celestial bodies rose in the East - as opposed to praying or pollinating. He had no difficulty when asked in what city the 2011 GA would be held. But an image of the moon just a couple of days past first quarter lead him to say he was looking a 19 day old moon. With grimaces from the audience Paul was down on his third question.

Paul Gray took second seat, and the questions, unsorted as to difficulty were seen as they appeared in alphabetical order. Paul pondered his first question for some time. It was difficult, but he guessed correctly that in 15,000 AD the belt stars of Orion will no longer rise at Halifax's latitude. A near stumble at the question asking what was the Sun's absolute magnitude, but after much shameful prompting from the crowd he was able to go on to know the 2008 picture of Dickinson, Bishop, Lane and Whitehorse all had asteroids named after them. Paul knew Barnard's star was in Ophiuchus, but he was unfamiliar (as we all were) with the common name of beta Virginis, which he said was Vindemiatrix (which is epsilon Virginis). The answer was Zavijava.

Sean Dzafovic up third, guessed the Big Bang occurred 13.7 billion and not 13.7 trillion years ago, he knew what can be known about a black hole, namely: mass, spin and charge (if any). He knew quickly that Canis Minor's brightest star was Procyon, but the age of the Cassegrain telescope surprised him (as it did many) to be over three centuries old at 1672 instead of 1872. It's in the back of the handbook!

Dave Lane then took the hot seat at this point. He could vaguely make out Cassiopeia superimposed on Leo, but asked Pat for help on the Cerenkov radiation being as to light as a sonic boom is to sound. Dave quickly knew the "coat hanger" was in Vulpecula, and he recalled comet McNaught from the pages of the 2007 February Nova Notes. Dave also guessed a supergiant burns its last fuels of silicon and sul-

phur in about a day, and asked Dave XVII for help on craters Cassini and Gassendi not being adjacent on the Moon.

Dave continued, identifying M13 as a globular cluster, and he could make a simple 4x telescope with a couple of convex lenses. He also guessed correctly that the Pleiades probably looks a lot like five of the Big Dipper's stars 600 million years ago. But Dave tripped up when he thought that when Venus was at greatest elongation east, the Earth would be at opposition for Venus when in fact it would be at quadrature. Dave was retired with nine correct. He took with him the prize book "Cosmos".

Pat Kelly, our original "Gazer" host, took his turn, and for the first time, as a contestant at such a quiz. He knew CA Chant had held the position of Handbook editor the longest. Princess Beatrice's fascinators hat was a giveaway, and Pat knew Luna 3 in 1959 gave us first images of the far side of the Moon. He guessed Vera Rubin as the female astronomer pictured. Pat asked Dave Lane to help him identify a certain style of star chart as that of Flamsteed, but Pat could not tell at what approximate time of day (on June 17th) the star Fomalhaut would have transited. Five right. Five down.

The last contestant of the evening was young guest Kathryn Aurora Gray. We promised her lots of help. She figured the radius of the Milky Way if measured in parsecs was close enough to 32,600. With much help she came to the conclusion that Neptune was celebrating its first full trip around the Sun this year, and then we met Hilton who showed us what his night myopia glasses might look like - a new feature in the Handbook this year. Kathryn was able to identify the Martians were looking at a double transit of the Earth and Moon over the face of the Sun in May of 1984. Finally Uranus was identified as the outer planet seeing the most Earth-Moon transits as any of the other outer planets, perhaps as many as the outer planets combined.

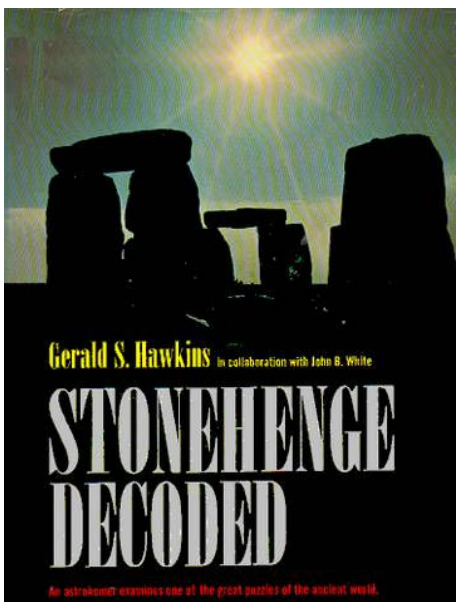
October Meeting Report

Ian Anderson

The October meeting of the Halifax Centre RASC commenced minutes after 8 p.m. on Friday the 21st as Secretary Chris Young played host to a packed assembly of close to 100 people. The absences of President Vanderberg and V.P. Howie (both due to illness) were regretted.

Our guest speaker Dr Vance Tiede from Yale University was prepared to speak and fifty plus new young faces were waiting in the audience to hear his talk. The talk was about the continuing debate within the scientific community, concerning the historic purpose and significance of Stonehenge. The title of the talk was "Stonehenge Wars".

The primer for Tiede's presentation was the book *Stonehenge Decoded* by Gerald Hawkins and John White, written in 1965. This book has been on my family's bookshelf for as long as I can recall, and since its release, its arguments have been widely accepted by the astronomical community, and I have always regarded Hawkins' interpretations of the site as a given - as obvious.



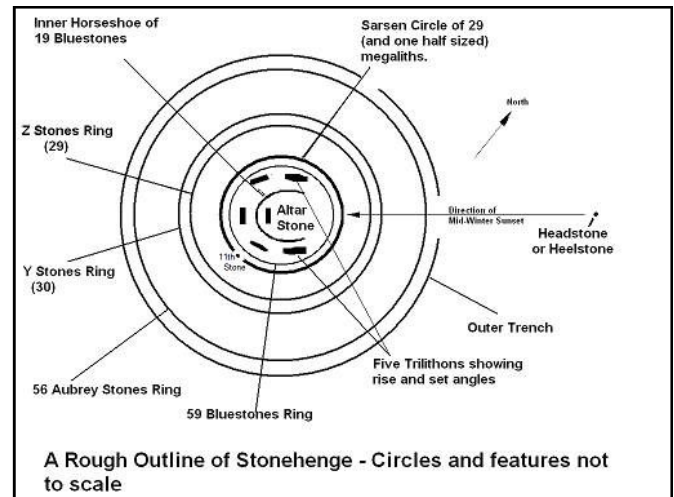
So it surprised me to learn that there is still debate in the archaeological community in Britain concerning Stonehenge's historical purpose. The basis of the evening's presentation is that very dispute between the astronomers' and archaeologists' interpretations of that ancient ruin, one which has not yet been settled - even in recent years.

In summary, Hawkins stated that Stonehenge is a place of pagan worship, of pre-Christian Druidic ceremony, but it was foremost designed as a calculator or specialised computer telling its priests when eclipses (both solar and lunar) would occur. It was chiefly concerned with the movements of the Moon, not the Sun.

People in antiquity were superstitious of darkening events like eclipses - the disappearance of the Sun and Moon - for they believed these happenings were omens of evil or bad luck, particularly if they occurred on the solstices. Stonehenge served as a temple and at the same time a structure designed to assure the population when eclipses might or could not happen during those seasons.

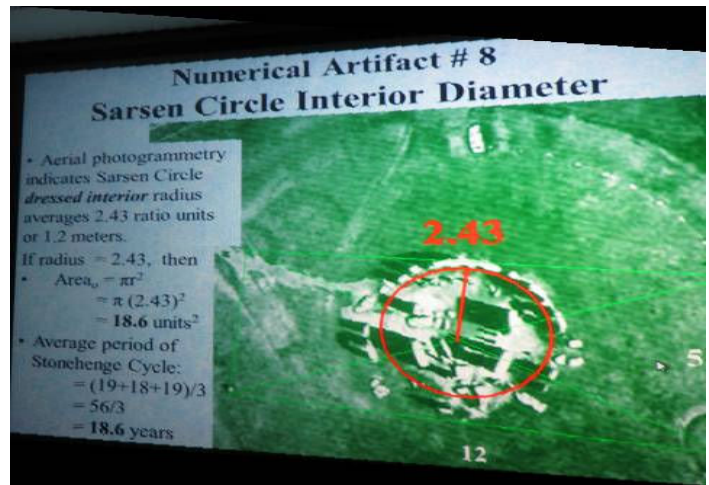
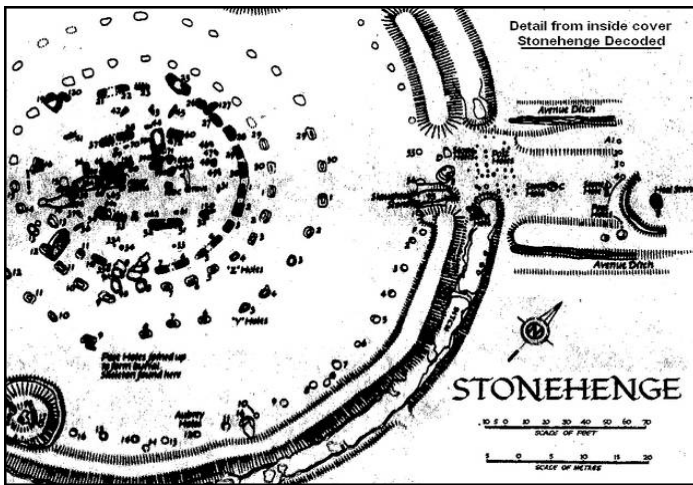
But archaeologists are concerned about the timeline and remote location of Stonehenge, and question the sophistication of the peoples of the area between about 3200 BC to 1800 BC when the third phase was completed - a feat totalling 50 generations. They claim the sightlines proposed by the astronomical community are "fortuitous happenstance" and unintentional.

According to Dr Tiede, there is just too much evidence supporting the astronomical significance of Stonehenge to conclude otherwise (despite little new scientific material having been added to the discussion in 46 years).



Tiede reminded the audience of the numerical artefacts which suggest something far more than "fortuitous happenstance". They were:

- 1) 19 and 59 Bluestones. 19 representing the number of years in the metonic cycle. (18.6 actually.) 59 in the circle outside the trilithons representing the number of days in a bi-monthly lunar cycle.
- 2) Sarsen Circle contains 29½ upright stones as No 11 is a half sized stone. This is again representative of the lunar month in days. The 11th stone probably never supported a crossing lintel.
- 3) 30 Y and 29 Z holes. The 8th Z stone is missing from the inner ring of 30 outside the Sarsen circle.
- 4) Latitude 51.178 N At this latitude a right angle is formed by the line towards the rising summer solstice sun and the line towards the northern most moonset.
- 5) Skyline angle 0.5 degrees throughout. The distortions of the lowest degree of the atmosphere are thus cleverly avoided.
- 6) 56 Aubrey Holes: is the smallest number of years where the phase and position of the moon repeat with an overall accuracy of better than three days. (Not to be confused with a Saros Cycle)



7) Linear Ratio Units of Station Stones & Moons Synodic period. Namely the distance between stations has a 12 to 5 ratio on the perpendicular, giving an interior area of a right angle triangle of 30 units², as the perimeter is 30 linear units, (5+12+13). 30 being the closest integer of the moon's synodic period.

8) Interior Area of Sarsen Circle = 18.6 Units² (See diagram) A unit of measurement here has been suggested as a simple integer multiple (8) of an early megalithic yard as proposed by the late Professor Alexander Thom.

As for new findings in astronomy since 1965:

1) Archaeologist Atkinson's survey confirms Stonehenge's Moon and Sun alignments suggested by Hawkins.



Guest speaker Dr Vance Tiede

2) New Greek translations now make astronomical sense: The god "visits every 19 years when the luminous bodies (*astron*) returns to the same place in the heavens..." In this case the Greek word "*astron*" does not mean stars but luminous moving bodies such as the planets, Moon and Sun. From this root word we get astronomy - which is what we're about and why we were there.

3) Greek astronomical fragment links 56 sided polygon to lunar eclipses.

How Stonehenge is preserved and interpreted by British Authorities currently hangs in the balance. As it is made-over by English Heritage with the addition of a new visitor centre, what weight will the astronomical component carry? The crux of the matter: could Northern Europeans really be so advanced in their mathematics and observations of the heavens long before the civilizations of Egypt, Greece, Rome, Persia and the Far East could have informed them? The evidence has shouted at us for millennia, and was finally observed decades ago. The answer is a resounding "Yes".

But in the thirty years from 1970 to the late 1990s, pamphlets for the site have recanted Hawkins findings - almost as if to put the genie back in the bottle. It is easier to discredit one man's findings than to seriously rethink that all of Mediterranean-centred history might have to be reconsidered, reconstructed, and ultimately rewritten.

Perhaps the most disconcerting feature of this debate is that many of the strongest proponents of the astronomical "fact" of Stonehenge are now deceased, and their influence has waned to such an extent that the arguments of Hawkins' book are lost to the sensibilities of current administrators.

Dr Tiede finished his presentation with a video depicting the ceremonies of a high priest at Stonehenge in the second millennium BC, after which he fielded questions from the audience.

A draw for a small telescope, donated by Perceptor Telescopes, was won by Blair MacDonald. Blair declared he will donate the scope to the local school board near his home.

A quick break followed during which the majority of attendees left the room.

The meeting resumed with a 4 minute video on "What's Up", for the evening skies of October. Jupiter now rises high in the evening sky at dusk, while Mars can be seen pre-dawn. 51 Pegasi was featured as a solar type star and one of the first to reveal an extra-solar system planet. Also mentioned were the Orionids centred around the 23rd of the month.

Meeting adjourned shortly before 10 p.m. when it was time for cookies and pop. All in all another excellent meeting.

STARMUS

Paul Gray

Wow! Amazing! Unbelievable! Those are 3 words to describe our adventure attending the Starmus Festival, held on Tenerife in the Canary Islands in June 2011. Starmus was the brainchild of Garik Israelian, a Spanish astronomer from the Canaries who wanted to do something special to celebrate the 50th anniversary of Yuri Gagarin's first flight into space.

Starmus brought together what is likely the greatest collection of the scientific minds of today in astronomy and space, along with some of the most famous of astronauts and cosmonauts. It was 5 days of pure bliss to any space or astronomy enthusiast and rocked each and every person who attended! In the next couple of articles of which this is part one Kathryn and I hope to share with you some of the experiences we had at this event, as well as share some of what we have learned. Come with us on a journey to the stars!

Our trip to Starmus began on a Friday with an evening drive from Fredericton to Halifax where we stayed with my parents for the night. They took care of Kathryn's 3 younger siblings for the time we were in Spain, and many thanks to the grandparents for doing this! Saturday morning was relaxing as we took our time to pack for a 5 p.m. flight from Halifax to Toronto. This would be Kathryn's first flight that she would remember, and she enjoyed every minute of it. Our stop-over in Toronto was a couple of hours, time to grab some supper, take Kathryn on a quick tour of Pearson Airport, and finally, at close to 10 p.m., we were on our red eye flight to Madrid, Spain.

Sunday morning around 11 a.m. we arrived in Madrid after a long flight. Soon after departing we were served supper and following that, the entire plane groaned as they announced the in-flight movie, *Never Say Never* star-

ing Justin Beiber! Needless to say, many on the flight decided that sleep was a better choice, including Kathryn.

On Sunday we had a short stopover at Madrid before boarding our 3 hour flight south to Tenerife. Starmus staff met us at the airport where a 1 hour drive to the Abama Golf and Spa Resort via a

Mercedes with driver (in tie) would get us to our destination about 6 p.m. local time, roughly 22 hours after we left Halifax! We were hungry as it was supper time and the driver took us to a roadside rest stop he knew where we sampled some local cuisine for the first time. We knew we were in for a treat this week, the food was delicious.

Check-in went smoothly, being met at the car by the first door hop who took our family name as another opened the doors for the girls, and from that point on we were addressed by name. As they escorted us into reception we were offered champagne while we were processed, and then we took a short tour and briefing on the facility as our bags were delivered to our room! We checked in with the Starmus Registration and they were excited to meet Kathryn and see that she had arrived! We were all very tired after 24 hours of travel, but decided that a dip in one of the 7 pools would be a good way to relax before an early bedtime. We actually had the entire pool to ourselves! Little did we know it would be the last night for a week where any of us, including Kathryn, would be in bed before midnight!

Monday morning we slept in until 8:30, adjusting well to the new time zone. It was down to brunch at 9 a.m. where we were greeted by staff offering strawberries and champagne as we waited to be seated. We learned that we were there the perfect week, with the hotel only about 40% full, thus we



The Abama Golf and Spa Resort Photo: Paul Gray

never really had to wait for anything at any of the food bars. The breakfast buffet was an amazing spread with a omelette/pasta bar, and an egg/bacon/sausage bar with over several types of sausages to choose from (I tried something different each day). There were cereals and breads from all over Europe, a cheese bar with over a dozen cheeses and the same for cold cut meats. Add in desert/pastry bar and well, no one was going away hungry!

That morning there were no scheduled events so it was time to relax and get our bearings on the meeting rooms and locations. Lunch each day was at the outdoor veranda restaurants with a view of the giant Koi pond and gardens. Lunch was always at 2 p.m., something else we would adjust to this week as meals were much later than we were used too.

Finally at 3 p.m. Starmus kicked off with first a talk by Michael Williams (President of the International Astronomical Union), about the top 10 discoveries of the last 50 years. Highlights included the CCD and the microwave background radiation. Next up was the panel of main organizers of Starmus including Garik with Brian May (Queen), Alexi Leonov, Buzz Aldrin and Francisco Sanchez (Director of the Instituto de Astrofísica de Canarias). Each spoke for a few minutes about Starmus and what they hoped we all would take home from it. Now it was Kathryn's turn, the reason we were here in the first place, the official

opening! After the head table cleared the stage, Garik took the microphone and introduced our Kathryn as the young lady that discovered the supernova back in January, and that she is only 10 years old. His enthusiasm for her was very visible and throughout the week he would always have time to give her a hug and time to talk with her, as well as make sure all was well.

With a round of applause Kathryn took the stage as Garik pulled out what was Brian May's chair for her to sit in front of the microphone. She sat very poised looking straight ahead into the throng of media cameras and reporters, so many in fact that we only a few rows back could not see her were it not for the large screens on the wall broadcasting the event! She then, in a very strong and clear voice, thanked Starinus and Garik for the invitation to be

part of the event, and that she was very happy and excited to be here in Tenerife and at Starinus. She then announced that she was now pleased to declare the first Starinus officially opened. The room of 400-plus people erupted in applause and dozens of whistles! We are in Europe after all and with a hug Garik thanked Kathryn, and to big smiles escorted her off the stage and back to us where we were seated.

A big weight had been lifted off all 3 of us as we all were nervous about Kathryn's short speech. I must say Kathryn has grown a lot over the last 9 months and is quite comfortable speaking to most anyone now.

With the formalities done it was time to get on with the talks. RASC's own Leslie Sage (author of "Second Light" in the RASC Journal) kicked things off with a talk about, "How astronomy has changed what it means to be human."

Jill Tarter, SETI guru and mother (so to speak), was next, with a talk that set the theme for the rest of the week: "A look at SETI". It really made us look at ourselves and our little Earth and the challenge that is before us all in trying to find the signal from a distant world. The big problem is it could take centuries for us to finally hear one, not because our technology is not good enough, but because so few civilizations live long enough to communicate. If we want to be one of those we better figure out a way to survive infancy as an advanced civilization! To begin with, we better stop thinking in terms of countries, or citizens of different nations, but rather start thinking about ourselves

as Earthlings! This was Jill's challenge: go home and change your Facebook so that you're listed as "Earthling" rather than what race, or what country you are from. As she put it, with the influential people and all the attendees there, it could start with us.

Next up was Michel Mayor, who spoke about extra-solar planets. A very interesting talk about the many different and strange types of planets that have been found, and another great speaker. Michel was the lead astronomer who found the first extra-solar planet, orbiting around 51 Pegasi, in 1995!

The second-last talk of the afternoon was from Buzz Aldrin, who spoke about going to the Moon and why, and how, we can go to Mars. A smart man with ideas on how to do it, and he wants to be involved in it when it happens! Watching him before and after with the media, as well as seeing him and Alexi Leonov interact, was worth the admission alone. One quickly saw how much these men, who lead the way to space, are such good friends.

Last up was Claude Nicollier, current NASA shuttle astronaut who has been part of service missions to the Hubble. What a first day of talks, and the excitement in the air was electric. During breaks, people would mingle with the speakers but in the "break room" they would be separated from the VIPs by a ribbon across the room. With Kathryn's VIP status, we were all directed to that side of the room though we would not go to many breaks as Kathryn and Susan would only take in occasional talks and take more time to go to the pools and relax and play, while I would try to attend most talks. It was not easy, as there were many, and the week was tiring as you will read. However, one memorable break for me was when I spent 20 minutes sitting with Charlie and Dorothy Duke (Apollo 16) and Jim Lovell (Apollo 13) and his son Jeff. Leslie Sage joined me for this time and we both relished it!



*Kathryn talking to Jill Tarter about her supernova
Photo: Paul Gray*

Day 1, however, was not over for us yet, even though the talks ended at 7 p.m. We got dressed up semi-formal and were on a bus to go to a nice restaurant at a banana plantation that is semi-outdoors, under cover, for the VIP Dinner. Cocktails at 8:30 p.m. (for almost an hour!) and then we were seated for a 5-course dinner. The highlight of the night was during dessert time, when Jill Tarter came looking for Kathryn with a big hug and the statement, "I saw you on YouTube and you did a great job!". Jill spoke with Kathryn for almost 15 minutes about her interest and encouraged her to pursue what she wants, but maybe someday consider going into X-ray or radio astronomy.

Finally back on the bus, it was 12:30 a.m. before Kathryn would hit her bed with mom and dad not far behind. Day 1 was over and already we were blown away by the experience.

Day 2 was our one day to sleep in, as nothing was planned for the morning. We awoke, went to breakfast, and took a cab to the local airport 20 minutes away to pick up our rental car for the rest of our time on the island, which would give us freedom to tour on our own in down-time as well as the few days after the festival. That morning we hit a supermarket to get munchies and snacks to keep in the room (which had a little fridge). This was much-needed, as we adjusted to such late

lunch and dinner times all week! We also would take a break and go karting, Kathryn's first time, but we are not sure who had more fun, her or Dad!

The Day 2 events kicked off with lunch on the Veranda from 1 to 3 p.m. While the three of us were taking our seats, we were joined by Ken Hodgkin, a Scott who a few years ago retired to the island and heard about the event only the week before! He lived only 5 km from the hotel! We would have a number of meals with him and he provided us with a DVD of some of the talks including Kathryn's opening remarks. Many thanks to Ken, and I hope to show a clip or two at a future meeting.

Following lunch it was off to the talks at 3 p.m. They started with Jack Szostak on "The Origin of Life on Earth," followed by Richard Dawkins with "Exobiology and Religion," Both were amazing and Dawkins made you simple realize that it all made sense.

Kip Thorne was 3rd up with his talk, "Black Holes, The Most Luminous Objects in the Universe but no Light?" This talk was one not to miss, as Kip is the world leading guru on black holes, and everyone learned a lot, I am sure. He made my head hurt! He would dive into how he is currently studying binary black holes and how they are not stable and how the larger one would consume the smaller. If this is the case, then as the smaller one crosses the event horizon of the larger and accelerates, the theory predicts that about 10% of the mass of the smaller black hole would be thrown clear of the two out into space. If this were to happen, even 10% of the mass of a small black hole represents a huge mass, so the event should generate a strong gravity wave! Kip is currently trying to de-

tect and measure such a gravity waves. He explained how this is done using two perpendicular lasers, 4 km long. What is amazing is the tiny amount of movement in the laser they hope to detect, about 1/1000 the width of an atom!

After the break we heard Sam Solanki present, "Is the Sun to Blame for Global Warming?" The afternoon ended with two talks by Russian cosmonauts Yuri Baturin and Sergei Zhukov. We had a couple hours before our next event so we took a 5-minute drive and took Kathryn to McDonald's for a taste of food from home. The girls tried onion rings at McDonalds and it was a nice break to get out and about before we had to get our warm clothes and go meet the bus for the last event of the day, the Star Party on Mt Tiede.

Departure was at 8 p.m. for what would be our first trip up the mountain. This excursion began in daylight but was a direct drive to the destination at a restaurant 2300 m above sea level. The sky from inside the volcano's 40-km crater was dark, but not as clear as one would expect. It turns out the absence of the trade winds was unusual, and we had a lot of sand and dust aloft that was blowing off the Sahara Desert 180 km east of us from the coast of Africa. As it was, we enjoyed our views of Scorpius rising on its side and the grand view of the Milky Way, 20¼ degrees higher than back home! Kathryn did some interviews with a German TV crew that was shooting a documentary about Starmus, and would so daily.

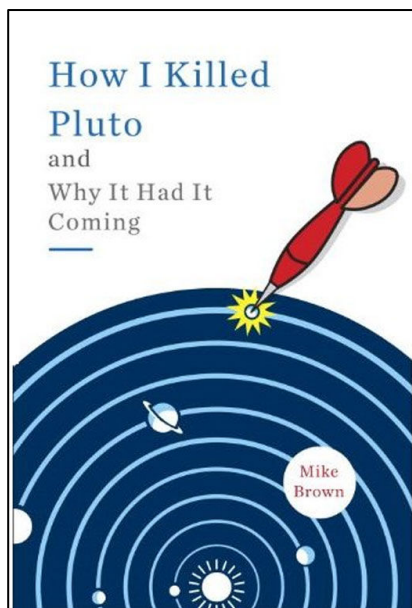
Finally around midnight after a evening of refreshments, mingling and viewing, we boarded the busses and were back home at Abama and finally to bed about 1 a.m.! I do not think Kathryn woke up for her walk from the bus to the room. With that, Day 2 of Starmus was over, and so ends this Part 1. There is so much we did not cover. More to come in part 2!



*Dr Richard Dawkins' talk; "Exobiology and Religion".
Photo: Paul Gray*

Book Review

Pat d'Entremont



Written by Mike Brown, published by Spiegel & Grau (Random House)

My brother Nil d'Entremont lent me this book, and I must say I had a hard time putting it down. It is the story of how the solar system came to have eight planets instead of nine, but it is much more than that in the sense that it gives us a glimpse of what really happens in the scientific community: the science yes, but also the politics, the competition, and the friendships that shape the life of professional astronomers.

A central character in this story is a trans-Neptunian object that has at times been known as Object X, Planet X, and Xena, and finally came to be known as 2003 UB313 or more commonly Eris. Eris's significance is that it is bigger than Pluto and common sense says that if Pluto is a planet, then so should it. And if it were, then its discoverer, the book's author, would now be the only living person to have discovered a planet. But Caltech professor Mike Brown felt that accepting such an accolade would be fraudulent, because he knew that if he did, then

soon our solar system would be littered with dozens if not hundreds of planets, all but eight of them being tiny objects that do not deserve to be in this esteemed club.

Another key character is a Kuiper belt object known either as K40506A or 2003 EL61, depending on who you believe discovered it. It turns out to be a little smaller than Pluto, but significant because a few days before it was introduced to the scientific community by Brown et al., a group from a small university in Spain announced its discovery. How could it possibly be, when Brown has the most modern equipment and computer software at his disposal, that someone using small equipment beat him to it? Or did they? Well, you'll have to read the book.

The real problem with K40506A's "pre-discovery" is that Brown and his colleagues have two other objects in their kitty, including then-known-as Xena, and if K40506A was pre-announced by someone else, then Xena is in danger of suffering the same fate. So they rush its announcement before they even know precisely what it is and the whole world goes sort of crazy.

And that's when the story becomes very interesting.

So what is a planet? Brown never does give us a definition, the only thing I don't like about the book, actually. But he does so on purpose, opting to try to convince us that it isn't definitions that are important, but rather scientific concepts. And he demonstrates how attempts at definitions can cause a lot of confusion and strife. Some astronomers, for example, feel that a planet should be defined as any object in the solar system big enough to be round (so formed by its own gravity), and that orbits around the sun and not any other object (in other words isn't a moon). Not only would this definition open the door to dozens of new planets, but at the time it was proposed it would have to include such objects as asteroid Ceres and Pluto's moon

Charon. Huh? Well, it turns out that Charon is so large in comparison to Pluto, that both these objects orbit around a common point outside of Pluto, which means they both orbit the sun and would therefore by that definition be a double-planet. Yikes.

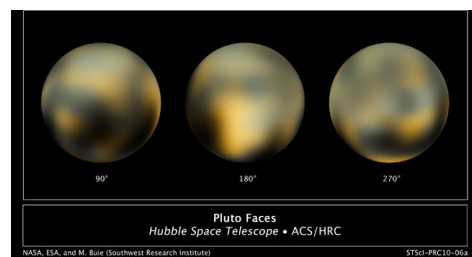
In the end, the International Astronomical Union held a vote, and it was a complex one. But I don't think it's a spoiler to tell you that Pluto, Charon, Eris, and Ceres did not make it. Intermingled in the science and the intrigue around the science are some very personal memoirs, including how Brown met his wife Diane, and how their daughter Lilah figured prominently in his life when all this discovery was going on.

All in all, this is a very easy read, and an entertaining one. The copy I read was from Bookmark on Spring Garden Road, but I am sure it can be obtained in many places. And in fact, there is a copy in our library because my brother donated his.

Postscript

So what, exactly is a planet? According to the IAU, it is all the above – round by its own gravity, orbits the sun, isn't a moon – plus: "has cleared the neighbourhood around its orbit". Brown never tells us that last piece. That's what causes Eris, Ceres, and Pluto and its goofy sidekick Charon to be excluded. Charon is back to being a moon (so far), and the others merely "dwarf planets".

Brown explains: as a stuffed dog isn't a dog, a dwarf planet isn't a planet. Requiescat in pace, Pluto.



Here Goes Eros!

Dave XVII Chapman

Another near-Earth asteroid (NEA) is on its way! If you had no luck finding 2005 YU55 (or were otherwise occupied) on its very near, very quick, and very dim passage on the night of 2011 Nov. 9, you may have better luck spotting 433 Eros, arriving this winter and passing Earth on 2012 Jan. 31. But this space rock will be much easier to observe, and has a fascinating history as well. In fact, observing Eros will be a kind of time travel. Read on!

Compared with 2005 YU55, Eros will pass about 70 Moon-distances away (vs. $\frac{3}{4}$ Moon-distance), will brighten to magnitude 8.1 (vs. magnitude 11.1), and will be observable for several weeks (vs. one night!). Accordingly, the backyard urban astronomer should easily snag Eros, even with binoculars. It also moves fast, moving almost the angular width of the Moon in one

night, and the motion should be obvious over an hour or so (see *Observer's Handbook 2012*, p. 250). Observing Eros at closest approach would be a fun project for the visual or photographic amateur.

Discovered in 1898, it was soon realized that 433 Eros does not hang out in the usual asteroid belt between Mars and Jupiter. The semi-major axis of its orbit (1.46 au) has a value between that of Mars (1.52 au) and Earth (1.00 au) but its highly elliptical orbit (eccentricity = 0.223) makes it a *Mars-crossing* asteroid (maximum solar distance 1.78 au) at one extreme, and a *near-Earth* asteroid (minimum solar distance 1.13 au) at the other extreme. (See the diagram for a comparison of the 3 orbits.) In fact, Eros was the very first declared NEA, and is the second-largest known. Eros is moderate in size (34x11x11 km) and is naturally 4–8 magnitudes fainter than the “brightest” asteroids on p. 23 of the Handbook, yet on its rare very close approaches to Earth, it becomes as bright as magnitude 7.0!

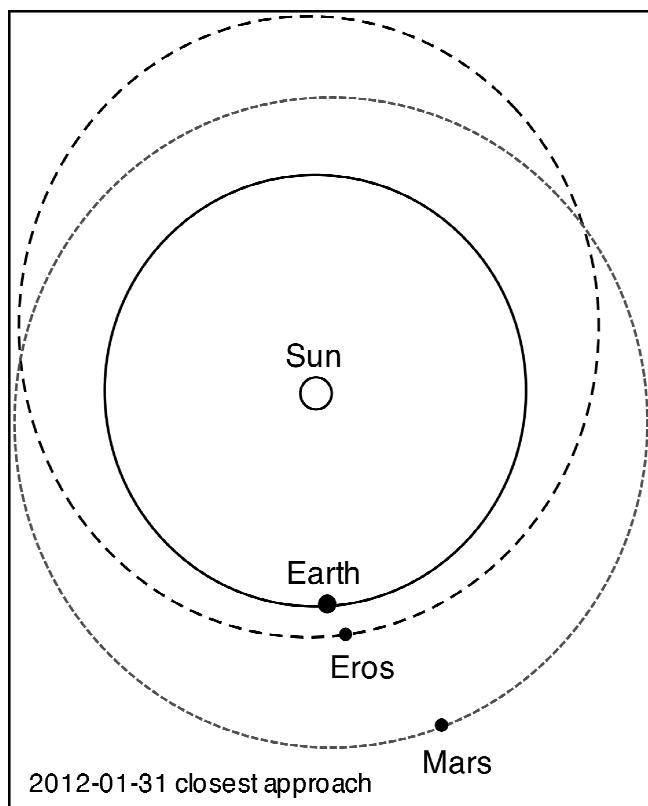
takes place on January 31, while opposition is not until March 1.

The modest 10.8° tilt of the orbit of Eros makes for exciting observing, as the asteroid passes through the plane of the Solar System very near its perihelion point. When Earth is nearby, as in 2012, Eros plunges through ~55° of declination from north to south past the Sickle of Leo over a couple of months, about 1 degree per day! (See the finder chart at:

dl.dropbox.com/u/17678378/Eros.pdf) The resulting path is more like a zig-zag than a classic retrograde loop!

Not every Eros opposition has a close approach, and there are some fascinating patterns. Close approaches have sequences of 37 and 44 years, and every 81 years (less 2.6 days!) the circumstances repeat themselves almost exactly. Since discovery, there have been notable close approaches of Eros in 1931 and 1975, and after 2012, the next will be in 2056. The upcoming opposition is almost identical to that in 1931, so observing Eros this winter will be like taking a time machine back 81 years to the first post-discovery close approach. I have before me an article by G. van Biesbroeck in *Popular Astronomy* from December 1930, entitled “The Coming Opposition of Eros” that almost could have served as this Nova Notes article, right down to the orbit diagrams and finder chart! (see tinyurl.com/cyxshf7)

I have thrown the reader a lot of facts in a short space, but I hope this article inspires some astronomical time travel and Erosian asteroid-hunting. I have some more fascinating Eros facts for the next edition, if the Editor grants me the space!



The revolution period of Eros is 643 days, close to $1\frac{3}{4}$ years. It has a synodic period (average time between oppositions) close to $2\frac{1}{2}$ years; however, the Earth-Eros distance varies widely from one opposition to the next, as does the time between oppositions, due to the highly eccentric orbit. The perihelion (nearest-to-Sun) position of Eros matches the position of Earth on its own orbit on January 17 each year (the lowest points of the orbits in the diagram), so oppositions of Eros near this date are close approaches; in 2012, the closest approach