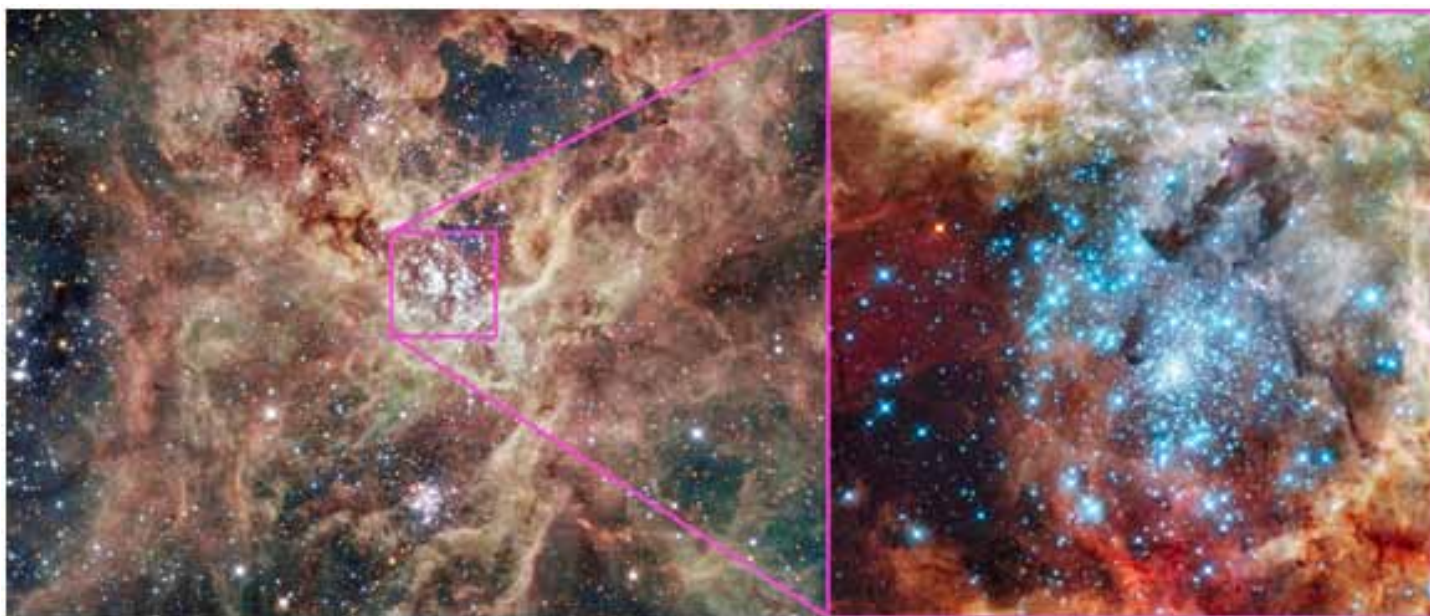


The Reflector

Newsletter of the Peterborough Astronomical Association

Is the Most Massive Star Still Alive?



Images credit: ESO/IDA/Danish 1.5 m/R. Gendler, C. C. Thöne, C. Féron, and J.-E. Ovaldsen (L), of the giant star-forming Tarantula Nebula in the Large Magellanic Cloud; NASA, ESA, and E. Sabbi (ESA/STScI), with acknowledgment to R. O'Connell (University of Virginia) and the Wide Field Camera 3 Science Oversight Committee (R), of the central merging star cluster NGC 2070, containing the enormous R136a1 at the centre.

ETHAN SEIGEL

THE BRILLIANT SPECKS of light twinkling in the night sky, with more and more visible under darker skies and with larger telescope apertures, each have their own story to tell. In general, a star's colour correlates very well with its mass and its total lifetime, with the bluest stars representing the hottest, most massive and shortest-lived stars in the universe. Even though they contain the most fuel overall, their cores achieve incredibly high temperatures, meaning they burn

through their fuel the fastest, in only a few million years instead of roughly ten billion like our sun.

Because of this, it's only the youngest of all star clusters that contain the hottest, bluest stars, and so if we want to find the most massive stars in the universe, we have to look to the largest regions of space that are actively forming them right now. In our local group of galaxies, that region doesn't belong to the giants, the Milky Way or Andromeda, but to the Large Magellanic Cloud (LMC), a small,

satellite galaxy (and fourth-largest in the local group) located 170,000 light years distant.

Despite containing only one percent of the mass of our galaxy, the LMC contains the Tarantula Nebula (30 Doradus), a star-forming nebula approximately 1,000 light years in size, or roughly seven percent of the galaxy itself. You'll have to be south of the Tropic of Cancer to observe it, but if you can locate it, its centre contains the super star cluster NGC 2070, holding

see "R136" on page 16

President's Message

Our Thoughts Turn to Spring

Finally we can anticipate spending some time under the night sky. It's the end of April so we must be ready. As I glance out the window and see a light snow falling I wonder how I could have possibly started this message the way I did. There's even a bit of snow on the ground from overnight.

April means the return of the annual Peterborough Regional Science Fair. The PAA was there again with Sean Dunne, Rick Stankiewicz and myself judging the projects and determining the astronomy award winners. A write-up is included in this issue of *The Reflector*.

On May 16th and 17th we will host our 10th annual "Astronomy on the Hill" weekend on Armour Hill at the Peterborough Museum and Archives. We need your help. If you have a telescope, bring it along, if not we need volunteers to watch equipment, direct traffic and mingle with the public answering questions etc. Please come out and support your club. This is a great weekend for families to get out and participate in live astronomy events.

Rodger Forsyth
PAA President

Things Are Heating Up

With winter finally at end of days we look forward to the warm weather; and hopefully clear viewing skies. It would be nice to have another clear night for viewing for our "Astronomy on the Hill" weekend on Armour Hill, May 16-17.

Rick Stankiewicz has been prolific this month. He has a light pollution article with respect to Quaker Oats, a report from the Hayden Planetarium in New York City, NY, a photo gallery submission of the most recent lunar eclipse, and a review of Jacob Berkowitz's lecture at Trent.

Roger Forsyth provides a report of the recent Regional Science Fair and the awarding of the Frank Hancock Award to some deserving students.

John Crossen has an opinion on Buzz Aldrin's recent plea to the U.S. Senate to fund a Mars colony and explains why the former astronaut's arguments don't hold water and counter-argues from the precedent of the International Space Station that a multinational, global mission is a better philosophy for our interplanetary dreams.

Ken Sunderland provides a membership report that illustrates the vitality of our club.

Dean Shewring has done a great job pulling together another display at the Peterborough Public Library. Don't miss out as it is on now until May 4.

Member Doug Armstrong sent along a tip that *R&D Magazine* offers a free newsletter if you are interested in science and engineering news. He notes that they have many astronomical news items. Check out this example: <http://tinyurl.com/qgzt3pp>



The Reflector

The Reflector is a publication of the Peterborough Astronomical Association (P.A.A.) Founded in 1970, the P.A.A. is your local group for astronomy in Peterborough and the Kawarthas.

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A Light Pollution Abatement Win



RICK STANKIEWICZ

ANY FORM OF POLLUTION is something that has a detrimental effect on us or our environment. We tend to think of air, water and noise pollution, but light can fall into the same category and be just as harmful to your health and the environment. Light pollution (LP) can take many forms. Consider your reduced visibility when a driver does not dim their headlights as they approach you at night.

This is called glare. It may be a neighbour's yard light that shines light onto your property, or worse yet, into your house. This is called light trespass. LP often boils down to excessive, or over-lighting or misdirected lighting. LP has been linked to many negative effects on human health including cancer, to detrimental effects on nocturnal organisms and just plain wasted energy.

See "Quaker" on page 15

The 46th Annual Regional Science Fair



PLANET MARS: CAN IT SUSTAIN LIFE AS WE KNOW? The Frank Hancock Award Winners, Madison Earle and Madyson Graham, pose with their project. Photo by Sean Dunne.

ROGER FORSYTH

THE PAA HAD THREE members present at the Regional Science Fair on April 8th offering their services as judges, two of which were award presenters. There were 215 students presenting over 160 projects, five of which were astronomy related. Rick Stankiewicz, Sean Dunne and I spent the entire day there and following our duties as science fair judges we also judged the astronomy related projects to determine the winner of The Frank Hancock Award and the one year family membership. Our choice for the \$100 Frank Hancock Award was “Planet Mars, Can it sustain human life as we know?” The project was designed by Madison Earle and Madyson Graham in the Junior category grades 7-8. They spoke well of their project which included “survival”

domes made from foam-core with hand drawn images applied.

The runner up and recipient of a one year family membership to the PAA was Gabriel Sikma. His project titled “Telescopes Through Time” was very well presented. He started with the inventor of the telescope and traced its history up to the Hubble.

He constructed a small reflector through which you could see the moon, an image cleverly hidden at the top of his display and illuminated by a small flashlight attached to his telescope. He mentioned that he and his family attended the Earth Hour event on Armour Hill this year. A good candidate for the family membership award.

Following all the judging and waiting the appropriate time Sean Dunne and I were on-stage with a number of other “dignitar-

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TELESCOPES THROUGH TIME. Runner up, Gabriel Sikma sits with his project. Photo by Sean Dunne.

ies” for the award presentation. I met and sat next to Dr. Ray Marsh the person that started it all in 1970. Dr. Marsh will also be our guest speaker for the May 1st meeting. Rick Stankiewicz stayed with us to photograph the presentations. We started with the runner up and wrapped it up with the 1st place winners. Sean Dunne was on his feet many times presenting IEEE awards.

It was a full day. We arrived around 8:00 a.m. and left there around 4:30 p.m. The PAA has been well represented over the years and I hope the tradition continues. Thank you Rick and Sean for your support this year and maybe we'll see you next year.



AWARD PRESENTATIONS. PAA President, Roger Forsyth, presents the Frank Hancock Award to Madison Earle and Madyson Graham (top) and a one year PAA Family Membership to runner up Gabriel Sikma (bottom). Photos by Rick Stankiewicz.

KW Telescope
PERCEPTOR



Our Changing Solar System



OUR LIBRARY LOBBY DISPLAY “Our Changing Solar System”, with (L to R) Sean Dunne, Ken Sunderland and Dean Shewring. Photo by Rick Stankiewicz.

DEAN SHEWRING

MONDAY, APRIL 27 saw the unveiling of a new display for the lobby of the Peterborough Public Library. The PAA’s display of “Our Changing Solar System” shows how our views have changed over the decades, from a focus on what we can most easily see from Earth, the planets, our Moon and the Sun, to a much closer look at the comets, other planetary moons, dwarf planets, asteroids, and other unusual bodies that share our outer space neighbourhood. The display contains posters, several magazines and books, models of the Moon, the Hubble Space Telescope and the Dawn spacecraft, a collection of solar system stamps, and a selection of photos

from stalwart astrophotographer Rick Stankiewicz.

This display gives us an opportunity to promote both the PAA and the upcoming May, 2015 Astronomy on the Hill event. “Our Changing Solar System” will continue at the Peterborough Public Library, located at 345 Aylmer Street North, until Monday, May 4th.

Aldrin Wants a Mars Colony For All the Wrong Reasons

JOHN CROSSEN

OUTER SPACE MAY BE VAST, but it's getting too crowded for Apollo 11 astronaut Buzz Aldrin. With India, China, Japan, the European Space Agency (ESA) and Russia currently orbiting the Moon, landing on comets and asteroids while the Chinese will soon establish a second space station, Aldrin is looking for the next big leap to re-establish America as the leader in space technology. To do so he has recently promoted a Mars colony to the U.S. Senate.

"In my opinion, there is no more convincing way to demonstrate American leadership for the remainder of this century than to commit to a permanent presence on Mars," was Aldrin's message to members of the U.S. Senate's Subcommittee on Space, Science and Competitiveness during a hearing on February 24, 2015.

I'm all for a manned Mars mission and an eventual Mars colony. But is the U.S. doing it for the right reason? To set up a Mars colony for the sake of establishing yourself as the space tech leader smacks of desperation and narcissism. Plus it harkens back to the 1960s when we went to the Moon just to beat the Russians.

The U.S. won but after five more missions nobody went back to the Moon. There were no lunar science missions. The much-talked-about Moon colony never materialized and lunar mining companies fell victim to the same fate. Instead of becoming a jumping off point for deep-space missions, the Moon remained "a magnificent desolation" to quote Mr. Aldrin. In my opinion we never finished the lunar missions, and now America is off to Mars to re-establish its leadership and national pride. It's a great idea with the wrong fuel.



BUZZ ALDRIN. Buzz Aldrin in his Apollo 11 flight suit. 45 years ago mankind first set foot on the Moon. Since then we haven't taken any steps to go back.

NASA and ESA have co-operated on projects in the past. Why not combine resources and make the colonization of Mars a global project? A Mars colony isn't just for Americans. We're talking the human species. And as a species we will become interplanetary, perhaps interstellar in our reach. To me it makes sense to start thinking "human race" from the get-go.

The Family of Man concept has worked for the International Space Station (ISS). Various labs and crew modules have been designed and built by Russia, Japan, Italy and more. If the entire cost had to be shouldered by the Americans we might not even have an ISS. But the costs and technologies have been shared. And on a small scale we have learned to live together in space.

Colonizing Mars will be a long-term investment of billions and billions of dollars. The justification for spending so much will have to be defended many times over as the future unfolds. Hell, people are already questioning the reasons for a Mars mission and we're still trying on getting the first manned flight on its way to the Red planet.

See "Aldrin" on page 13

PHOTO GALLERY



I have just spent the last 3 weeks in the Interior of Alaska chasing the Northern Lights —Aurora Borealis and leading two of our Annual Photo Tour/Workshops. The weather and driving conditions the first week made for a real challenge with icy roads and temps down to -28°F. But the last two weeks were wonderful with highs in the 50s and lows in the teens, with much improved road conditions. We saw Aurora for 20 out of the 21 nights we observed and photographed.

The best night was the 17th of March St. Patrick's Day night, we experienced a KP-8 Aurora outside of Fairbanks, Alaska. The reports I received from my Astronomy Friends back home is that the Aurora went as far south as Tennessee and Kansas that evening! It sure was amazing up here!

During the last week of the trip the strong Moonlight lit up the foregrounds, and required much brighter Aurora displays to overcome the strong Moonlight! Fortunately we had several Kp-4 & KP-5 Aurora events during the bright Waxing Gibbous Moon phases. So many of these shot will appear as if they were taken in daylight.

Best Regards,

John Chumak www.galacticimages.com

Three Quarters of a Tetrad



April 4th marked the date of the third lunar eclipse in the previous 18 months and a chance for a 4th is coming up on September 27th of this year. This is called a “tetrad” (group of four) by astronomers. This relatively rare event (seven times this century) is when there are four lunar eclipses at roughly six month intervals in a two year period. This third eclipse opportunity was not well situated for those of us in eastern North America, as the Moon was setting as it was starting to slip into the Earth’s umbral shadow. From about 6:15 to 6:50 a.m. EDT. I was in my backyard clicking away every few minutes to capture the slow progression of the Moon being eclipsed by the darkest part of the Earth’s shadow cast into space.

As the western horizon brightened, the Moon appeared to slip into the woods near my neighbour’s barnyard and out of view for totality. Luckily, we should have one more chance to see a total lunar eclipse near the end of September and the timing will be better for viewing for eastern North America. We should see totality about 10:10 p.m. from this part of Ontario.

The images shown here were taken on a tripod mounted Canon 50D, with 200mm f/2.8 lens, at ISO 200 for 1/800th to 1/250th second exposures.

You might not get to witness the climax of every astronomical event, but it is still nice to witness a bit of astronomical “history” and to being able to capture and share it is a real bonus. Stay tuned for the 4th quarter action in five months from now.

Keep looking up,

Keep looking up,
Rick Stankiewicz

Hayden Planetarium

RICK STANKIEWICZ

WHEN I FOUND MY WIFE and I would be in New York City (NYC) this past January for a brief tour of the city I of course made plans to see the Hayden Planetarium inside the huge Hayden Sphere. No self respecting astronomy enthusiast can go to NYC without making plans to see this planetarium along with the other related exhibits, which are all part of the American Museum of Natural History (AMNH) at Central Park West and 79th Street. Charles Hayden was a philanthropist whose foundation has given generously since 1935 to create and maintain this world class facility that bears his name. I have read about this facility for years, but this was my chance to see it firsthand. The AMNH happens to also be where the movies "Night at the Museum 1, 2 & 3" were filmed.

We spent a good part of a day in and around these facilities. They are all very impressive and very well laid out and maintained. We started with the introductory show about the Big Bang and the expansion of the universe in the Hayden Big Bang Theatre, located inside the second floor level of the Hayden Sphere. Here you (and up to 60 others) stand in a large room for a 5 minute presentation that is projected onto a round screen that is a shallow concaved shape. It has the effect of a reverse planetarium, as you are looking down instead of up, at a curved screen and everyone has a good view of the presentation no matter where you stand around the perimeter. A great presentation narrated by actor Liam Neeson. Unfortunately, they don't allow any images to be taken in this area.

After exiting the theatre you walk down a spiral shaped walkway called the Heilbrunn Cosmic Pathway, where you take a journey through cosmic time from the Big Bang



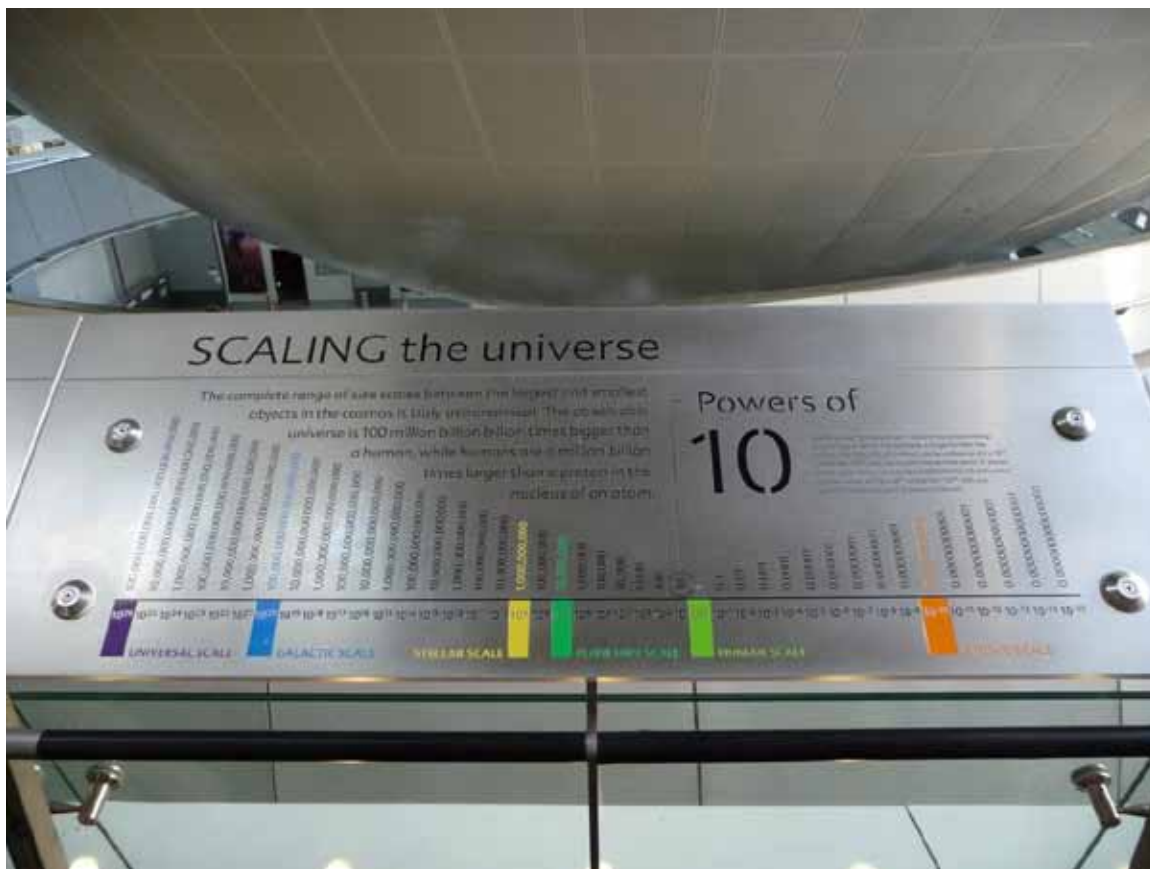
to present day. Here every step you take is equal to 147 million years in history. Pretty cool visualisation of space through time. There are numerous stations to take in, of appropriate happenings through time as the universe is expanding, like the formation of globular clusters and the formation of banded iron (jasper).

After this, we headed in for show time of the "Dark Universe" playing in the main planetarium. The ½ hour experience was very well done. They do a very good job explaining and demonstrating very complicated and difficult subject matter. The (recorded) narration for the show is done by none other than Dr. Neil deGrasse Tyson, the current Director for the Hayden Planetarium. He was not hanging out with the public this day (no where to be seen actually), so no autographs were happening for this astro-nut.

Then we had time to wander about the Cullman Hall of the Universe and inspect

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exhibits like the 15.5 ton Willamette (iron-nickel) Meteorite. It is the largest meteorite ever found in North America and the sixth largest in the world (see inset of me beside it for scale). There are mini-theatres too where you can learn about black holes and the like.

Then there was the whole second floor Scales of the Universe exhibit, that takes you on a walk around the perimeter of the 26.5 m Hayden Sphere and uses it to scale models of planets and stars, etc. around it, showing relative sizes to each other. The scaling is done by having each station going up in size by the power of 10. So, at one point the Hayden Sphere represents the Sun relative to a 2.7 m diameter model of Jupiter and a 24 cm scaled model of the Earth. In another, The Hayden Sphere represents the Milky Way Galaxy along with scaled model of globular cluster M80. It is a great use of space and never stopped making you think and re-visualizing the universe and everything within it.

Finally, there was the Rose Gallery, which currently exhibits images taken of and on the Moon by Apollo astronauts from 1969 to 1972. Many of these images I had never seen before. Each is a work of art on its own. There was even a sample of Moon Rock from the Apollo 15 mission (1971) on display. It didn't look like cheese to me, but did look a lot like 3 billion year old basalt. Any one of the exhibits we saw would have been worth the price of admission and this is saying nothing of the other exhibits of natural history contained within the walls of this hallowed institution. There was a life-sized model of a Blue Whale hanging from the ceiling of the Hall of Ocean Life. Impressive!

So next time you have a chance to visit the Big Apple, be sure to plan a trip to the Hayden Planetarium and all the other halls and exhibits the AMNH has to offer, you will be glad you did.

The Star Dust Revolution

RICK STANKIEWICZ

ANOTHER ADVANTAGE OF your membership with the PAA, is that from time to time members are invited to hear guest lecturers at Trent University. This was the case on March 27th this year, when Jacob Berkowitz was speaking at 7:00 p.m. on campus at the Wenjack Theatre and we were all invited to attend. At least a half dozen PAA members were in attendance to hear this author speak about his latest book, *The Stardust Revolution — The new story of our origin in the stars*.

As you may have heard the quote from the late/great Carl Sagan, “We are all made of star stuff,” well Berkowitz takes it a step further and considers this line of thinking revolutionary. “Stardust” is real, actual particles, grains of meteors, forged in stars like our Sun. He suggests we are as much descendants of stars, as we are evolved from early hominids like Lucy (*Australopithecus afarensis*).

It is proposed that there have been three “revolutions” in the last 500 years. First, there was the Copernican Revolution, which re-ordered the heavens and our place within it. Then came the Darwinian Revolution, which connected the evolving continuum of life and how everything is affected by it. Now comes the Stardust Revolution, that is not really separate, but a combination of everything that has come before.

Then it was explained that this third revolution is made up of five “realizations” or insights that have occurred. The first is the discovery (realization) that stars are more than just givers of heat and light. They actually make “stuff”. They forge the elements of the universe or the 2% of matter that fills our notion of physical, tangible things. In other words, stars are the beginning of all things.

The second realization is that all the “starstuff” (elements) that are created, are

spread out across the universe like seeds on the wind, as stars blow up and out.

The third realization is that you can DNA test every element, using isotopic fingerprinting to show where elements come from.

The fourth realization is that there is a cycle for how stars and stuff are born and distributed from Mass Loss to Diffuse Clouds to Dense Clouds to Accretion Disks to Stellar Systems. There was a good graphic representation of the cycle as described. There was also a 30 panel image of pictures taken by the Hubble Space Telescope of different star-forming regions or protoplanets within the Great Orion Nebula (M45), showing embryonic stars and some of their protoplanetary disks. It is hard to believe there are this many examples from just one nebula.

The fifth realization is meteorites are the carriers of the “tool kits of life” because they have the potential for the building blocks of life, as we know it. For example, eight of the twenty known amino acids (that are linked to life), have been found on carbonaceous chondrite meteorites.

Physics, chemistry and biology are merging in this revolution. This form of “cosmic ecology” was lead by people like Carl Sagan. We are all part of a “living system”. We are all connected in every way, therefore we need really do need to take care of ourselves and our planet. We all want to know what we are made of and where we came from and this explains some of the draw to genealogy by so many people. There is more order in the universe than we may realize and this might be the final insight, according to the author of the Stardust Revolution.

You can always read the book for yourself and draw your own conclusions, but if nothing else, it will be thought provoking, as I sure found it to be.

State of the Membership

A Report from PAA Membership Director

With the April 1st membership renewal date now past, let's take a snapshot.

At present, the 2015 roster consists of 54 memberships and some 85 names as a result of family memberships. In the discussion that follows, it's important to bear in mind the difference between a member, and a membership, because family memberships contain multiple members. Our membership application form provides for several options, including single, family, and student (all modestly priced I might add!).

A more detailed profile of the membership follows:

Paid Single Members	37 (includes 2 students)
Paid Family Members	17 (5 memberships)
Sponsored Family	17 (5 memberships)
Sponsored Single	3 (3 memberships)
Prize Memberships	9 (2 memberships)
Honourable Life Members	2 (2 memberships)

Table 1. Membership of PAA by Category

The numbers tell us that the single membership is our most subscribed category at about 70%. We also see that the 8 sponsored memberships account for 20 members, which is approaching 25% of the total membership. We are able to support so many sponsored members through the generosity of our sponsors, whose logos you see at our website, in *The Reflector*, and other print materials. They deserve our patronage. Prize memberships are given at the local science fair and at our annual "Astronomy on the Hill" event.

What about growth? We're certainly holding our own, with perhaps a modest increase in total memberships. In recent months we've added about 25 new names and it seems to me that we're always introducing new members at the regular meeting—a good thing!

On the other hand, we lost 15 memberships going forward into 2015 from 2014. To give that number some perspective, we lost 11 memberships in the previous year. Expressed as a percentage of total memberships, that's about 25% in each year.

Is that normal for a special interest club like ours? (I don't know.) Certainly people come & go for a whole variety of reasons, such as moving away or loss of interest. If you, as a current member, ever choose not to renew, the Membership Director would be interested to learn why. With that information we can then try to improve the PAA to meet the expectations of the membership.

The PAA Bylaws describe the duties of the Membership Director as follows: "shall be responsible for maintaining an accurate list of the membership of the PAA. The Membership Director shall issue a membership certificate to each member in good standing." In lieu of issuing a separate membership certificate, your nametag on a PAA lanyard serves this purpose, in addition to identifying you to fellow members. Please wear it to all club meetings.

Kenneth Sunderland

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Aldrin

I'm sure none of this is news to Buzz Aldrin. What I'm hoping is that all that patriotic talk is just his way of selling the idea to the Senators and the American public. We are a species of explorers. We will not languish in our complacency.

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natalie.graham@live.ca
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The Sky this Month

Mercury is well placed in the evening twilight from the 1st to 21st. Greatest elongation east (21°) on the 7th. Inferior conjunction on the 31st.

Venus is bright and high in the evening western sky.

Mars not visible as it enters conjunction with the Sun.

Jupiter is in the western evening sky and moving eastward in Cancer and sets after midnight.

Saturn is visible most of the night. Moves from Scorpius into Libra on the 12th.

Eta-Aquariid Meteors peak on the 6th at 11 am.

Moon Phases

Full Moon	11:42 PM	May 3
Last Quarter	6:36 AM	May 11
New Moon	12:00 AM	May 18
First Quarter	1:19 PM	May 25

*continued from page 3***Quaker**

Astronomers were the first to raise the flag on this issue over a century ago, but LP has now become a societal issue that affects us all. We can, however, do something about it. Due to 150 years of lighting proliferation, the world has created a monster that needs to be tamed. There are various forms of light pollution abatement (LPA) that an individual, community, municipality and government can take to reduce LP and its negative effects on us and our environment. Education is the first step in acknowledging there is an issue, understanding what it is and what can be done about it. The next step is making changes to how you use and direct the light sources you control. Are you over lighting your property? Do you have a yard light that stays on all night or do you use timers or motion sensors? By considering the amount of light and the style or design of the fixtures you install on your house or business you can be in control of LPA. Take note of environmentally aware businesses and commercial properties to see which ones utilize “full cut-off” fixtures. These are a good sign of LPA efforts in action. They are easy to spot because they will be flat lensed or the light source will be recessed in the fixture.

We all play a part. The city of Peterborough is a collective of light producers and users. Together they produce a dome of light that can be seen for kilometres in any direction around the city. In fact, if you were to drive away from Peterborough for 50 kilometres in any direction at night and look back, you will see the light dome glowing above the horizon that defines its location. How can this be? This glowing apparition is the manifestation of the collective light from all the occupants in the city, due mostly to over-lighting, reflected light, mis-directed light and in the worst cases, light being shone intentionally up into space.

Do we need legislation to help us deal with the situation? Many people would suggest we do. A case in point is that just a few months ago the Peterborough Planning

Committee adopted an amendment to the city Sign By-law that will regulate electronic signs within the city. Some of the changes included addressing the brightness of a signs output, so that it cannot be more than .05 times the ambient light level. Another consideration was the distance these types of signs can be from a residential area and the times of day they can be in operation. These are all steps in the right direction when it comes to LPA for this and future generations. There is no need to pollute our night sky and we all need to be part of the solution. (<http://www.darksky.org/> and <http://www.rasc.ca/lpa>)

This past March 28th was Earth Hour in Peterborough and around the world. The PAA had a very successful public viewing event on Armour Hill. There were other great things happening that night, as in previous years. The PepsiCo Foods Canada plant (Quaker Oats) turned off much of their outside lighting and other non-essential power in and around their facility and the results were impressive. Except for 2010, when they were not able to cut their facility operation, they have had an energy savings every year. This year alone there was a reduction of 52% during Earth Hour from the same time period just the week before, notes Noorulain Salim to the staff at the plant. Also, note the before and during images of the plant exterior from this year (photos by Andrew Adams). Pictures are worth a thousand words. They also speak for themselves.

After communicating with a management staff at PepsiCo about their efforts, I was informed that they actually have a Resource Conservation Intern position (Noorulain Salim) working in Peterborough. Now this shows a commitment to energy reduction. The real icing on the cake however, was when I learned that the reason PepsiCo started down this road in 2008, was due to the PAA. I am sure it did not hurt that there were dollar savings as a result of their efforts, but it is the end result that matters.

Way to go, PepsiCo!

continued from page 1

R136

more than 500,000 unique stars, including many hundreds of spectacular, bright blue ones. With a maximum age of two million years, the stars in this cluster are some of the youngest and most massive ever found.

At the centre of NGC 2070 is a very compact concentration of stars known as R136, which is responsible for most of the light illuminating the entire Tarantula Nebula. Consisting of no less than 72 O-class and Wolf-Rayet stars within just 20 arc seconds of one another, the most massive is R136a1, with 260 times the sun's mass and a luminosity that outshines us by a factor of seven million. Since the light has to travel 170,000 light years to reach us, it's quite possible that this star has already died in a spectacular supernova, and might not even exist any longer! The next time you get a good glimpse of the southern skies, look for the most massive star in the universe, and ponder that it might not even still be alive.



Peterborough Local 590



Articles

Submissions for *The Reflector* must be received by the date listed below. E-mail submissions are preferred (Microsoft Word, OpenDoc, ASCII and most common graphic formats are acceptable). If your article contains photos or graphics, please provide a separate file for each. Typed or hand-written submissions are acceptable provided they are legible (and not too long.) Copyrighted materials will not be published without written permission from the copyright holder. Submissions may be edited for grammar, brevity, or clarity. Submissions will be published at the editor's sole discretion. Depending on the volume of submissions, some articles may be published at a later date. Please submit any articles, thoughts, or ideas to:

phillip.chee@gmail.com

Next submission deadline:
May 26 2015



Meetings

The Peterborough Astronomical Association meets every first Friday of each month, except July and August, at the **Peterborough Zoo Guest Services and Rotary Education Centre** (inside the main entrance at the north end of the Zoo) at 7 p.m. P.A.A. general announcements will begin each meeting with the guest speaker starting at 7:30 p.m.