Nova Notes

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

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Astrophoto of the Month *Leonid—Michael Boschat*

Here's a Leonid that appeared about 6:40 A.M. near Orion this morning, twilight was just starting in the east so I took a gamble to the west, the Moon was still a bit above the horizon but behind some cloud. And it was WINDY! A lucky catch.

Date: Nov.19, 2002 • Time: 1020 UT • Film: Kodak Gold 400 • Camera: Zenit-B with 50mm f/1.7 lens • Place: Roof of Dalhousie University

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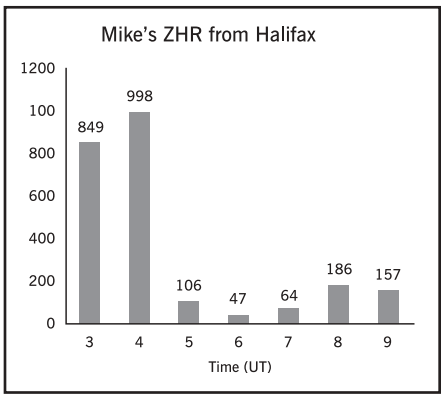

Here's the graph Mike provided for the Leonid ZHR (zenith hourly rate), based on his observations. See his full report on page 4.

As heard on hfxrasc@lists.rasc.ca...

If you're a member with email, why not become part of the Centre's email list? The list is a great resource for people looking for other members to observe with, for reminders of upcoming astronomical events, or for sharing information. Members who observe at St. Croix usually post a notice to say if they'll be out that night. Log on to our website (www.halifax.rasc.ca) to get signed up and you too could participate in lively intellectual discussions, or at least read them!

Does light have mass?

I thought of this one over the weekend as I was typing the meeting report.

We learned on Friday night of the duality of light: it is in the form of waves and also as particles of energy called photons. But we've all seen examples of gravitational lensing, which would imply so sort of gravitational attraction.

How can a wave or a bit of energy be attracted to another body? Does it not need mass? Or am I stuck in the Newtonian way of looking at things, and ignoring Einstein's general theory of relativity? If so, how does Einstein's theory explain it?

Who can help me see the light on this one?

- Pat D'Entremont

Does light have mass?

No, light isn't massive. Or at least a photon doesn't have mass. But I've read in articles where people like to refer to light as having "relativistic mass". What the heck is that? Well… as best I can tell it's a sort of mass based on E=hf (where h=Planck's constant and f=the frequency of the photon… I think this was covered in the presentation), and then people like to equate Energy to mass via Einstein's E=MC^2. Also people make the same argument but with relating a photons momentum to mass with p=mv.

As for gravitational lensing, isn't this caused by light traveling around the "dent" that a massive object puts into space-time… that is, light isn't attracted to a body through a gravitational effect, it simply travels in a straight line along space-time (like a marble rolling across a bed sheet) that has been curved by the result of a massive body on space-time (like if the marble encountered a bowling ball on the bedsheet it would just roll around the dip, or dent, that the bowling ball places in the bedsheet).

I need clarification here too. Someone help!!

– Graeme Hill.

Does light have mass?

Photons have no mass, in the sense of "how much would one photon weigh if you held it in your hand". For a start, "massless" particles move at light speed, so you would never catch up with one!

Mass in the sense of "momentum divided by the speed" depends on the speed of the object. This is not a particularly useful concept, but some people call it "relativistic mass". At low speeds, it is essentially the same as the inertial or "rest" mass.

In Newtonian mechanics, the acceleration induced by a gravitating mass (i.e. the Earth) on a nearby object (i.e. the Moon, and apple or a speck of dust) is independent of the object's mass. (This was in my article, Pat.) In the limit of vanishing mass (a photon) this would still hold true. According to Newton, a photon would undergo the same acceleration as an apple at the same point. That is, gravity bends light rays.

When Einstein looks at the same problem, he says that the gravitating mass warps spacetime (Graeme's bedsheet) and photons follow geodesics (i.e., "straight" lines). The principle is about the same, but Einstein comes up with a different answer for the refraction effect, larger than Newton's.

Arthur Eddington's measurement of the deflection of starlight passing near the Sun during a solar eclipse on 29 May 1919 was a crucial test of Einstein's relativity theory. Its success catapulted Einstein into international scientific celebrity status, where previously he was only only known in the world of physics.

There is an interesting story about this in the April 1994 issue of Nova Notes, written by yours truly.

– David M.F. Chapman

Editor's Note

This is just the start of what was to become a very long (about 30+ posts!) and very interesting email thread. These were the initial posts, to include the complete text of all the replies would have taken up this whole newsletter!

Nova Notes
The Newsletter of the Halifax Centre of the RASC

PO Box 31011
Halifax, Nova Scotia
B3K 5T9

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

Nova Notes is published bi-monthly in February, April, June, August, October and December. The opinions expressed herein are not necessarily those of the Halifax Centre.

"Letters to the Editor" or letters to our resident expert "Gazer" are also most welcome.

Contact the editor at the following:

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Nova Notes is also available as a PDF file on our centre's website at **www.halifax.rasc.ca**

Material for the next issue should reach the editor by Jan. 24

October 2002 Meeting Report

Pat D'Entremont

The meeting began right on schedule at 8 P.M. President Mary Lou Whitehorne began by welcoming the non-members visiting us, talking about the benefits of membership, and inviting guests to help themselves to our goodies. Only one thing: she has first dibs on the chocolate timbits.

The Great Canadian Railroad

Dave Chapman then proceeded to announce the newly arm-twisted nominated slate of executives. It was noted that there had not been an election since at least 1985, and unless new nominations come in soon, these people will go in by acclamation as well. The nomination committee of Chapman, Levine, and Evans came up with the slate shown at right.

RASC Halifax Centre Nomination Slate for Year 2003 Executive

President	Steve "Astroworks" Tancock
1st Vice President	Pat "Who Wants 2 be a Gazer" Kelly
2nd Vice President	"Professor" Pat d'Entremont
Secretary	Craig "Legs" Levine
Treasurer	Paul "Moneybags" Evans
Nova Notes Editor	"Slimeball" Michael Gatto
Nat. Representative	Dave "Dust" Lane
Librarian	Michael "Pops" Falk
Observing Chair	Dave "Just Married" Lane
Councillors	"Howling" Dave Chapman
	Andrea "Miss Universe" Misner
	Clint "Hydrogen Alpha" Shannon

Stars and Their Spectra

Our speaker for the night was Dr. Francis LeBlanc. Dr. LeBlanc is the President of the Moncton Centre, and he teaches Astronomy and Nuclear Physics at the Université de Moncton. The topic of his talk was Stars and Their Spectra.

All information arriving from astronomical objects is in the form of electromagnetic radiation, of which visible light is but a small part of the full spectrum. Electromagnetic waves cycle in space, which we call wavelength, and in the number of vibrations per second, which we call frequency. Wavelength times frequency equals the speed of light.

All electromagnetic radiation, not just visible light, can be observed. Light is really of a dual nature: waves, and particles of energy, which we call photons. Our atmosphere blocks some of this radiation, and lets in light in two windows: the optical window and the radio window. To study any radiation not coming through one of these windows, we need to go out in space.

Absorption Lines

The hotter the object we are observing, the more electromagnetic radiation it emits. Depending on the heat of a star, it will emit its maximum light at a different wavelength. That it why we see stars of different heat in different colours. Every star emits at all wavelengths. As energy of photons is transferred to atoms, light is absorbed. This happens at different wavelengths for different elements, and this way we can tell what elements are present in what stars.

Star surface temperatures give us unique absorption lines. The hotter the star, the bluer (e.g. Rigel), and the colder, the redder (e.g. Betelgeuse). We have documented several spectral classes – O, B, A, F, G, K, M – each with many sub-classifications. Depending on lines in the spectrum being absorbed, we can tell how hot a star is.

Spectroscopy

The study of a spectrum is called Spectroscopy. We can identify not only what elements are present in a star by its spectrum, but also density, pressure, temperature of its outer regions, stellar rotation, and the structure of its magnetic field.

What's Up?

Dave Lane gave us the scoop on the night sky. The upcoming observing session will start around October 29th. November 1 will be the next Member's Night at SCO, then December 6.

Venus has now sunk too low to be observed. However, Mercury is a good morning apparition, just before sunrise. Saturn is getting to be a mid-evening object, and Jupiter is two hours behind it. Mars is visible, but too small to be observable. ("Hey, you forgot Pluto," yelled some hecklers.)

Last Member's Night, there were 15 telescopes, so we are running out of room. A committee was therefore struck to decide what to do about this. Dave Lane, Craig Levine, Gary Weber, and Paul Gray are current member, but others are welcomed to join.

Dave also made an appeal for volunteers to guard SCO on Halloween night, and to run the Saturday night public tours at the Burke Gaffney Observatory at SMU.

Retire to the Fireside

The meeting adjourned at 9:54, with several people planning to meet at the TUNS parking lot, with a plan to talk more astronomy at the Fireside Lounge. ✯

The 2002 Leonids from Halifax

Michael Boschat

November 18th turned out to be a really lousy day, rain, overcast, and high northwest winds sometimes gusting to 90 km/hr. Was it going to clear for us to observe the last big Leonid shower for 100 years? — *nahhh* I figured, Murphy's Law was at play here. I turned on the radio to listen for some meteors and there was the odd one, nothing amazing yet, we still had 12 hours before first peak and any radio meteor rates would not increase for awhile, assuming we didn't hit a small clump before that.

I made 8 P.M. my "final" time decision to either go to the roof of Dal or just stay at home and listen to them. As the day went on the sky broke here and there and the Sun came out a few times… "Hmmm…" I said looking at some blue sky… "Old Murphy's Law is teasing us now with a bit of sunshine… making us think it will be clear." Yeah, I talk to myself now and then, and "Murphy" is my arch nemesis. Anyway the day went on and by 8 P.M. I decided to go down to Dal. I packed up my camera and other items and off I went. I met 2 "reporters" there one from the CBC radio and a journalism student from King's College. There were questions and replies, until one asked about ionization, aghhh!!! I went blank… I forgot what ionization was! I had to do the shameful thing and do a Google search!! uggg…

About 9:45 P.M. we went up to the roof and watched the fast moving clouds with some clear areas going over the Moon and giving a bit of sky. By 10:30 P.M. or so the CBC reporter left and the other reporter stayed a bit longer. Lo and behold the sky began to clear somewhat and I could see Orion and Jupiter. I saw my first Leonid earth grazer about 11:30 P.M. as it went from the southeast to southwest about 25 degrees off the horizon, it was whitish to me and about zero magnitude. By midnight the 1st peak had started but not many Leonids were noted. My results follow at the end of this article.

I began taking photographs while blocking the strong wind from knocking over my camera. I decided to take refuge on the east side of the observatory and shoot Orion for a few frames. As usual the clouds would come over the area and I decided to take a break. By 12:30 A.M. I went in to get warm and take a rest as a headache was starting up!

About 1 A.M. I went back up to the roof and just looked for a bit, slowly moving in a circle watching the sky and seeing Leonids. By 2 A.M. I took another break. I was up and down 'til 4 A.M. then decided to go all out 'til twilight. Up to the roof and a new roll of film in camera, it had cleared a lot by then and I decided to shoot at the radiant which was higher up near the meridian, a bit tough on the neck! But one Leonid made an appearance from the radiant. Next shot, then next with nothing, I was shooting from 30 seconds to one minute or a tad more. Sometimes I would get distracted by a Leonid as I was counting the exposure time and it would run a bit longer.

By 6 A.M. twilight was coming and I was amazed at how bright Venus was over in the southeast twilight with Mars and Spica, very nice! I decided to shoot towards Orion in the southwest and the Moon had been covered by some clouds – as usual. I made an exposure and a Leonid went in Orion, got that for sure. Then wound to the next frame, "click" and lock taking a time exposure and counting 1001… 1002… etc. for a 30 sec exposure but was distracted by 2 Leonids at one time. As I turned back ready to stop exposing a –6 Leonid with a small terminal flare appeared to the right of Orion. I stopped the exposure and looking through the camera field figured I missed it. I tried to wind the film but that was it my last exposure. I took one last look around and called it a night.

Arriving home just before 7 A.M. I turned the meteor radio on and it was just going wild with meteor pings! I listened for a few hours 'til the rates slowly dropped below 300/hr! Eventually I decided to get the 2 rolls of film developed at the SuperStore's one hour processing. Going back and getting the prints I saw I had indeed captured that –6 Leonid! talk about luck… I looked at the other Leonids, faint, but nonetheless I had captured 4 on film and from the city that's not too bad.

I just looked at the print and though, "You tried to get me this year Murphy… ya tried but didn't."

My results for the November 18/19, 2002 Leonid Meteor shower

Date: November 18/19, 2002
Begin: 03:00 UT
End: 10:50 UT
Observer: Michael Boschat
Location: Halifax, Nova Scotia, Canada
Recording Method: Eye

Start	End	Lim. Mag.	Leonids
03:00	03:30	4.0	3
04:00	05:00	4.0	21
05:00	06:00	4.0	4
06:00	07:00	4.5	4
07:00	08:00	4.5	7
08:00	09:00	4.0	15
09:00	10:00	4.0	14

Total Leonids observed 68

Mike Boschat ✯

Various Leonid Reports

I stationed myself on the back deck of my house, hiding from both the wind and the moonshine. That left me with less than half the sky to look at. The clouds were puffy, luminescent, and fast-moving. The winds raged through the trees. Large holes permitted intermittent viewing. Between 11:45 and 12:00 I counted 3 Leonids, 2 very bright, and one rather faint. One of the bright meteors zipped through (above?) two holes, adding a bit of excitement to the event. The first of the night, the brightest, left a train not far above the NE horizon. It was the only train I saw all night.

The wee-hours stint began under essentially open skies. Between 4:30 & 4:50 I counted – again from my sheltered location – 13 meteors. 12 could be traced back to Leo, but one, swimming against the current, was heading towards Leo.

It might well have been from one of the Taurid showers.

Not a storm, but a nice shower. The expectancy, the uncertainties, the Wuthering Heights rage of nature, and the meteors themselves all contributed to make the night memorable.

Walter Zukauskas

Just before midnight things didn't look good so I went to bed. Around 4:00 A.M. I got up and to my surprise saw a completely clear sky. I came to the computer and contacted Graeme to see if he wanted to head to SCO, while I waited for a reply I went outside. My first Leonid was a fireball above the southern horizon. At approx. 4:45 I saw Graeme's reply and headed right over to pick him up. We decided to head toward Lawrencetown.

We ended up at the "tea house". The tea house sits out on a point between two beaches high on a hill. We set up just below the crest of the grassy hill using the tea house as our moon and wind block. The skies were completely clear above with some cloud low on every horizon. The roar of the surf washing up on the two beaches far below on either side of us was almost deafening at first. I likened it to the sound of a jet on take off. As soon as we sat back in the reclined chairs (with the grounds slope adding to the angle perfectly) the sense of sound quickly became second to the sense of sight. One of our first sightings was a very bright Leonid low in the South. We enhanced the show with some casual conversation of aurora's and glider flights over the rocky mountains. We wondered how wide and how long does the lighted streak of a bright meteor actually measure.

As dawn crept over our shoulders and the patch of black sky directly above became smaller and smaller we were seeing only the bright ones. The sun lit up the ring of clouds low on the horizon and we knew we were done. Before we left we climbed the 20 paces to the crest of the hill to see where we were… we stood speechless… this made-in-Nova Scotia observing sight was every bit as beautiful in the light of dawn as it was under the streaking night sky. The wind howled, the enormous waves crashed like thunder and we walked off satisfied with the memories of our last great Leonids shower.

Sergio Grbac

Toward midnight Monday the sky was about 50% clear at Avonport with big fluffy clouds blowing past. There was very little activity prior to 12:00, so at that point I took a nap to be ready for the second peak (I had given a talk that evening and my batteries badly needed re-charging). Sherman Williams reported a dozen or so meteors centred around 00:20 (AST), the first "peak".

By 4:30 the sky at Avonport was entirely clear. Anticipating a party at SCO, Sherman and I drove to St. Croix (while watching meteors out the car windows) only to discover that our arrival had increased the number of observers there by 300%. (Barry Burgess was already there with two cameras.) The question in our minds was: With the last big Leonid peak imminent and a clear sky, WHERE WAS EVERYONE?

We opened the roll-off, sat on chairs, and counted meteors from 5:30 until 6:45 A.M. Before dawn interfered significantly, Sherman and I counted 84 meteors, the average rate being about 120 per hour with a noticeable peak between 5:45 and 6:00. The brightest meteor (at 6:09) was about mag -7 low over the water to the southwest of the observatory (Barry thinks he has it on film). The sky was mostly clear (a few small clouds were always in sight) until about 6:15 when the percent of clear sky fell from 90% to about 30%, but by then dawn was interfering too.

We could hear the cold north wind in the tree tops but it was sheltered and quite pleasant at SCO.

At 7:08 A.M. (11 minutes before sunrise) on the drive back to Avonport we saw a fireball low in the NW.

The 2002 Leonids were a good shower, but inferior to those of 2001 and especially the fireball mini-storm of '98. And once again, SCO provided clear skies!

Roy Bishop

Yes the Clear Sky Clock was bang on (again). The Musquodoboit Clock predicted clearing at 5 A.M., so I didn't have much hope for the first peak. I went out a little before midnight and saw only small holes in the clouds, wonderfully illuminated by the bright moon.

Like Graeme, I tried listening for the peak activity inside, but also had very poor success.

I got up at 04:30 to clear skies and bright stars (haven't seen them in ages). Bundled in many layers I headed out and set up in the front yard, shielded from the moon by tall trees and the house. The sky was clear with occasional small puffs of cloud ripping by on the icy wind. There I lay on the deck, slowly freezing to death and enjoying the show.

The morning peak was really quite good, in spite of the bright moon. Right on schedule there was a remarkable burst of activity between 05:50 and 06:00. Though the moon and advancing twilight was washing out the fainter meteors, there were some spectacularly bright meteors low in the south and east. The peak rates I observed were between 05:40 and 06:00 at 100-120/hr. All in all, cold but worth getting up for.

Calum Ewing

I just woke up at 2:30 P.M. after getting back from New Brunswick at 9:30 A.M. this morning. We had an Excellent night in Memramcook NB where the skies were clear and crisp. The sky clock was bang on again and we saw the first peak, observing from a secluded area about 5km off the main highway in some kind of woodlot/farming field with great horizons. We had high winds and cool temps of -10ºC and windchill I think about -15 to -20 with gusts but we had a nice stand of trees to shade us from the wind and moon's light. We had a couple of calls from BBC London (England) on the cellphone and they wanted to know what we were seeing and what conditions were like. Dave talked to them while we exclaimed "WHOOOOOOOAAA!" in the background as meteors came down.

The first peak we saw nice rates. Paul H, Dave and Paul Gray have their counts which were in the 100 per hour range. We took a break after the sharp decline in the first peak and went into Moncton to search out a Tim Horton's. It was 2 A.M. and Tim Horton's in NB just don't remain open like they do in NS as we drove past many closed ones!! We finally found a "drive through only" Tims and filled up on hot chocolate and coffee, getting prepped for the next round of meteors to come near dawn. We headed back to our site, via Dave's navigation with a GPS. We could have found it by remembering it but it was cool to use a toy to get us there regardless :)

We got back about 3 to 3:30 A.M. and started observing again. Not too many spectacular ones but we did have an estimated –6mag or brighter one that cast blue shadows on the ground as it terminated. That was the best one we saw so far and wanted more, and the shower gave in and we steadily got increasing rates into the 40's, 50's and upward. Towards 6 A.M. the rates were the highest of the night with Dave, Paul and Paul all counting well over 200/hr with meteors coming bunches of 3, 4 and 5 at a time. (I hope these are correct guys, as I am barely awake writing this). Dawn was creeping up on us, Mars was well up, Venus rose and the pinkish, yellow, blue sky grew more as the time went on. I had been taking photos of the peak while standing there looking up and just taking it all in. CBC Radio had asked me to do live "on location" reports for them and sent me off with a cell phone. It was soooo tempting to say "HI! Kermit the frog here for Sesame Street news" but I held back and received calls from CBC Radio Moncton and Halifax and gave them a report on what we had seen and what conditions were like and why we drove to NB to see it. Was fun to do and was grateful for the opportunity.

This would be the last time I'd see this many Leonids in one observing session. It wasn't the storm we had expected but nonetheless it was a great showing and I'm glad we made the drive to NB to see it. A once in a lifetime event well worth the effort to see.

I'm sure I am missing some details that Dave, Paul and Paul will no doubt bring up. Paul Heath wiping out in the snow 2 times was funny, while we all had our laughs and fun. Dave had a tape recorder and was timing meteors via time signal, Paul H. was counting using pen and paper and Paul was using a video camera to see what he could record as well counting meteors also. I didn't count, I just looked up and took it all in.

Darren Talbot

I was out from 4:45 to 5:15, then 5:30 to 6:00. The best showing was between 4:45 and 5:00. On average, I counted about 1 bright meteor per minute. I am sure there were more, but the moon, street lights, and a swaying tree continually setting off three neighbouring motion-sensor lights were hampering my viewing. There were a couple of mini-bursts that I saw. One around 4:50 with nine meteors within 15 seconds, then four bright ones within seconds around 5:35. The clouds started rolling in around 6:00.

I was happy to see anything with the crappy weather we have been having the past couple of weeks :)

Johnny McPherson

Astro Ads

For Sale by the Centre

Celestron Ultima 8" Schmidt-Cassegrain Telescope

- excellent condition
- includes deluxe tripod and wedge, DC-powered R.A. drive, deluxe carrying case, Telrad and 50mm finders, 1.25" star diagonal, 35mm B&L and 15mm RKE eyepieces, and Celestron 2x Barlow.

SOLD!

Asking $1,300.00

Contact Dave Lane at 826-7956 or dave@nova-astro.com

The St. Croix Observatory

The St.Croix observatory. Pictured from left to right, the RASCan, the warm room and the roll-off roof observatory.

The roll-off with the roof partially open.

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.

Members' Night

Every weekend closest to the new Moon there is a Members' Night at St. Croix. The purpose of members' night is to attract members from the centre to share an evening of observing with other members. It's also a great night for beginners to try out different scopes and see the sky under dark conditions. For more information or transportation arrangements, please contact the Observing Chairman Dave Lane at 826-7956. *Dates for Members' Nights for the following few months are:*

Fri. Jan. 31st *(Rain date, Sat. Feb 1st)*

Fri. Feb. 28st *(Rain date, Sat. Feb. 29nd)*

Directions from Halifax

(from Bayers Road Shopping Centre)

1. Take Hwy 102 (the Bi-Hi) to Exit 4 (Sackville).
2. Take Hwy 101 to Exit 4 (St. Croix).
3. At the end of the off ramp, turn left.
4. Drive about 1.5 km until you cross the St. Croix River Bridge. You'll see a power dam on your left.
5. Drive about 0.2 km past the bridge and take the first left (Salmon Hole Dam Road).
6. Drive about 1 km until the pavement ends.
7. Drive another 1 km on the dirt road to the site.
8. You will recognize the site by the 3 small white buildings on the left.

Become a St. Croix Key Holder

For a modest key fee, members in good standing for more than a year who have been briefed on observatory can gain access to the St.Croix facility. For more information on becoming a key holder, contact the Observing Chairman Dave Lane at 826-7956.

RULES FOR THE 17.5" SCOPE

On Members' Nights the 17.5" scope must be shared by all members. The 17.5" scope can be used by anyone, but all views have to be shared with anyone interested in taking a look.

On non Members' Nights the scope can be used by individuals wishing to work on personal observing projects. Members should try to limit their use to under 45 minutes when other members are waiting to use it. Preference will be given to members who send an email to the hfxrasc list, or call the observing chair on the night they want to go out. If no one else wants to use the scope then feel free to use it all night, but it would be considerate every so often to ask members there if anyone has been quietly waiting to use it.

Please contact the Observing Chairman Dave Lane for more information or to book the scope at 826-7956.

Meeting Announcements

Halifax Centre of the Royal Astronomical Society of Canada

December 13

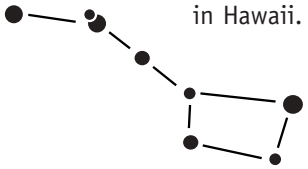
"All I Want for Christmas is a Mini Black Hole."

No, it is NOT a chocolate Timbit! Blair MacDonald will be speaking all about black holes for the beginner. Bring your questions and be prepared for lots of entertaining discussion.

January 17

"The Skies of Mauna Kea."

In April of 2002, five Halifax Centre members traveled to the Big Island of Hawaii to observe from the summit of Mauna Kea. This talk will be presented by four of the five observers. It will fill you in on what they did, how they did it, and why they did it. There may even be some mention of the non-astronomical fun they had in Hawaii. Speakers: Dave Lane, Roy Bishop, Bill Thurlow, Mary Lou Whitehorne.



Meetings begin at **8:00** P.M.

Members of the general public are welcome.

All members—but especially new ones—are invited to come to the meetings 20 - 30 minutes early to participate in our new informal "Meet and Greet". It's a chance to ask questions about astronomy, the RASC, memberships, or to just say hello.

Room 176 Loyola Building
Saint Mary's University *(See Map Below)*

The Halifax RASC Executive meetings begin at 7:00 P.M., and members are welcome to attend.

Halifax RASC Executive 2002

Honorary President	Dr. Roy Bishop	
President	Mary Lou Whitehorne	865-0235
1st vice-president	Pat Kelly	798-3329
2nd vice-president	Steve Tancock	465-4092
Secretary	Craig Levine	852-1245
Treasurer	Paul Evans	423-4746
Nova Notes Editor	Michael Gatto	453-5486
National Representative	David Lane	826-7956
Librarian	Dr. Michael Falk	422-5173
Observing Chairman	Dave Lane	826-7956
Councilor	Clint Shannon	889-2426
Councilor	Dave Chapman	463-9103
Councilor	John Jarvo	897-0529

Meeting Location

Meetings are held every third Friday of the month, except for the months of July and August. Meetings take place in room 176, Loyola Building (#3 on map) at Saint Mary's University.

1. *McNally*
2. *Sobey Building*
3. ***Loyola Academic Complex***
4. *Loyola Residence*
5. *Patrick Power Library*
6. *Science Building*
7. *Burke Building*
8. *Bookstore*
9. *Alumni Arena*
10. *The Tower*
11. *Rice Residence*

P = Parking