Orbit

The Official Publication of the
Hamilton Centre of the
Royal Astronomical Society of Canada

Volume 44, Issue 3: January, 2012

Issue Number 3, January, 2012
Roger Hill, Editor

As I noted last month, the changes in the Hamilton Centre were coming thick and fast.

Change, however, is not a synonym for progress. For instance, the new Facebook page is having a good effect, as more and more people are connected in to what's going on. The Yahoo! Group has some good and interesting stuff in it, although there appear to have been a challenge or two with the calendar functionality, but I'm sure that Gary Bennett will soon have this resolved.

One of the things we have to be wary of with the Yahoo! Group is that membership does not require approval and neither do the messages, and all members can post messages. So, when you post there, make sure that you don't post anything you don't want the entire world to see.

We've also go all sorts of events coming up in the near future, but one of the ones that should merit special consideration is the one called Armchair Astronomy.

The Hamilton Centre has a fair number of active observers and astrophotographers, some of whom have been in the hobby for decades, and others who are relative newcomers. Many of the activities of the centre revolve around these major interests, along with public outreach events like Sidewalk Astronomy, the Westfield nights and the Burlington Seminars. However, there is a side to the hobby that is not addressed as often.

One of the things that drew me, and others, into the hobby were things like Cosmology, astronautics, robot explorations, and the like. In other words, the sorts of things you don't need a telescope for. In fact, we often have speakers who's topics include such subjects, but the discussion rarely goes further.

When I first joined the Centre over 40 years ago (egad!), there were meetings of one kind or another virtually every week, and one of the most fun were the ones that went by the title of Discussion Group. The format was that someone (a volunteer) would select a topic and talk about it for 10 or 15 minutes. This would (hopefully) spark a good discussion or even the occasional heated argument, and sometimes not. I seem to remember one about pulsars and what they really were: some of us were really hoping they'd turn out to be interstellar beacons, but arguably the reality was far stranger (if not quite as exciting). I remember Derek Baker talking about science, and what makes a theory a scientific theory.

What sparked this was that I met a couple of guys at the Burlington Seminar in the Fall who knew far more about Cosmology than I did, and it was just something that I glossed over. Thinking about it, I realized that there was no forum for people like them in the Centre, and it was something that I wanted to learn more about. Was I the only one? Possibly, and possibly not, but the Board thought it might be worthwhile finding out.

So, the first one will be on Tuesday, January 10th, starting at 7:30pm. The calendar, however, does not state the location. Not that this matters much to me, because, as luck would have it, I'll be away floating around the Caribbean that week.

Anyway, it should be good fun!

Until next month,

Roger Hill

.Presidents Message—Andy Blanchard

I hope you all had a happy and safe holiday season. December was very busy for the club. We had a swap meet at our monthly meeting, and Brady and Brian from KW Telescopes provided an excellent presentation on narrow band filter photography. Our public outreach program was on overdrive. I will leave it to Mark to provide the details. I did attend the last of the three nights at Westfield and we provided hundreds of children and parents with a wonderful view of Jupiter.

The board voted unanimously in favor of reintroducing our annual banquet. I am pleased to announce our guest speaker will be Terrance Dickenson on June 9th, the same day and location of our first Ontario Astronomy Swap Meet. The location of the banquet will be the Holiday Inn at Bronte and QEW, and the format will be an all you can eat buffet. The price will be $50.00 per person and that includes your admittance to the Swap Meet. The libations will be a cash bar and the attire for the men tie and jacket, and for the ladies appropriate dinner wear. There will be of course awards, and prizes. The banquet will be open to all of our sister RASC clubs and other local astronomy enthusiasts'.

I have taken on the role of program director for the moment, but I am asking for someone to step forward to take on this role. The program director is responsible for ensuring all of the calendar programs have speakers or hosts. To also ensure the programs happen as scheduled and then report each month on past and future events to the board and membership. Very little time is required, and most of the work has already been done. This is a great opportunity to get involved and experience a lot more fun that the club can offer you.

We have added a new programmed event to the calendar starting in January. Armchair Astronomy is actually an old idea that worked well in the past but drifted away for reasons unknown. Each event will have a host and a topic, the concept is to come out and discuss the current months topic, and let the conversation take its own direction. A fun night of astronomy discussion with friends sounds like my kind of way to spend a full moon night!

Be sure to join us on Jan 5th 2011 at our general meeting. Our guest speaker will be Dr. Mike Reid: "The Big Controversy over the Big Bang" a topic sure to interest everyone in the club.

The best I guess is for last, we have secured two shows at the planetarium in Hamilton for the March Meeting. The seating is very limited and if the past is an example we have always been oversubscribed. There will be one show at 7pm and a second one at 8:30. The costs of the seats are $15 per person and available until the 31st of January, and will be open to just Hamilton RASC members and their families. After that we will offer the seats to our sister clubs and their families.

Also don't forget to come out to the observatory on Jan 1st 7pm to 10pm for the third annual Blanchard Levee. Lots of food and friends, and as in the past this is a social event to welcome the new year we promise to our better half's, no astronomy discussions are allowed. This year we will have a master at arms who will fine the offenders and the proceeds will go to the clubs coffers. So I do recommend a pocket full of $2 coins, as I am sure we will all slip once or twice. Come out and eat, drink and socialize with your friends.

Happy New Year everyone

Andy Blanchard
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Report from the Board: Program Director—Mark Pickett

There were three Christmas Nights at Westfield in December. The first, on the 3rd, was cloudy at the start, and Peter Lloyd and I didn't set up the Bell telescope. Of course, by 7:30 it was clear, but it was too late for observing!

The next two events were excellent. On the 10th of December, Rick Cudmore and I manned the Bell telescope and the Marsh mount. On the 17th, Andy Blanchard and I did the same. About 250 people each night were treated to Jupiter and the four moons. Most people were amazed to learn the telescope was 127 years old! The staff at Westfield all heard about the scope from various people leaving the event, and it was really quite special to see the excitement.

The Outreach Committee gained a lot of members this month, and we will have a first meeting to lay out the plans for 2012. The meeting will be in the next few weeks.

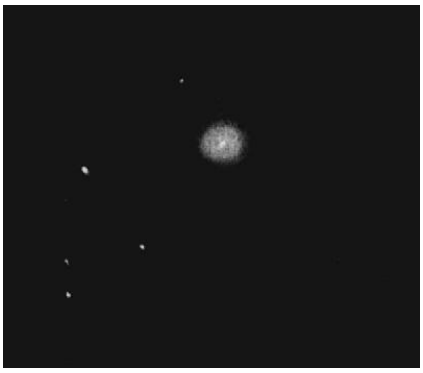
Smackdown: 200" telescope vs. 5" Takahashi...

There was some discussion a little while at the Board level about Orbit. One of the things that Andy did was to scan in the very first issue. The intent at the time was to produce it quarterly, but it didn't take too long before Orbit was published 10 times a year...a schedule that has been maintained for the past several years.

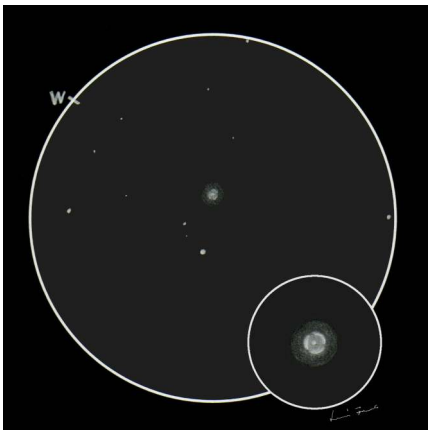
Anyway, one of the things in it that caught Gary Colwells eye was a statement about a photograph of the Horsehead Nebula taken by the 200" Hale telescope at Palomar Observatory: " *We amateurs cannot hope to approach or even duplicate the work done by this magnificent telescope*" . So, Gary took a look through his archives, and came up with one that he'd taken with a 5" Takahashi. The two pictures are produced below, as much as possible at the same scale.

Winter Observing: Nebulous Treasures—Mike Ducak

As we enter the winter months and frost settles over our telescopes, amateur astronomers are presented with unique challenges but also unique opportunities. Our attempts to ward off the cold and keep our lenses from fogging up are rewarded as the great hunter Orion and his famous nebula ascend into the south-eastern sky. It is not an overstatement to say that M42 is the most magnificent of deep-sky objects. It can be appreciated well at low power and reveals startling detail at high power, especially when a nebula filter is employed. It is a mind-bending experience to observe wispy clouds similar to those in Earth's lower atmosphere, but at a distance of over a thousand light years.



But M42 is not the only nebulous treasure awaiting those who brave the winter chill. Below the feet of Orion in the constellation Lepus, forming a shallow isosceles triangle with stars Saiph and Rigel, is IC 418, commonly known as the Spirograph Nebula. Granted, this is a tough one to find by star-hopping, since the nebula is small and bright and hardly distinguishable from surrounding stars at low power. Only at powers over 100x does the disc shape become apparent. Careful star-hopping from Rigel should get you in the vicinity, however, and once there you can boost the power to zero in on the nebula. For anyone wondering where the term "planetary nebula" comes from, this object will make it obvious. Almost spherical in appearance, the Spirograph does indeed resemble a ghostly planet, except rather than a well-defined edge, IC 418 shows a bit of fuzziness along its perimeter. Once you find the nebula, don't be afraid to crank up the power. Use neighbouring stars to achieve optimum focus, because focussing on an inherently fuzzy object is difficult at high power.



Once you've had your fill of IC 418, scoot over to the neighbouring constellation Gemini, which lies just west of Orion and is marked by the bright star pair Castor and Pollux. The target here sits beneath the twins, specifically under the star Wasat (delta Gemini). It is called NGC 2392, and is fittingly referred to as the Eskimo Nebula. Indeed, you might be bundled like an Eskimo when searching for this object but your preparations will pay off when you find it. This planetary nebula resides just below fifth-magnitude star Gemini 63, and is paired with a seventh-magnitude star. You might mistake the pair for a binary system, until you notice that one star looks a little bloated. Ah ha! Magnify this "star" and you will quickly see that it is not a star at all. 2392 is one of the sky's finest planetary nebulae. Use a nebula filter if you have one, and as much power as you can. At 360x in my 8-inch reflector the nebula clearly displays a mottled structure. Under good conditions you can discern separate inner and outer shells of gas; you may see the central star, and even get a hint of the filaments of super-hot gas propelled outward by stellar wind. Larger apertures will reveal more detail; averted vision may also help. This is an object that one can spend considerable time on, since you always get a sense that there is more to be seen. It is a good idea before you set out to look up pictures of these objects on the Internet or a book featuring Hubble photos; visual details will be more easily attained if your mind has an image of the object to start with.

In the winter, more so than at any other time, preparation is crucial. Be sure to bundle up before you head out for a nebula-hunting session. Long underwear and thick socks will help ward off the chill. You'll also want gloves thick enough to keep your fingers from freezing while still allowing you to handle your precious eyepieces without dropping them in the snow. Some astro dealers sell hand-warming pads but I can't vouch for their effectiveness. Finally, try to keep your lenses covered when not in use to keep them free of frost, especially if you don't have the luxury of dew heaters.

Happy hunting in 2012!

Record-breaking black holes discovered; U of T astronomer on international team

Author: Kim Luke; from the University of Toronto's U of T News

An international team of astronomers has discovered two gigantic black holes with masses about 10 billion times the mass of our sun. These black holes have a mass more than 50 per cent greater than any other previously measured. "They may be the dormant remains of quasars that were extremely luminous billions of years ago," said Professor James Graham, director of the Dunlap Institute for Astronomy and Astrophysics at the University of Toronto and founding member of the team behind the discovery.

A black hole is a region of space that has so much mass concentrated in it that there is no way for a nearby object to escape its gravitational pull. The masses of black holes are measured by figuring out how strong their gravity is. More mass means more gravity and a stronger effect on stars that orbit in the galaxies that they inhabit.

Using several telescopes − the Gemini Observatory, the MacDonald Observatory and the Keck Observatory – the scientists measured the speed of stars orbiting in these galaxies, thereby measuring the strength of the gravitational field of the black hole.

"Black holes inhabit the centres of nearly all galaxies − the centre of our very own Milky Way galaxy harbours a black hole four million times the mass of the sun − relatively speaking, a baby! But only a few dozens of these black holes have been 'weighed' carefully," said Graham.

"We believe that 10-billion solar mass black holes like these are the ultimate power sources for the distant quasars observed in the early universe, one to three billion years after the Big Bang," he said.

Quasars are among the brightest phenomena in the universe, emitted by material whirling around and falling into the black hole at the centre of a galaxy. The more massive the black hole, the more powerful the quasar can be.

More recently, quasars have toned it down: the ones closer to home are not nearly as luminous as those of 10 billion years ago. The light coming from the two galaxies the team observed shows them as they were less than half a billion years ago. No quasar there, but black holes massive enough to have powered extremely bright quasars several billions of years earlier.

"Our measurements of black holes with 10-billion solar masses in nearby galaxies show that these types of galaxies originally hosted very luminous quasars," said Graham. "For the last 10 billion years, these enormous black holes have been dormant."

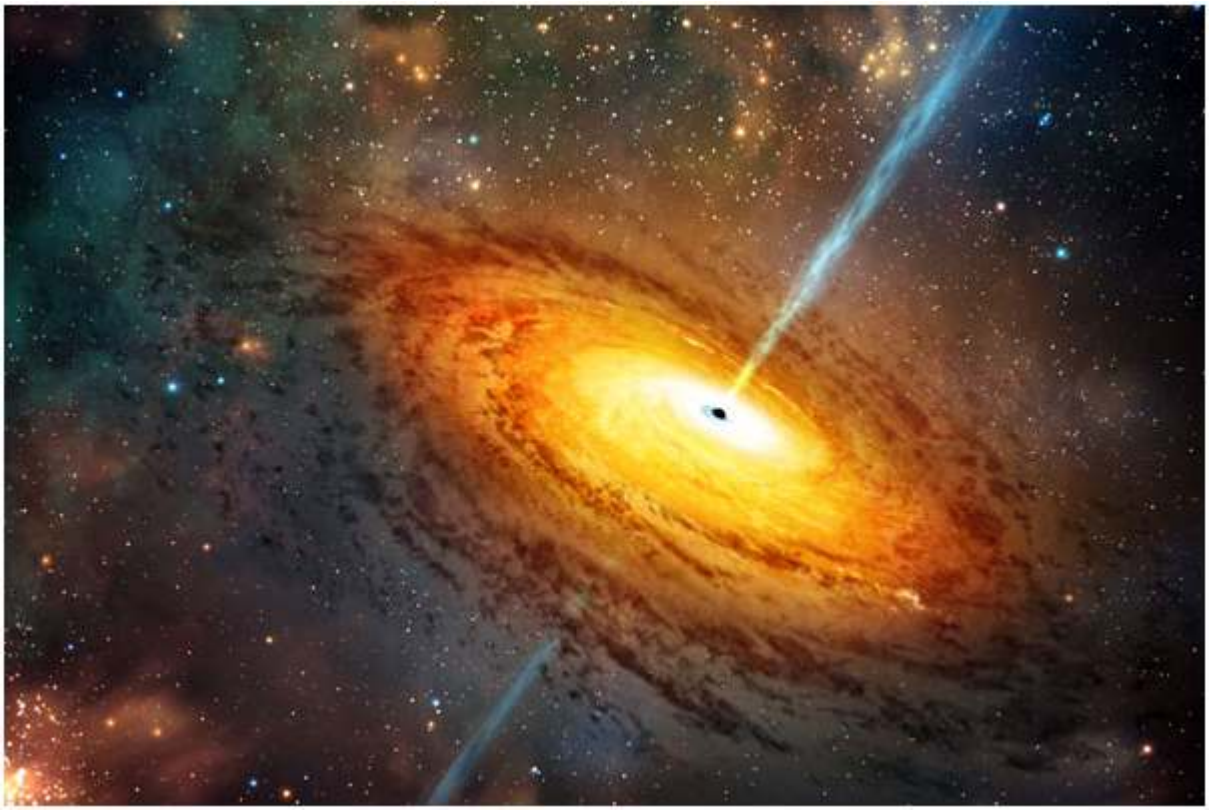
To look for such massive black holes, the team turned their telescopes toward giant galaxies since there appears to be a tight correlation between properties of the host galaxy and the mass of its black hole. This key piece of evidence helps scientists piece together how galaxies and their central black holes form and grow. The correlation suggests there is a sort of feedback between the growth of the central black hole and the formation of the stars that eventually comprise the central region of the galaxy.

"But these newly measured black hole masses are a surprise," said Graham. "They are significantly more massive than predicted using the previously known correlations. Something that we had not anticipated for the most massive black holes must be at play here."

Graham's research career includes an impressive list of astronomy firsts. He discovered the first disk of asteroidal debris orbiting a white dwarf star. He made the first images of the binary black holes in the ultra-luminous galaxy Arp 220. In 1994, he was a member of a team which made one of the first definitive identifications of a brown dwarf in the Pleiades open cluster, an accomplishment that was also one of the first important discoveries made using the Keck telescope. In 2008, he and his Berkeley colleague Paul Kalas discovered Fomalhaut b, the first exoplanet seen with visible light. Captured by the Hubble Space Telescope, the image was named one of the 10 biggest scientific breakthroughs of all time by Time magazine. Currently, Graham is working to detect many more planets by direct imaging. He is the project scientist for the Gemini Planet Imager, a highly advanced adaptive optics instrument at the Gemini Observatory in Chile. The black hole research will be published in Nature on Dec. 8.

The illustration and Nature paper are available here. Watch the Dunlap Institute's video.

Other members of the international team include lead authors Chung-Pei Ma, Nicholas McConnell, a former student of Graham's, and Shelley Wright, all of UC Berkeley (Wright will join U of T in January 2012). Research was supported by the National Science Foundation, the Hubble Fellowship, NASA, and the Miller Institute for Basic Research in Science at UC Berkeley. The Gemini Observatory is operated by the Association of Universities for Research in Astronomy, Inc. under a cooperative agreement with National Science Foundation on behalf of the Gemini partnership.



An artist's impression of a supermassive black hole, with matter falling into it rotating as a disk heating up in its centre, and two jets of relativistic particles emitted along the axis. Some gas and stars from the surrounding galaxy are visible in the background.

Dawn Takes a Closer Look By Dr. Marc Rayman

Dawn is the first space mission with an itinerary that includes orbiting two separate solar system destinations. It is also the only spacecraft ever to orbit an object in the main asteroid belt between Mars and Jupiter. The spacecraft accomplishes this feat using ion propulsion, a technology first proven in space on the highly successful Deep Space 1 mission, part of NASA's New Millennium program.

Launched in September 2007, Dawn arrived at protoplanet Vesta in July 2011. It will orbit and study Vesta until July 2012, when it will leave orbit for dwarf planet Ceres, also in the asteroid belt.

Dawn can maneuver to the orbit best suited for conducting each of its scientific observations. After months mapping this alien world from higher altitudes, Dawn spiraled closer to Vesta to attain a low altitude orbit, the better to study Vesta's composition and map its complicated gravity field.

Changing and refining Dawn's orbit of this massive, irregular, heterogeneous body is one of the most complicated parts of the mission. In addition, to meet all the scientific objectives, the orientation of this orbit needs to change.

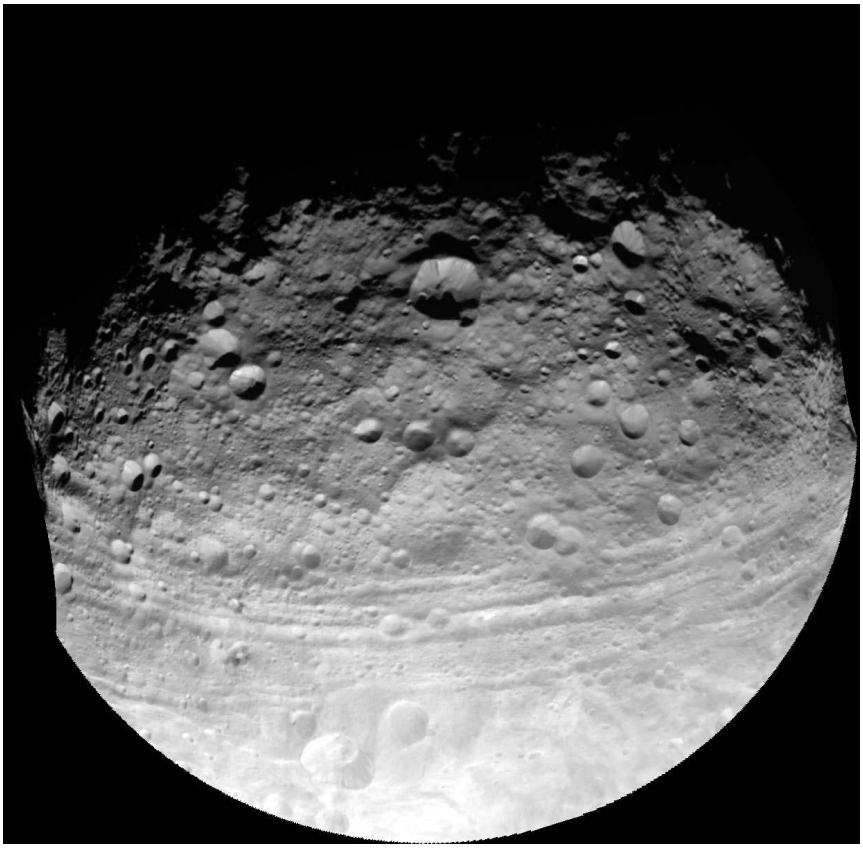
These differing orientations are a crucial element of the strategy for gathering the most scientifically valuable data on Vesta. It generally requires a great deal of maneuvering to change the plane of a spacecraft's orbit. The ion propulsion system allows the probe to fly from one orbit to another without the penalty of carrying a massive supply of propellant. Indeed, one of the reasons that traveling from Earth to Vesta (and later Ceres) requires ion propulsion is the challenge of tilting the orbit around the sun.

Although the ion propulsion system accomplishes the majority of the orbit change, Dawn's navigators are enlisting Vesta itself. Some of the ion thrusting was designed in part to put the spacecraft in certain locations from which Vesta would twist its orbit toward the target angle for the low-altitude orbit. As Dawn rotates and the world underneath it revolves, the spacecraft feels a changing pull. There is always a tug downward, but because of Vesta's heterogeneous interior structure, sometimes there is also a slight force to one side or another. With their knowledge of the gravity field, the mission team plotted a course that took advantage of these variations to get a free ride.

The flight plan is a complex affair of carefully timed thrusting and coasting. Very far from home, the spacecraft is making excellent progress in its expedition at a fascinating world that, until a few months ago, had never seen a probe from Earth.

Keep up with Dawn's progress by following the Chief Engineer's (yours truly's) journal at http://dawn.jpl.nasa.gov/mission/journal.asp. And check out the illustrated story in verse of "Professor Starr's Dream Trip: Or, how a little technology goes a long way," at

http://spaceplace.nasa.gov/story-prof-starr.



This article was provided courtesy of the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

SN 2011dh—A nice supernova!

There were a couple of good events, astronomically speaking, for me in 2011. The second of them, the final launch of the Space Shuttle, was extensively covered in the September, 2011, issue of Orbit.

The other one, though, was the supernova in M51. This was the second supernova I'd seen, or detected, in M51. There have been three in the past 17 years (1994, 2005 and 2011), which is really a lot for a galaxy that should average one every forty years or so.

It was discovered by a couple of guys in France. They'd taken the image late on May 31, but did not get around to checking their images and asking for verification until June 2nd. Richard Huziak, in Saskatchewan, is a keen variable star observer, and he asked if anyone knew how to get in touch with a guy in KW, who, he knew, had posted an image of M51, taken on the evening of June 1st (the very early hours of June 2nd UTC).

I realized that I'd taken a few two minute exposures of M51 as well, that same evening, but I'd moved on to other targets when it had disappeared behind a tree.

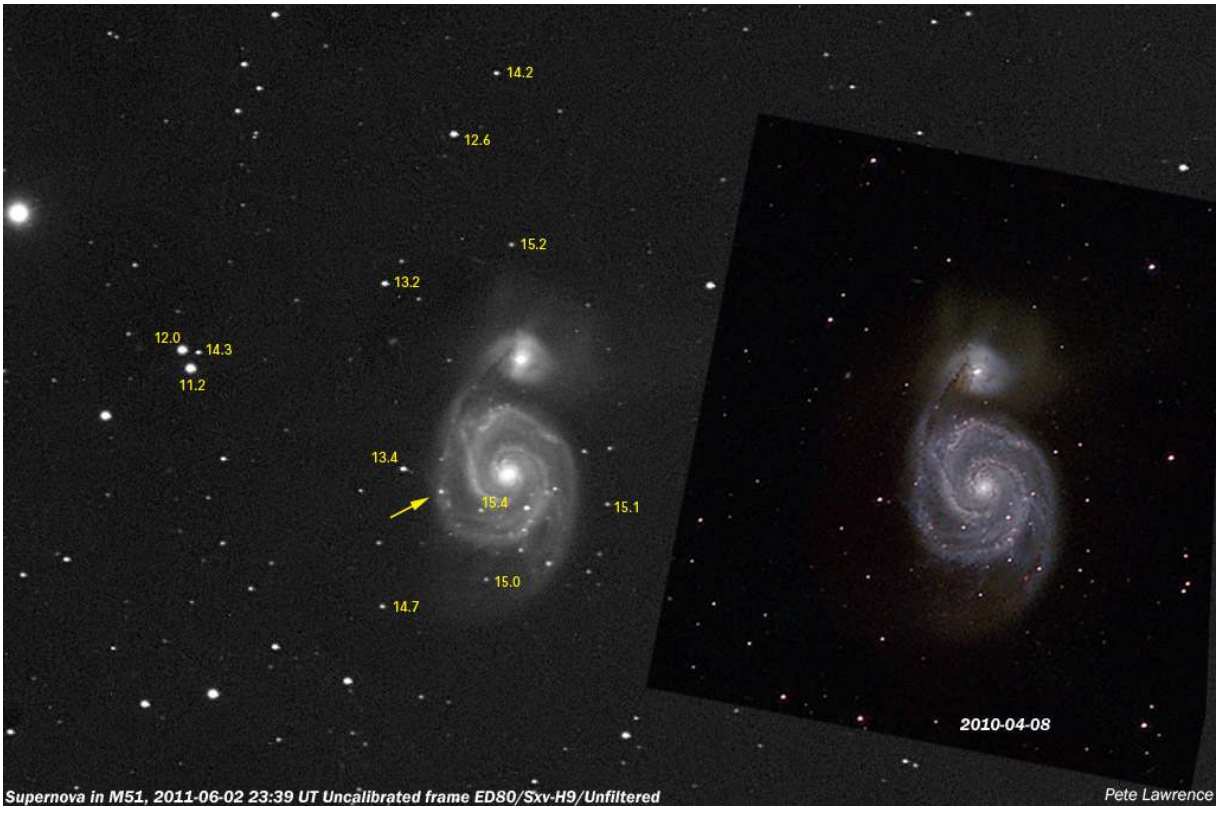
I told Richard that I had three two minute exposures, in RAW mode. It turned out that mine were Post discovery, but pre -announcement. And by a few minutes, my poor grainy images were the 2nd ones take of the Supernova in Canada. I sent Richard my three RAW images, which he pushed through his software to get magnitude estimates (I was lucky I'd taken 3), which turned out to be quite useful.

There were other people who'd taken images of M51 around the same time, so a good light curve was generated. Crucial to the understanding of supernovae, though, was that the first few minutes and hours post cataclysm be well documented. Frequently, this is not the case, as the vast majority of them go unrecognized outside of the community of people who have organized supernova searches. M51 is perfectly placed, though, as it is relatively close (20,000,000 light years) and is face on. It also transits after sunset in the early part of the summer in the northern Hemisphere, making it a popular target.

A candidate progenitor has been detected in Hubble Space Telescope images and it may have been a highly luminous yellow supergiant with an initial mass of 18-24 solar masses.

I've included a couple of images from Pete Lawrence, as he's done a nice bit of work labeling the magnitudes of a number of field stars for comparison.

The image on the front cover is my stack of three images, taken on the evening of June 1st (EDT)



Winter, by Walter de la Mare

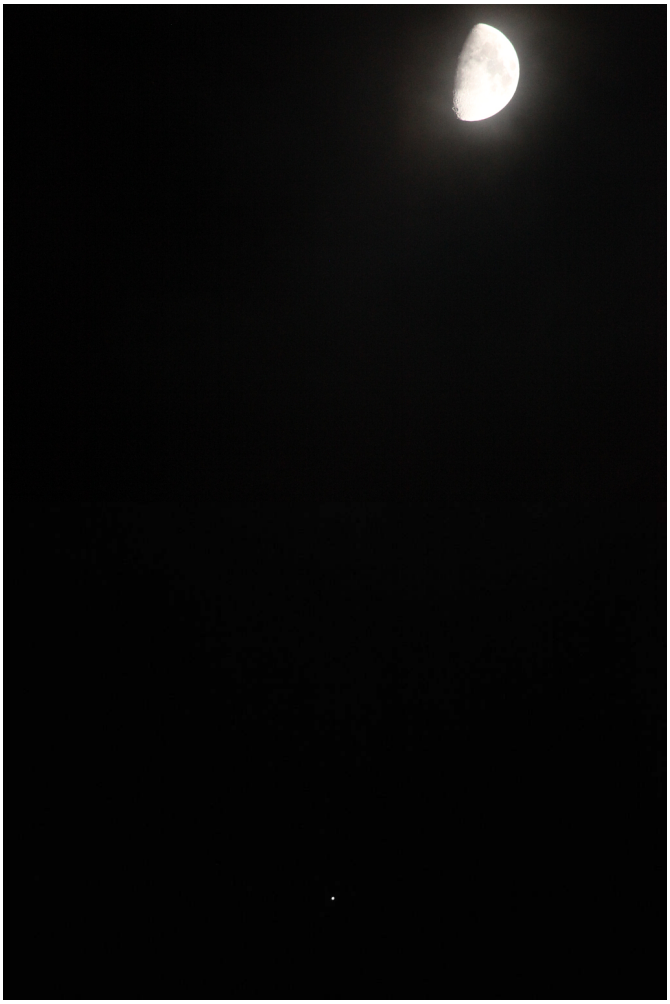
Clouded with snow
The cold winds blow,
And shrill on leafless bough
The robin with its burning breast
Alone sings now.

The rayless sun,
Day's journey done,
Sheds its last ebbing light
On fields in leagues of beauty spread
Unearthly white.

Thick draws the dark,
And spark by spark,
The frost-fires kindle, and soon
Over that sea of frozen foam
Floats the white moon.

Silver, by Walter de la Mere

Slowly, silently, now the moon
Walks the night in her silver shoon;
This way, and that, she peers, and sees
Silver fruit upon silver trees;
One by one the casements catch
Her beams beneath the silvery thatch;
Couched in his kennel, like a log,
With paws of silver sleeps the dog;
From their shadowy coat the white breasts peep
Of doves in a silver-feathered sleep;
A harvest mouse goes scampering by,
With silver claws, and silver eye;
And moveless fish in the water gleam,
By silver reeds in a silver stream.



Like a beacon through an overcast sky, the Moon gently drifts 4 degrees above Jupiter's radiant disc. Jupiter is almost exactly a degree below the ecliptic, with the moon almost exactly 3 degrees above.

It was a chilly -7C in Milton, and fingers nearly froze using a Canon 5DMKII, 400mm f5.6, 1/100second, ISO 4000. No processing.

Photo by Colin Haig, January 2, 2012 at 6:47pm EST.

What you missed in December...!

The December meeting continued the run of excellent meetings we've had for the last while. It was a night of two parts, in that the guys from KW Telescope came out and there was a swap meet. First off, Brady Johnson talked about using Digital SLRs or one-shot colour CCD cameras with narrow bandwidth filters. This technique essentially removes light pollution from the sky, eliminates any chromatic aberration and really brings out the details in nebulae. There was some discussion around whether or not this was a valid representation of the colours of objects in the sky. The answer came back that it's not even close to what these objects would look like if we had they were bright enough to activate the colour sensing part of the eye, but that very few people seemed to care much anymore.

The second part of the night was a Swap Meet, and there were all sorts of goodies for sale. Roger Hill managed to sell both a telescope and a DSLR, and while Andy brought a pile of stuff with him, not all of it went back home! Colin had a scope to sell (if anybody's looking for a Dob...speak to Colin...I think he may still have it), and Kevin had a table full of interesting looking stuff.

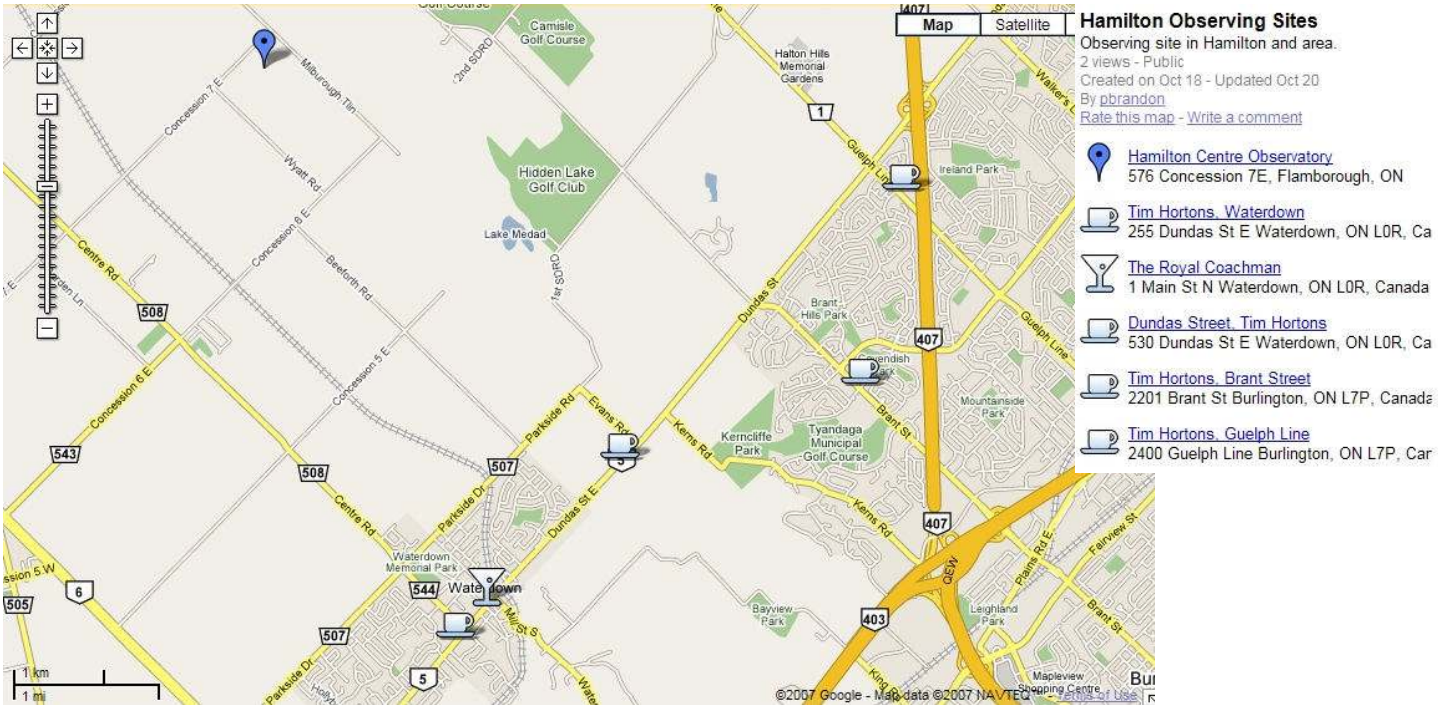
All in all...another great night!











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Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
26	27	28 4p Telescope Basics for Beginners	29	30	31	1 6p New Years Levy
2	3	4	5 7:30p Monthly Meeting - Dr. Mike Reid: The Big Controversy over the Big Bang	6	7	8
9	10 7:30p Armchair Astronomy	11	12 8p Board of Directors Meeting	13	14	15
16	17	18 7:30p Public Night	19	20	21	22
23	24	25	26	27 6:30p Sidewalk Astronomy	28 6:30p Sidewalk Astronomy	29 6p Orbit Deadline 6p Orbit Deadline
30	31	1	2 7:30p Monthly Meeting - Guest Speaker John Percy Professor Emeritus: U of T	3	4	5