Orbit

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Issue Number 10, October, 2011
Roger Hill, Editor

And so it comes down to this. After three years, I'm stepping down as President. Next month, you'll find someone else doing a "From the keyboard of the President" thing every month, although I'll still do an Editors note...assuming, of course, that my offer to keep doing Orbit for at least one more year is taken up.

I'll also, more than likely, be on the Board next year, too, should the membership approve.

So, this coming year we've got some changes that are going to occur. More than likely, Andy Blanchard will be taking my spot, and he has some really good ideas, honed by years of running one of the most successful Investment Planning Counsel offices in the country. He has some ambitious plans for the Hamilton Centre, but he's going to need a fair bit of help to realize them.

This was at the heart of the questionnaire that was filled in by a representative proportion of the membership in September. I'm hoping that you'll get to hear more about this at the Annual General Meeting later this week (I'm writing this on Monday, October 3rd).

The results of the survey were discussed at the last Board meeting, and in many ways, served to engender more questions.

For instance, I'd like to know more about what the membership would like to see at Meetings (less of me, for instance—wish granted!). Should there be a report on the Board activities? When we met in Burlington, I wanted to get a series of 5 minute (maybe 10-we had Gary Colwell doing a section on What's Coming up in the Sky this month, Ev did a Greek in the Round, Glenn frequently did something on observing equipment and gadgets to make the observers life better. There were attempts to get a monthly beginners astrophotography, a News from the World of Astronomy, sections of the meetings too, but for one reason or another, they did not continue after more than a couple of meetings.

So, I'd like to know more from you about what you'd like to see in meetings.

Other things I think would be worthwhile would be the level of knowledge our main speakers should aim their talks toward. Do you want to hear professional astronomers update us on their latest work? Do you want more advanced amateurs (from other organizations) come and talk about objects, techniques, observing, etc.?

I'd like to know this because I suspect I'll be involved in bringing speakers in for at least the next few months.

Of more immediate concern to me is Orbit. I know there are people out there who read it the moment it comes out (or as soon as they can get to it). I know this because I get email from them...both from former editors, long time members, and from the more recently joined members.

I've been Editor of Orbit now for four years (going into my 5th), and it's something I enjoy. Not least because I get to write stuff here and not be interrupted! In fact, it's something that I enjoy far more than I ever thought I would. Oh, my wife listens to my complaints when a "writers block" descends and I end up surfing the 'net far more than is necessary, but those times are vastly out-numbered by the times when I sit down to write and find I've run out of room. Fortunately for you, dear reader, I've set myself a two page limit for this monthly brain dump! Back when I was President for the first time back in the mid '90's, I was not always so considerate!

Anyway, back on topic. I'd like to make some changes to Orbit. I've been producing 12 pages of content for four years. In that time I think it's been late twice, and there have been 10 issues a year. I've tried a few things over that time, and while I greatly appreciate any and all articles sent in (Thanks!!!! Really!), it has mostly been me that's written it. There are many things I like, and consequently, the content has been greatly skewed toward that.

So, what I'd like to know is how often you read Orbit. Do you read all of it? Are there any sections you like more than others? Do you like the stuff we get from JPL most months? To what level should I aim the content? Do you want to read more about what others in the Centre have done?

Should Orbit be free to all? For members only? Current issue for members only and past issues freely available?

Would you be willing to contribute? I'd love a couple of regular columns on what people found interesting in astronomy this past, or upcoming, month. Anywhere from four or five paragraphs to a couple of pages would be great.

Normally, at about this point, I'd be putting down some words about what has happened in the Centre over the last year, but I'm going to save that for the meeting on Thursday night, and write a précis of it for the November Orbit.

Here's what you should know for the upcoming year, though. There's a very aggressive list of events on the RASC Hamilton Yahoo! Group calendar through to the first of January. The list contains 20 events, and I'll put it at the end of Orbit. Hopefully, I'll be able to get some details on these.

What this is leading up to, though, is that the Board could use a few more hands. Little by little over the last three years, we've been able to attract more people to the Board, and we'd like to have a few more this year. And not just because of the number of events going on, but also because the Government of Canada is changing the rules under which non-profit organizations like ours operate. Our By-Laws must change in accordance to the new rules. The question will then become" Do we adopt our By-Laws to match those that the National organization mandates for all new Centres, and consequently guarantee that we meet the new legal requirements? Or do we cleave to our treasured (almost) independence and have to go through the entire process ourselves, paying a legal firm to ensure that we are in compliance?

We've got an astrophotography course coming up. This was attempted earlier this year, and while there was a large and enthusiastic response for the initial night, there was not as much follow-through as one might wish for. The lessons learned through that process will be applied and there should be a much more extensive series of offerings this time around.

We'll be doing public nights, too, on the third Wednesday of the month

There's going to be another Smackdown event on October 15, with a BBQ starting at 4pm. This will be similar to the very successful one we held in June, but with much more night, and far fewer mosquitoes!

There will be a "Learn all about your new telescope" event at the Observatory on December 28th, for everyone that got some goodies from Santa!

We've got Peter Jedicke coming from London in November as our speaker, and our December Vendor is a guy who sells meteorites...so save your sheckels and buy yourself a relic of the ancient solar system, or a piece of another planet.

So...that's all for this month,

Clear skies, one and all,

Roger Hill
Orbit editor and President.

Dark Clues to the Universe

By Dr. Marc Rayman

Urban astronomers are always wishing for darker skies. But that complaint is due to light from Earth. What about the light coming from the night sky itself? When you think about it, why is the sky dark at all?

Of course, space appears dark at night because that is when our side of Earth faces away from the Sun. But what about all those other suns? Our own Milky Way galaxy contains over 200 billion stars, and the entire universe probably contains over 100 billion galaxies. You might suppose that that many stars would light up the night like daytime!

Until the 20th century, astronomers didn't think it was even possible to count all the stars in the universe. They thought the universe was infinite and unchanging.

Besides being very hard to imagine, the trouble with an infinite universe is that no matter where you look in the night sky, you should see a star. Stars should overlap each other in the sky like tree trunks in the middle of a very thick forest. But, if this were the case, the sky would be blazing with light. This problem greatly troubled astronomers and became known as "Olbers' Paradox" after the 19th century astronomer Heinrich Olbers who wrote about it, although he was not the first to raise this astronomical mystery.

To try to explain the paradox, some 19th century scientists thought that dust clouds between the stars must be absorbing a lot of the starlight so it wouldn't shine through to us. But later scientists realized that the dust itself would absorb so much energy from the starlight that eventually it would glow as hot and bright as the stars themselves.

Astronomers now realize that the universe is not infinite. A finite universe—that is, a universe of limited size—even one with trillions of stars, just wouldn't have enough stars to light up all of space.

Although the idea of a finite universe explains why Earth's sky is dark at night, other factors work to make it even darker.

The universe is expanding. As a result, the light that leaves a distant galaxy today will have much farther to travel to our eyes than the light that left it a million years ago or even one year ago. That means the amount of light energy reaching us from distant stars dwindles all the time. And the farther away the star, the less bright it will look to us.

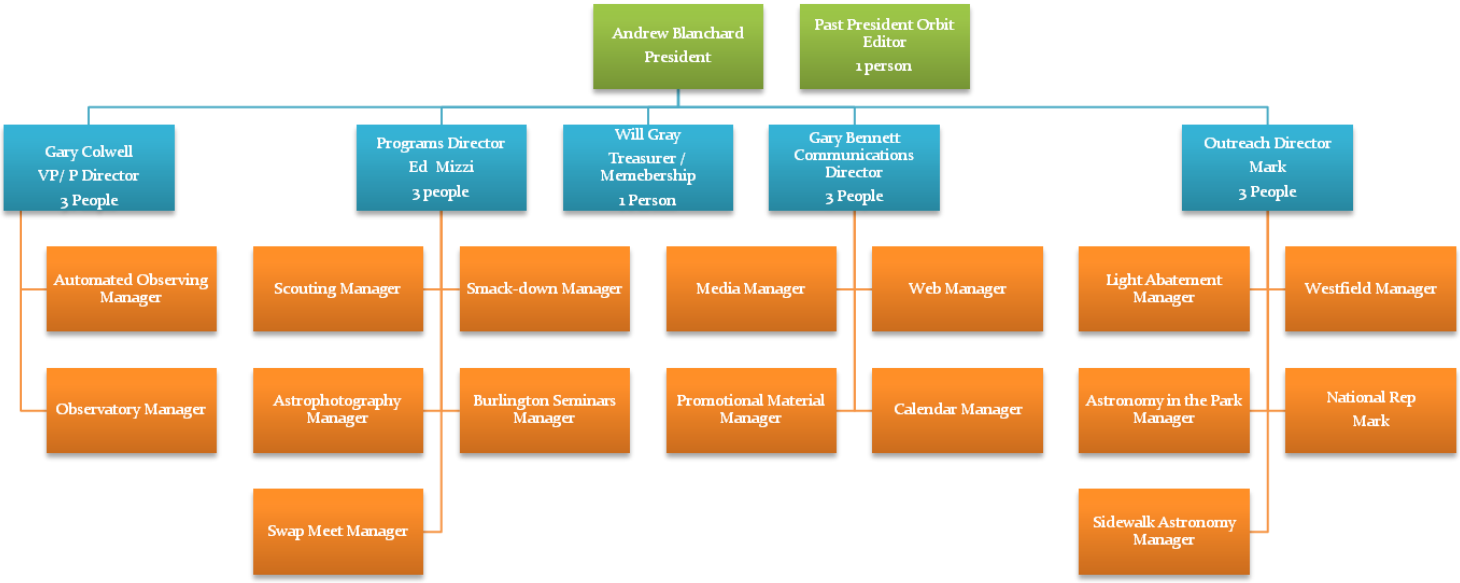
Also, because space is expanding, the wavelengths of the light passing through it are expanding. Thus, the farther the light has traveled, the more red-shifted (and lower in energy) it becomes, perhaps red-shifting right out of the visible range. So, even darker skies prevail.

The universe, both finite in size and finite in age, is full of wonderful sights. See some bright, beautiful images of faraway galaxies against the blackness of space at the Space Place image galleries. Visit http://spaceplace.nasa.gov/search/?q=gallery.

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

This Hubble Space Telescope image of Galaxy NGC 4414 was used to help calculate the expansion rate of the universe. The galaxy is about 60 million light-years away. Credit: NASA and The Hubble Heritage Team (STScI/AURA)

Hamilton RASC Centre



There has been a fair bit of discussion in the last couple of months about re-structuring the way the Hamilton Centre operates. It was felt that the time had come to move to a newer method of organization. To this end, the above chart was created to get an idea as to how the Centre would look.

There are a number of organizations that operate this way. One extremely successful southern Ontario group has a small executive and a number of committees that report to the Executive. They believe that utilizing such a structure gives the committees more autonomy while still allowing similar accountability.

The question was raised about moving to this mode of governance a couple of years ago, and while at the time there was no familiarity on the Board with how to run an organization this way. The questioner was also unsure as to what steps we'd need to take to mold the Hamilton Centre this way.

Andy Blanchard, though, has been very successful at running his business in precisely this manner. So, with Roger Hill making it well known that he would NOT be a consideration to run as President for a fourth successive term, the opportunity has arisen to move to the 21st Century.

It should be noted that the names in the boxes above are conditional upon these people being elected to the Board of Directors, and that any additional people can easily be slotted in as necessary.

An Astro-Geekend at Splitrock Observatory by Gary Colwell

Late September saw one of my monthly pilgrimages to the cottage to take advantage of the new moon at my observatory. Every new moon (or closest to new moon) weekend I spend at the observatory trying to make use of the incredibly dark skies for astrophotography. I had just come back from Starfest the previous month and was excited at the prospect of bringing up a bunch of friends to enjoy the skies.

I call the weekend the "Splitrock Astro-Geekend and Star-B-Que". We have a nice steak BBQ on the Saturday night and try to image and digest at the same time.

We had a really good turnout…Ev RiIett, Gary Bennett, Andy Blanchard and Roger Hill (who unfortunately at the last minute could not make it (family crisis—Ed.)), Richard Harding from the Ottawa Centre, David Dev (who took pics below) and yours truly were there. Even Terence Dickenson had accepted the invite but could not make it due to a prior obligation.

By the way, as part of the new observing program for the upcoming year, I am going to open up a quarterly "Hamilton Centre Astro-Geekend" at the observatory for any members who wish to attend. More details on that later!

I arrived on the Thursday evening to amazingly clear skies and got time to image M33….I tried to also image M42 but the morning haze started and it was a bit too low (actually it went behind one of my trees….)

Friday saw the clouds roll in and rain started about noon. Gary Ev and Andy arrived Friday afternoon as did Richard…..but Richard had never been to the cottage before and didn't know it existed. After a few hours of waiting at the trailer, he drove down to the cottage and we all had a really good chuckle. Friday night was a wipeout, except for around 2:00am Sat morning. Andy & I were staying up at the trailer hoping it would clear and it did, so he went to the cottage and woke the others and we all had a bit of time observing, taking pictures and having a great time.

Again the clouds rolled in Saturday morning and it looked pretty bleak for observing Saturday night, the clear sky chart wasn't too impressive, but from past experience it sometimes clears despite the forecast…and around 8:00 pm the skies opened up to a wonderfully clear evening which lasted all night.

Just before that we had our HUGE BBQ….it sure would have been easier to just go away and digest but the skies beckoned!!

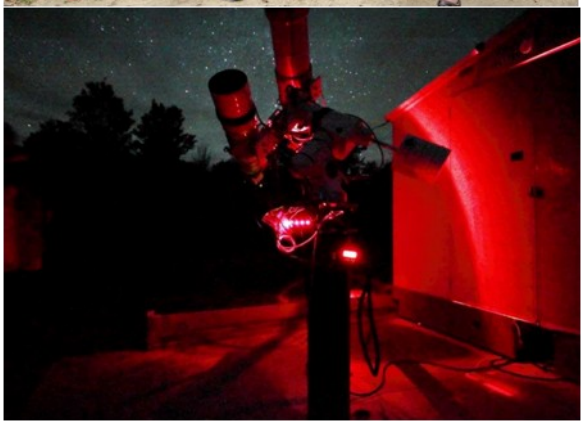
Ev set up her new 80mm scope on my spare NEQ6 pro mount, we set up the GOTO and she enjoyed roaming the clear dark skies. Andy had just purchased a brand new CGE Pro mount (man it is HUGE) and set it all up T-Pointing, plate solving, aligning, bowling all that sort of stuff in his Skyshed POD…..the real bummer is that both David and Richard DID NOT BRING SCOPES with them as they thought the weather would not co-operate….BIG HUGE MISTAKE!....lol…

Gary B set up his gear and was busy astro imaging!

I got a wonderful image of the Rosette Nebula Saturday night (see front cover—Ed.)

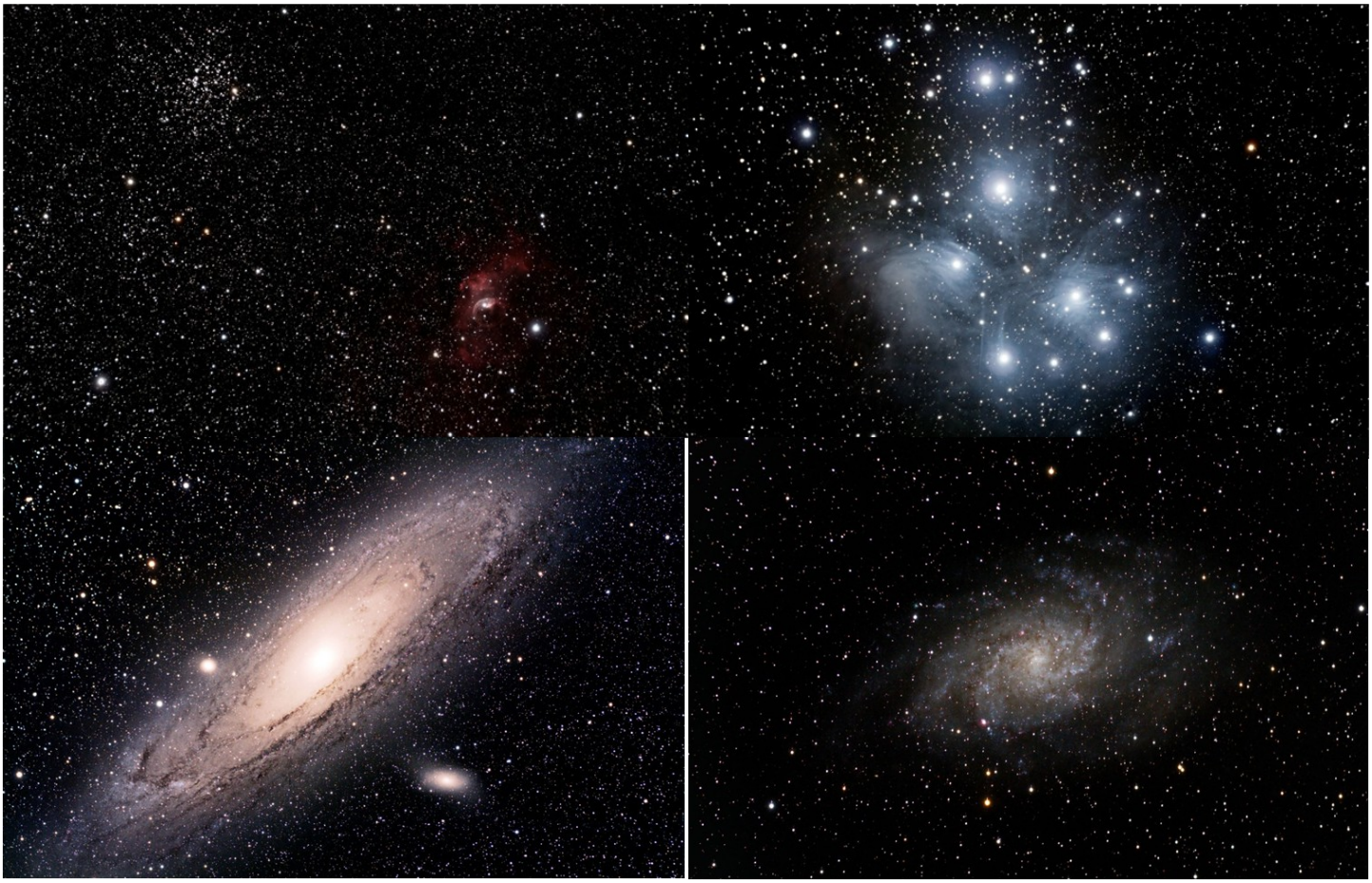
All in all we had a BLAST…with many more to come.

I also spent a week just after the geekend and got pics of M31, the Pleiades and the Bubble Nebula seen on the following pages.



Clockwise, from left:
Ev, Richard and Gary C.;
Gary C, Andy, Gary B. and Richard;
Scope and Sky silhouette;
Setting up a mount for Ev;

Clockwise, Below from left:
The Bubble Nebula;
The Pleiades;
M33; and
M31



ALMA Opens Its Eyes

Humanity's most complex ground-based astronomy observatory, the Atacama Large Millimeter/submillimeter Array (ALMA), has officially opened for astronomers. The first released image, from a telescope still under construction, reveals a view of the Universe that cannot be seen at all by visible-light and infrared telescopes. Thousands of scientists from around the world have competed to be among the first few researchers to explore some of the darkest, coldest, furthest, and most hidden secrets of the cosmos with this new astronomical tool.

At present, around a third of ALMA's eventual 66 radio antennas, with separations up to only 125 metres rather than the maximum 16 kilometres, make up the growing array on the Chajnantor plateau in northern Chile, at an elevation of 5000 metres. And yet, even under construction, ALMA has become the best telescope of its kind — as reflected by the extraordinary number of astronomers who requested time to observe with ALMA.

"*Even in this very early phase ALMA already outperforms all other submillimetre arrays. Reaching this milestone is a tribute to the impressive efforts of the many scientists and engineers in the ALMA partner regions around the world who made it possible,*" said Tim de Zeeuw, Director General of ESO, the European partner in ALMA.

ALMA observes the Universe in light with millimetre and submillimetre wavelengths, roughly one thousand times longer than visible-light wavelengths. Using these longer wavelengths allows astronomers to study extremely cold objects in space — such as the dense clouds of cosmic dust and gas from which stars and planets form — as well as very distant objects in the early Universe.

ALMA is radically different from visible-light and infrared telescopes. It is an array of linked antennas acting as a single giant telescope, and it detects much longer wavelengths than those of visible light. Its images therefore look quite unlike more familiar pictures of the cosmos.

The ALMA team has been busy testing the observatory's systems over the past few months, in preparation for the first round of scientific observations, known as Early Science. One outcome of their tests is the first image published from ALMA, albeit from what is still very much a growing telescope. Most of the observations used to create this image of the Antennae Galaxies were made using only twelve antennas working together — far fewer than will be used for the first science observations — and with the antennas much closer together as well. Both of these factors make the new image just a taster of what is to come. As the observatory grows, the sharpness, efficiency, and quality of its observations will increase dramatically as more antennas become available and the array grows in size [1].

The Antennae Galaxies are a pair of colliding galaxies with dramatically distorted shapes. While visible light shows us the stars in the galaxies, ALMA's view reveals something that cannot be seen in visible light: the clouds of dense cold gas from which new stars form [2]. This is the best submillimetre-wavelength image ever made of the Antennae Galaxies.

Massive concentrations of gas are found not only in the hearts of the two galaxies but also in the chaotic region where they are colliding. Here, the total amount of gas is billions of times the mass of our Sun — a rich reservoir of material for future generations of stars. Observations like these open a new window on the submillimetre Universe and will be vital in helping us understand how galaxy collisions can trigger the birth of new stars. This is just one example of how ALMA reveals parts of the Universe that cannot be seen with visible-light and infrared telescopes.

ALMA could accept only about a hundred or so projects for this first nine-month phase of Early Science. Nevertheless, over the last few months, keen astronomers from around the world have submitted over 900 proposals for observations. This ninefold level of oversubscription is a record for a telescope. The successful projects were chosen based on their scientific merit, their regional diversity, and also their relevance to ALMA's major science goals.

"*We are living in a historic moment for science and particularly for astronomy, and perhaps also for the evolution of humanity, because we start to use the greatest observatory under construction at the moment,*" said Thijs de Graauw, Director of ALMA.

One of the projects chosen for ALMA Early Science observations was that of David Wilner from the Harvard–Smithsonian Center for Astrophysics in Cambridge, Massachusetts, USA. Wilner said, "*My team hunts for the building blocks of solar systems, and ALMA is uniquely equipped to spot them.*"

His team's target is AU Microscopii, a star 33 light-years away that is only 1% of the age of our Sun. "*We will use ALMA to image the 'birth ring' of planetesimals that we believe orbits this young star. Only with ALMA, however, can we hope to discover clumps in these dusty asteroid belts, which can be the markers of unseen planets*." Wilner and his team will share their data with a European team who also requested ALMA observations of this nearby, dust-ringed star.

Any hunt for habitable planets around other stars often begins with a hunt for water in those distant solar systems. Debris discs, the swarms of dust, gas, and rocks around stars, are suspected also to contain craggy ice chunks filled with frozen water, gas, and possibly even organic molecules — the astrochemistry of life.

Simon Casassus, from the University of Chile, and his team will use ALMA to observe the gas and dust disc around HD142527, a young star that is 400 light-years away. "*The dusty disc around this star has a very large gap, which may have been carved by the formation of giant planets,*" said Casassus. "*Outside the gap, this disc contains enough gas to make about a dozen Jupiter-sized planets. Inside the gap, a young gaseous giant planet could still be forming, if there is gaseous material available*." Their ALMA observations will measure the mass and physical conditions of gas interior to the gap. "*Thus, ALMA gives us a chance to observe planet formation, or its most recent wake,*" said Casassus.

Further away, 26 000 light-years from us in the centre of our galaxy, sits Sagittarius A*, a supermassive black hole four million times the mass of our Sun. Gas and dust between it and us hide it from our optical telescopes. However, ALMA is tuned to see through the galactic murk and give us tantalising views of Sagittarius A*.

Heino Falcke, an astronomer at Radboud University Nijmegen in the Netherlands, said "*ALMA will let us watch flares of light coming from around this supermassive black hole, and make images of the gas clouds caught by its immense pull. This will let us study this monster's messy feeding habits. We think that some of the gas may be escaping its grip, at close to the speed of light.*"

Like the black outlines in a child's colouring book, cosmic dust and cold gas trace out structures inside galaxies, even if we can't see those galaxies clearly. At the outer fringes of our visible Universe lie the mysterious starburst galaxies, bright islands in an otherwise calm, dark cosmos. ALMA will hunt for cold gas and dust tracers here, as far back as a few hundred million years after the Big Bang, at a time astronomers call "cosmic dawn".

Masami Ouchi of the University of Tokyo in Japan will use ALMA to observe Himiko, a very distant galaxy churning out at least 100 Suns' worth of stars every year and surrounded by a giant, bright nebula. "*Other telescopes cannot show us why Himiko is so bright and how it has developed such a huge, hot nebula when the ancient Universe all around it is so calm and dark,*" said Ouchi. "*ALMA can show us the cold gas deep in Himiko's star-forming nebula, tracing the movements and activities inside, and we will finally see how galaxies started forming at the cosmic dawn.*"

During its Early Science observations, ALMA will continue its construction phase in the Chilean Andes, high on the remote Chajnantor Plain in the harsh Atacama Desert. Each new, climate-armoured antenna will join the array and be linked via fibre optic cabling. The views from each distant antenna are assembled into one large view by one of the world's fastest special-purpose supercomputers, the ALMA correlator, which can perform 17 quadrillion [3] operations per second.

By 2013, ALMA will be an up to 16-km wide array of 66 ultra-precision millimetre/submillimetre wave radio antennas working together as one telescope and built by ALMA's multinational partners in Europe, North America and East Asia.

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Southern Observatory (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC) and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI) and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction, commissioning and operation of ALMA.

The Star-Splitter

`You know Orion always comes up sideways.
Throwing a leg up over our fence of mountains,
And rising on his hands, he looks in on me
Busy outdoors by lantern-light with something
I should have done by daylight, and indeed,
After the ground is frozen, I should have done
Before it froze, and a gust flings a handful
Of waste leaves at my smoky lantern chimney
To make fun of my way of doing things,
Or else fun of Orion's having caught me.
Has a man, I should like to ask, no rights
These forces are obliged to pay respect to?'
So Brad McLaughlin mingled reckless talk
Of heavenly stars with hugger-mugger farming,
Till having failed at hugger-mugger farming
He burned his house down for the fire insurance
And spent the proceeds on a telescope
To satisfy a lifelong curiosity
About our place among the infinities.

`What do you want with one of those blame things?'
I asked him well beforehand. `Don't you get one!'

`Don't call it blamed; there isn't anything
More blameless in the sense of being less
A weapon in our human fight,' he said.
`I'll have one if I sell my farm to buy it.'
There where he moved the rocks to plow the ground
And plowed between the rocks he couldn't move,
Few farms changed hands; so rather than spend years
Trying to sell his farm and then not selling,
He burned his house down for the fire insurance
And bought the telescope with what it came to.
He had been heard to say by several:
`The best thing that we're put here for's to see;
The strongest thing that's given us to see with's
A telescope. Someone in every town
Seems to me owes it to the town to keep one.
In Littleton it might as well be me.'
After such loose talk it was no surprise
When he did what he did and burned his house down.

Mean laughter went about the town that day
To let him know we weren't the least imposed on,
And he could wait---we'd see to him tomorrow.
But the first thing next morning we reflected
If one by one we counted people out
For the least sin, it wouldn't take us long
To get so we had no one left to live with.
For to be social is to be forgiving.
Our thief, the one who does our stealing from us,
We don't cut off from coming to church suppers,
But what we miss we go to him and ask for.
He promptly gives it back, that is if still
Uneaten, unworn out, or undisposed of.

It wouldn't do to be too hard on Brad
About his telescope. Beyond the age
Of being given one for Christmas gift,
He had to take the best way he knew how
To find himself in one. Well, all we said was
He took a strange thing to be roguish over.
Some sympathy was wasted on the house,
A good old-timer dating back along;
But a house isn't sentient; the house
Didn't feel anything. And if it did,
Why not regard it as a sacrifice,
And an old-fashioned sacrifice by fire,
Instead of a new-fashioned one at auction?

Out of a house and so out of a farm
At one stroke (of a match), Brad had to turn
To earn a living on the Concord railroad,
As under-ticket-agent at a station
Where his job, when he wasn't selling tickets,
Was setting out, up track and down, not plants
As on a farm, but planets, evening stars
That varied in their hue from red to green.

He got a good glass for six hundred dollars.
His new job gave him leisure for stargazing.
Often he bid me come and have a look
Up the brass barrel, velvet black inside,
At a star quaking in the other end.
I recollect a night of broken clouds
And underfoot snow melted down to ice,
And melting further in the wind to mud.
Bradford and I had out the telescope.
We spread our two legs as we spread its three,
Pointed our thoughts the way we pointed it,
And standing at our leisure till the day broke,
Said some of the best things we ever said.
That telescope was christened the Star-Splitter,
Because it didn't do a thing but split
A star in two or three, the way you split
A globule of quicksilver in your hand
With one stroke of your finger in the middle.
It's a star-splitter if there ever was one,
And ought to do some good if splitting stars
'Sa thing to be compared with splitting wood.

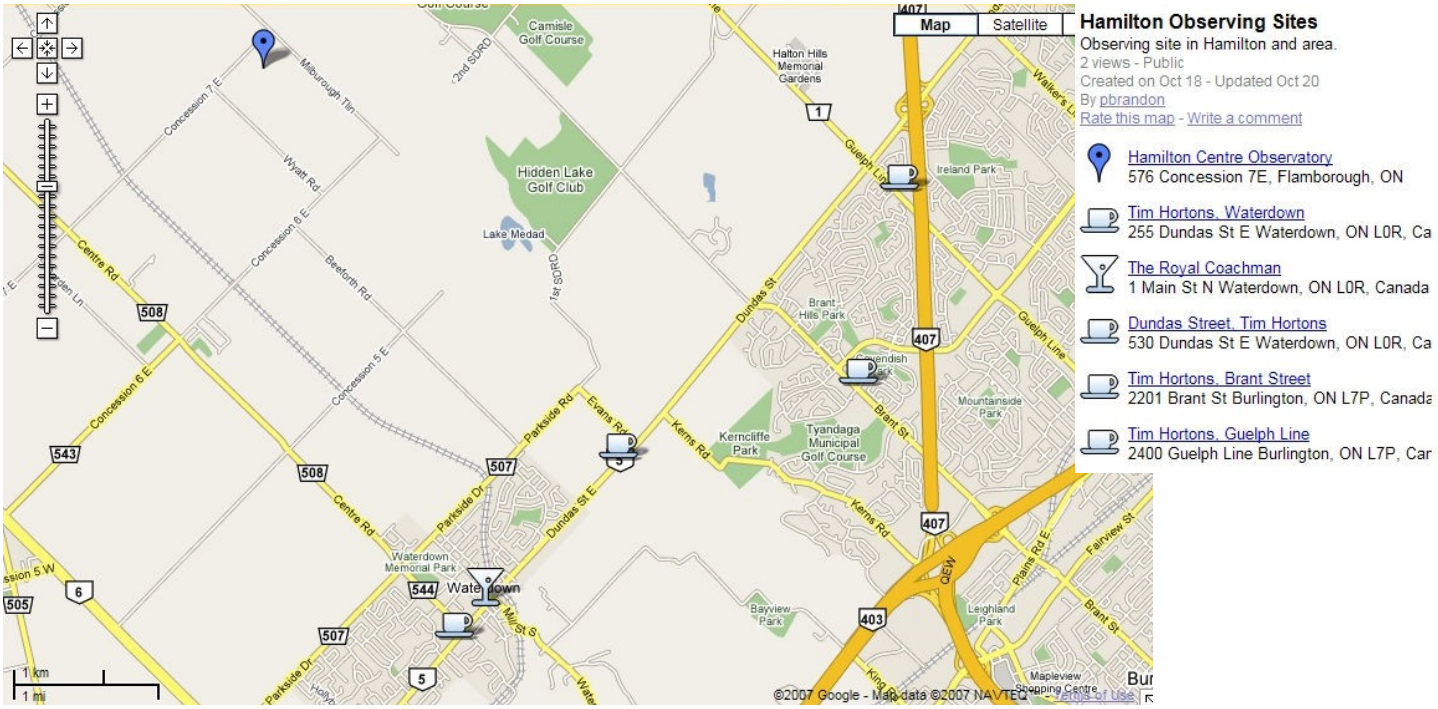
We've looked and looked, but after all where are we?
Do we know any better where we are,
And how it stands between the night tonight
And a man with a smoky lantern chimney?
How different from the way it ever stood?

-Robert Frost (1874-1963)

What you missed in September...!

September was Members Night, and we had presentations from Gary Colwell, Glenn Kukkola, Colin Haig and Roger Hill

What we didn't have was Ed Mizzi taking pictures! So, instead, here's some pictures from previous picnics, and other gatherings



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Meetings are on the first Thursday of every month except July and August, upstairs at the Royal Canadian Legion, 79 Hamilton Street in Waterdown. Start time is 8pm.

Front cover picture by Gary Colwell. Back picture by Roger Hill. Picnic pictures from the archives. Alma pictures from ESO press release.

Oct 6th:	Annual General Meeting at the Legion in Waterdown
Oct 7th:	Sidewalk Astronomy—Spencer Smith, Burlington.
Oct 15th:	Fall SmackDown and BBQ—Observatory
Oct 19th:	Public Night—Observatory
Oct 28th:	Geekend—Split Rock
Nov 3rd:	Monthly Meeting: Peter Jedicke—Waterdown Legion
Nov 4th:	Sidewalk Astronomy—Spencer Smith, Burlington.
Nov 16th:	Public Night—Observatory
Nov 19th:	David Dunlap Observatory
Nov 24th:	Astrophotography—Observatory.