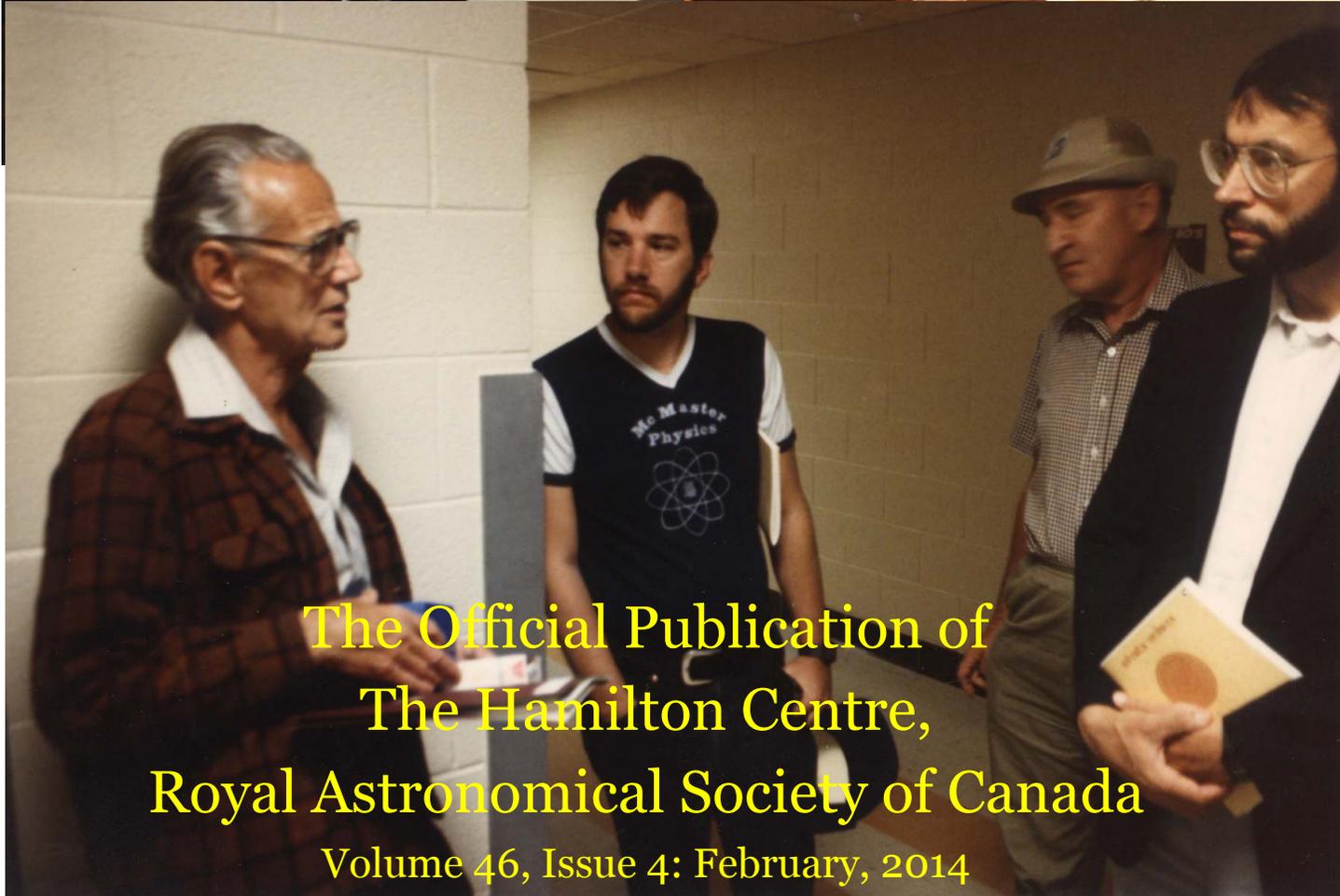
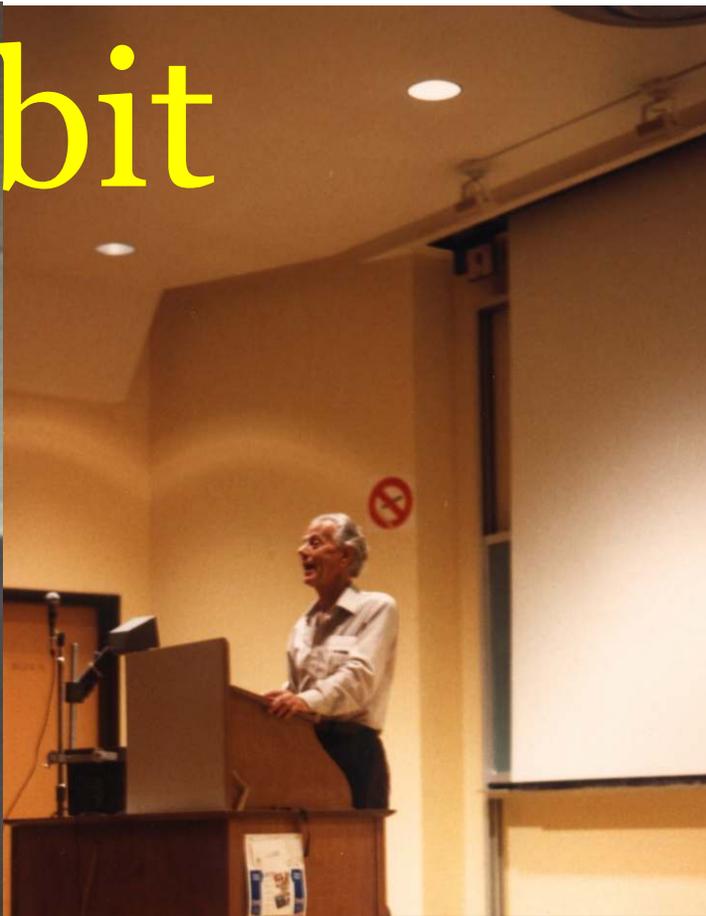
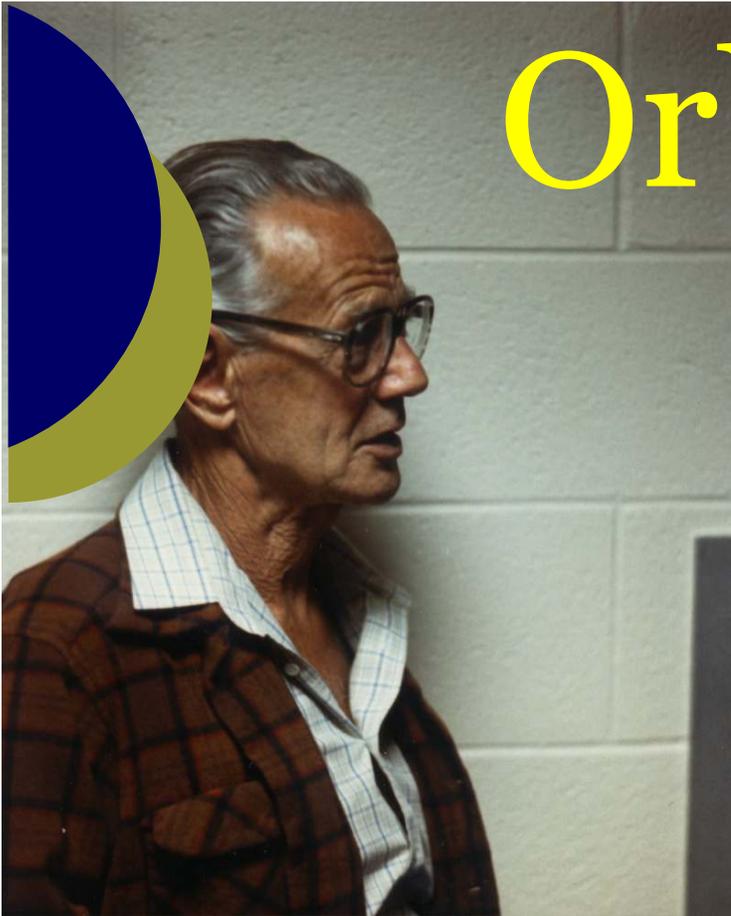


Orbit



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Issue Number 4, February, 2014

Roger Hill, Editor

There is so much good stuff going on in the Centre, it's hard to know where to start!

So, if you don't mind, I'll start off with NOVA.

We had our first meeting last night, and it looks like Mark Pickett's decision to have the observing session prior to the classroom portion was a good one. We got in some good observing, with a nice fat crescent Moon, Orion, the Pleiades and Jupiter all showing well. The single biggest problem was that the parking lot had not been plowed out, and everything had to be carried in. Mark's excellent Telescope Load program paid dividends, though, as two of the attendees each took home a scope. A little unexpected, but not unappreciated!

Ed Mizzi and I had spent a couple of hours on Monday afternoon getting the room all set up, and I tried to contact the snow plow person, but to no avail.

One of the really nice things about the observatory at the moment is how great it looks. The new floor is fantastic. I was worried that bringing snow in via the soles of your boots would lead to a slippery surface, but it doesn't appear that way...nobody had any trouble with the ceramic tiles.

The other thing is the new baseboard heaters...Let me tell you, they work really well! It did not take long for the temperature in the observatory to get nice and toasty. Well done to Dave Surette, who lead the effort to get this done.

I talked about Westfield last month, but we have had discussions with them on expanding our partnership with them. We could be looking at construction in the summer or very early Fall, as Westfield celebrates it's 50th anniversary. We have an excellent relationship with them, and we're looking at doing some interesting and innovative things there. Not everything is set to be released, yet, as our Board has to approve a few things before they can move forward. Just rest, assured, that there will be some cool things being done at Westfield before Halloween.

If you're at the February meeting (I cannot...I have to work that night), you'll hear about an interesting variation on Sidewalk Astronomy. Mark Pickett has set up an arrangement with one store of one of Canada's finest retailing giants. The local store manager is very enthusiastic about us setting up in their parking lot, but, as always, Mark could use a hand. If you can't make it to the meeting on February 6th, and you have some spare time on the evening of the 7th, please let Mark know that you'd like to help out. If it's clear, it should be a great evening with a nice 1st Quarter Moon visible along with Jupiter and it's Moons.

Let me see...what else? Oh, AstroCATS...the planning for our annual trade show is well advanced. I've seen an incomplete list of the exhibitors this year, and some of the invited speakers. It promises to be a great couple of days that you won't want to miss. Once again we'll be looking to the membership to help out with all the activities that are going on, and I hope that many members will volunteer...the event is a lot more worthwhile as a participant and rather than a customer.

Our cover photos this month come from Rob Allen, a long time Hamilton Centre member (he pre-dates me!) who attended the lecture given by the late John Dobson at the 1984 GA, in Hamilton. Mr. Dobson was also a guest at the Hamilton Centre Observatory, where he was unimpressed with a 6" telescope on a home made alt-az mount. I trust, however, that he would have loved the 10" Dob that Mark Kaye built almost 20 years ago.

I should also welcome Ray Badgerow back to these pages...it has been about a decade since his last submission, and I trust that a similar length of time will not pass until his next submission!

Roger

AstroCATS 2014 Update – Only 3 months until Showtime!



For the benefit of our new members, AstroCATS is a full-blow, 2-day astronomy trade show hosted by RASC Hamilton Centre. It is a really fun event that features exhibitors from around the world, seminars for every taste and experience level, famous guest speakers, and some nice prize booty. This year we are having a 2-day Solar Star Party sponsored by Lunt Solar Systems and Stephen Ramsden (Charlie Bates Solar Astronomy Project). All of the leg-work is done by a handful of club members, but during the show we have a large contingent of volunteers that help out (ticket/raffle sales, guides, safety, etc.) by donating their time for a 4-hour shift. AstroCATS is a fundraising event and it brings in a big chunk of \$'s that helps fund our outreach programs.

New Exhibitors for 2014: Apogee Imaging Systems, Astro Hutech, AstroPics, ATIK Cameras, Lunt Solar Systems, Meade Instruments, Ontario Telescope, PlaneWave Instruments, Sky & Telescope Magazine, Sunward Hobbies...stay tuned for more!

Prize Update: Some of our Sponsors have announced prize contributions. In particular, MallinCam will be giving away 10 cameras (over \$ 6K worth). More to come...

Solar Star Party: Lunt Solar Systems and Stephen Ramsden of the Charlie Bates Solar Astronomy Project have teamed-up to put on a spectacular Solar Astronomy program.

Special Hotel Rates: Invite your out of town family and friends. We have arranged special accommodations only steps away from the exhibit hall. Mohawk Residence & Conference Centre is offering 2-bedroom suites for only \$ 79.00/night. Includes continental breakfast, parking, WiFi.

Keep an eye on the website as more exhibitors, guest speakers, and prizes are added in the coming months:
www.astrocats.ca

Mark these dates on your calendar:

Saturday May 3 – 10:00 AM – 6:00 PM

Sunday May 4 – 10:00 AM – 4:00 pm

In the next few weeks we will be putting out the call for volunteers. It is actually quite a lot of fun and you will get free admission to the show and a nice T-Shirt to keep. We will post a schedule on our website and you will see the job duties and time slots that we need volunteers to fill.

New this year... AstroCATS will also have participation from “neighboring” RASC Clubs (Southern Ontario). By sharing a portion of admission ticket sales revenue we will have more attendance, which makes the exhibitors happy to come back year-after-year, and we will have even more funding for our programs.

Gary Bennett
Chairman, AstroCATS

Surprising Young Stars in the Oldest Places in the Universe

By Dr. Ethan Siegel

Littered among the stars in our night sky are the famed deep-sky objects. These range from extended spiral and elliptical galaxies millions or even billions of light years away to the star clusters, nebulae, and stellar remnants strewn throughout our own galaxy. But there's an intermediate class of objects, too: the globular star clusters, self-contained clusters of stars found in spherically-distributed halos around each galaxy.

Back before there were any stars or galaxies in the universe, it was an expanding, cooling sea of matter and radiation containing regions where the matter was slightly more dense in some places than others. While gravity worked to pull more and more matter into these places, the pressure from radiation pushed back, preventing the gravitational collapse of gas clouds below a certain mass. In the young universe, this meant no clouds smaller than around a few hundred thousand times the mass of our Sun could collapse. This coincides with a globular cluster's typical mass, and their stars are some of the oldest in the universe!

These compact, spherical collections of stars are all less than 100 light-years in radius, but typically have around 100,000 stars inside them, making them nearly 100 times denser than our neighborhood of the Milky Way! The vast majority of globular clusters have extremely few heavy elements (heavier than helium), as little as 1% of what we find in our Sun. There's a good reason for this: our Sun is only 4.5 billion years old and has seen many generations of stars live-and-die, while globular clusters (and the stars inside of them) are often over 13 billion years old, or more than 90% the age of the universe! When you look inside one of these cosmic collections, you're looking at some of the oldest stellar swarms in the known universe.

Yet when you look at a high-resolution image of these relics from the early universe, you'll find a sprinkling of hot, massive, apparently young blue stars! Is there a stellar fountain of youth inside? Kind of! These massive stellar swarms are so dense -- especially towards the center -- that mergers, mass siphoning and collisions between stars are quite common. When two long-lived, low-mass stars interact in these ways, they produce a hotter, bluer star that will be much shorter lived, known as a blue straggler star. First discovered by Allan Sandage in 1953, these young-looking stars arise thanks to stellar cannibalism. So enjoy the brightest and bluest stars in these globular clusters, found right alongside the oldest known stars in the universe!

Learn about a recent globular cluster discovery here: <http://www.nasa.gov/press/2013/september/hubble-uncovers-largest-known-group-of-star-clusters-clues-to-dark-matter>.

Kids can learn more about how stars work by listening to The Space Place's own Dr. Marc: <http://spaceplace.nasa.gov/podcasts/en/#stars>.

Globular Cluster NGC 6397. Credit: ESA & Francesco Ferraro (Bologna Astronomical Observatory) / NASA, Hubble Space Telescope, WFPC2.



John Lowry Dobson (1915-2014) Obituary by Douglas Martin

Hour after hour, night after night, decade after decade, all over planet Earth, John Lowry Dobson rolled his homemade telescopes to street corners and national parks to show people the heavens.

“Look at Saturn,” he would say. “No charge.”

He gave hundreds of thousands of people a fresh view of the stars, prompting Smithsonian magazine to describe him as a “carny barker for the cosmos.” A lanky figure with a ponytail, he toured with his road show in a creaky former school bus, which he called Starship Centaurus A, after a galaxy. The bus towed one of Mr. Dobson’s bulkier creations, a telescope as large as a mid-size automobile.

He died Jan. 15, at 98 – or, as he might have put it, 123 days into his 99th orbit around the sun.

Mr. Dobson is credited with developing the first, high-powered portable telescope that amateur astronomers could build inexpensively, and tens of thousands have done so. Dobsonian telescopes, as they are known generically, are still a popular item on the market, although Dobson chose not to benefit from them commercially.

He also founded a stargazing club, Sidewalk Astronomers, which announced his death, in Burbank, Calif. The organization has chapters on every continent but Antarctica. Mr. Dobson wrote books with inviting titles (*Astronomy for Children Under 80* is one), and he appeared on Johnny Carson’s *Tonight Show*. In 2005, he was the subject of a documentary feature, *A Sidewalk Astronomer*, directed by Jeffrey Fox Jacobs.

Most compelling to Mr. Dobson was divining what “the whole ball of wax” means. He delved into matters such as the origin of the universe with both passersby on the street and astrophysicists. He denounced the Big Bang theory on the ground that something cannot come from nothing – a view contrary to what many scientists believe – and wrote equations that he contended proved his point.

All this was perhaps par for the course for a man who spent 23 years living as a monk in a monastery of the Vedanta Society, a Hindu-inspired order noted for its intellectual rigour and vows of chastity. The head swami there assigned him to reconcile Hindu scripture with modern physics, Mr. Dobson said.

“I don’t know what your problems are, but that was mine,” he was quoted as saying in a biography prepared by friends.

It was this mission that prompted Mr. Dobson to scrounge through trash for materials to make his first telescope.

He was born on Sept. 14, 1915, in Beijing, where his parents were Methodist missionaries. As a child, he said, he laid on his back, gazed upward and imagined the sky as a vast ocean.

After leaving China because of political unrest, the family settled in San Francisco, and Mr. Dobson attended the University of California, Berkeley, graduating with a chemistry degree. Afterward, he joined the Ramakrishna monastery in Sacramento, Calif., where he led worship services and cared for the flowers.

As part of his quest to reconcile religion and science, Mr. Dobson decided to make a telescope to look at the universe. As material, he used plywood, cardboard tubes, glass from ship portholes and even cereal boxes. What resulted was essentially the same as the telescope Newton had developed in the 17th century: a tube with a concave mirror at the bottom to gather light and a flat, secondary mirror near the top to bounce light out to the eyepiece.

Mr. Dobson’s chief innovation was creating an axis at the base on a wooden mount that could move, not just up and down, but also sideways, like a cannon.

Mr. Dobson never sought a patent on his design or a copyright for the name, saying he did not care about money and wanted the telescopes distributed as widely as possible. Commercial manufacturers, seizing on the design, eventually did, selling versions in kits. Amateurs used them to see phenomena previously visible only to professional astronomers – precisely as Mr. Dobson had hoped. He said he had always wanted to share the exhilaration he felt at seeing, for the first time, in close-up, a three-quarters-full moon through a telescope he had made.

“It looked as if we’re coming in for a landing,” he said. “I thought, everybody has to see this.”

The abbot expelled Mr. Dobson from the Hindu monastery in 1967, saying he was spending too much time outside the monastery with his telescopes. Mr. Dobson left with only a \$50 bill, slept on friends’ floors in San Francisco and foraged for food in Golden Gate Park. Though he lectured regularly, he never had a steady source of income. He told The Los Angeles Times in 2005 that the last year he had paid income tax was 1944.

Mr. Dobson had a son, Loren, with Ruth Ballard, a professor of genetics at Sacramento State University. He leaves them both.

Mr. Dobson had a knack for phrase making that delighted audiences at the national parks he often visited. At Yellowstone, he was asked if the sky was part of the park. “No,” he said, “the park is part of the sky.”

His long view was long indeed. Human bodies, he told an audience, are made of stardust. He pointed to a photo of a nebula.

“If you give this cloud another 10 billion years,” he said, “it will go to school and chew gum.”

John Dobson visits Hamilton—Rob Allen

To have a celebrity like John Dobson come to Hamilton, and the Hamilton Centre GA, was such a treat. I was so thrilled to hear and meet the man whose name had become attached to a simple telescope design that we had become so familiar with.

Back then, even in 1984, he was already an elderly gentleman but you could see he was still full of energy and dedication to his cause. I'm not surprised that he lived to the ripe old age of 98!

The first part of his lecture was the inspiring history of his life and the path that he took to his passion for philosophy and astronomy. This included his belief in the importance of making astronomy available to the public. That enthusiasm brought about a simple design for a telescope mount that would make astronomy affordable to anyone, anywhere.

The second part of his talk took a turn when he discussed his religious belief, and how it inspired his views on cosmology and the universe. This included studying the ancient classical Sanskrit language, his belief in it's religion, and how it informed his interpretation of the universe.

His own cosmological theories that he presented were controversial, somewhat confusing, and opposite to the current understanding and belief of the day. At the lecture's conclusion there were several perplexed members asking questions regarding his theories.

Also after the lecture he handed out material pertaining to the “Vendarta Society” based in California- a religious group where he had been a monk for a number of years.

Definitely one of the most unusual lectures I have ever attended at the RASC.

John Dobson's dedication to his religion went hand in hand with his enthusiasm for astronomy and made his determination and achievements all the more understandable.

After his lecture he spent several hours talking and signing books for anyone who was interested or had further questions.

I see John Dobson as not unlike our own Rev. Dr. Marsh who pursued his understanding of God through his telescope building and observations. They both used religion and astronomy to better understand the cosmos.

Polaris Is Getting Brighter—Nola Taylor Redd, SPACE.com Contributor

The North Star has remained an eternal reassurance for northern travelers over the centuries. But recent and historical research reveals that the ever-constant star is actually changing.

After dimming for the last few decades, the North Star is beginning to shine brightly again. And over the last two centuries, the brightening has become rather dramatic.

"It was unexpected to find," Scott Engle of Villanova University in Pennsylvania told SPACE.com. Engle investigated the fluctuations of the star over the course of several years, combing through historical records and even turning the gaze of the famed Hubble Space Telescope onto the star.

Scientists have known since the early 20th century that the familiar star was part of a pulsating class known as Cepheid variables; its variations were suspected as early as the mid-1800s. But unlike most Cepheid variables, the pulses of Polaris are very small.

"If it had not been so popular as the North Star, we likely wouldn't have known it was a Cepheid until modern times," Engle said.

In the early 1990s, scientists realized that the oft-lauded brightness of Polaris was beginning to decline. Engle and his group began to research the star around the beginning of 2000, when they found that the dropping brightness was on the rise again.

"It started increasing rather rapidly," Engle said.

Curious, the team began to search historical records to see what other measurements they could find. Combing through data from the past century, they compared the information on Polaris with observations of other celestial bodies from the same telescopes and details about the instruments to compare the relative brightness of Polaris over the years. They found that the star had grown brighter over the past hundred years.

The next step was to determine just how far back the increasing brightness went. Engle pursued observations by Danish astronomer Tycho Brahe in the 16th century and Persian astronomer Abd al-Rahaman al-Sufi in the 10th century, using information from historical texts to determine just how bright the star was in the ancient sky.

According to Engle, if we take the measurements of al Sufi and Ptolemy at face value, the North Star has brightened by about two and a half times over the last two centuries. Modern interpretations of the historical data indicate that it could be as much as 4.6 times brighter than it was in ancient times.

As they pursued the historical documents, Engle and his team continued to monitor the increasing brightness of Polaris. But they were stymied when a modern CCD device—essentially a very sensitive digital camera—replaced the older imaging device on their telescope. The newer technology was too sensitive to image the bright North Star.

The team relied on observations from amateur astronomer Richard Wasatonic, whose backyard telescope still utilized the less-sensitive imaging equipment. They also obtained observations from astronomers in Croatia and the Czech Republic who still utilized older equipment.

"We have to beg, borrow and steal to find people who use older photoelectric equipment," Engle said, acknowledging the irony of wanting to use older equipment.

The team ran into similar difficulties when they sought to image Polaris with the Hubble Space Telescope. Even after receiving approval, he said that the HST team was very hesitant to let Engle and his colleagues image the bright star, concerned that the sensitive Cosmic Origins Spectrograph (COS) might suffer.

The HST observations provided insights into the atmosphere of Polaris, which is changing along with its brightness.

Engle presented the results of his ongoing research in a poster session at the American Astronomical Society meeting in Washington, D.C., earlier this month.

Polaris isn't the only Cepheid variable changing over time. Engle described an ongoing study of 15 other Cepheids, most of which have shown unexpected long-term changes in their average brightness.

"For a long time, Cepheids have been prized because, even though they pulsate, they're consistent," Engle said.

Such consistency has led to them being dubbed as one of the 'standard candles' of the universe. Standard candles are objects whose known brightness allows them to accurately measure distances across space.

"It is possible that a good bit of Cepheids are undergoing these changes," Engle said. "They might be very, very complex stars, much more than we originally thought."

Astronomical Highlights of 2014—Ray Badgerow

Here are some of the major astronomical events of 2014 based upon Astronomical Calendar 2014:

- Jan. 3 : Quadrantids ,best meteor shower of the year.
- Jan. 5: Jupiter at opposition
- Jan. 11: Venus at inferior conjunction.
- Mar. 10/20: Naked eye occultation of Regulus by 163 Erigone (Eastern Ontario)
- Apr. 8: Mars at opposition.
- Apr. 14/15: Total lunar eclipse visible from the Americas and Pacific Ocean.
- May 10: Saturn at opposition
- May 22: Mercury is highest in the evening sky (for northern hemisphere observers)
- May 29: Comet 209P/Linear closest to Earth (0.053AU) ,mag.11
- Jul. 4: Pluto at opposition
- Jul. 6 : Trio of Moon,Mars and Spica in morning sky
- Aug. 17/18: Close conjunction of Jupiter and Venus in morning sky
- Aug. 29: Neptune at opposition
- Aug. 31: Trio of Moon, Mars and Saturn
- Oct. 7: Uranus at opposition
- Oct. 8: Total lunar eclipse visible from the Pacific and most of the Americas
- Oct. 19: Comet C/2013 A1 Siding Spring near miss of Mars (0.001 AU!)
- Nov. 6 : Asteroid 6 Hebe at favorable opposition.

America is preparing to land a robot on the moon for the first time in four decades.

NASA is looking for private partners to participate in the project that will see a new generation of rovers wandering across the moon's surface.

The American space agency has set up a programme called Catalyst to exploit commercial opportunities offered by the moon.

It believes that eventually there will be a market for commercial cargo trips to the lunar surface.

"As NASA pursues an ambitious plan for humans to explore an asteroid and Mars, US industry will create opportunities for NASA to advance new technologies on the moon," said Greg Williams, NASA's deputy associate administrator for the Human Exploration and Operations Mission Directorate.

But America is not alone.

Last month China sent its Jade Rabbit rover to the moon, making it the first country to make a soft lunar landing since 1976, when the Soviet Union sent the Luna 24 mission to collect rock samples.

Other countries including Japan and India are also looking to become major players in lunar exploration.

"It's starting to get a little crowded out there," said Jonathan McDowell, an academic at the Harvard-Smithsonian Center for Astrophysics.

"After the Apollo programme we did amazing things with robots in space.

"We went to every planet in the solar system and we rather forgot the moon, we rather felt we had been there and done that.

"In terms of human flight we retreated to earth orbit, we worked on the space shuttle and then the space station."

For decades, information from the moon was sketchy, with grainy images being sent back to earth from an old spy satellite.

But recent lunar orbiting missions have produced far more impressive results.

Images now display a huge amount of detail including the trail of Neil Armstrong's walk when he was the first man to set foot on the moon in July 1969.

This work has breathed life into the hope of putting a man back on the moon.

The idea was first floated by President George W Bush although according to Dr. McDowell, the budget he set was unrealistic.

But the growing use of private partnerships has changed the financial landscape.

NASA is ready to offer its expertise to private companies to develop lunar exploration, but it is not putting up any cash for the missions.

However, the co-operation with the private sector has fuelled optimism that the moon could eventually house a space station.

Already there are plans to explore the lunar South Pole, where it is hoped there could be abundant natural resources that would make a base self-sustaining.

"We now have a huge database on the moon. We have been looking for water. On the lunar South Pole there could be ice," Dr. McDowell added.

"If we are going to make 'Star Trek' voyages to other planets, the moon is a great place to go.

"It is great to do this somewhere where it only takes three days to get home."

By David Millward, The Telegraph

SN2014J—Stuart Atkinson 2014

For almost half a century, every time
I read the word “Supernova” I imagined
Standing outside, on a cold, clear night,
Seeing a hole punched in the sky;
The hide of heaven punctured, allowing the light
Of a more brilliant, more beautiful universe to come surging through,
A Niagara Falls of photons
Brighter than any Full Moon.

After all, those woodcuts, engravings and paintings on cave walls
All showed a spectacular sight:
Something beyond bright, a cosmic Maglite shining
Right in Earth’s eye,
And as the years passed I grew impatient to see
Something like that above me,
A freshly-lit cosmic beacon burning above my town,
Above my hills and trees...

In my mind’s eye I always saw my
First supernova shining amongst the stars of winter.
High, somewhere above Orion,
Its icy rays slicing through the Pleiades, putting nearby
Rigel and Sirius to shame; I pictured
A celestial welding flame so insanelly bright
It would cast swaying shadows behind me as I stood there
Staring, staring...

...but instead what I saw was a barely there
Pinprick peeking through a puff of smoke,
A mere silvery mote – even when magnified a dozen times –
Off to one side in a telescope’s eyepiece on a night
Of scudding clouds and mist-dimmed stars,
As I stood in the mud, in a car park.

Tempting... so, so human... to groan “Oh, is that it?”
But grossly unfair. Remember, I scolded myself, there, so hard to see
Through the fur on the Great Bear’s shoulder,
A star has blown itself apart..!
Not today, but, as the poster says,
A long time ago in a galaxy far, far away.
So far away the light entering our eyes tonight
Set off when Mankind still swung from trees
And the delight of walking upright was just a dream,
Ten million years from waking...

So don’t dismiss that distant fleck of light too soon.
That’s the Universe bursting a balloon
Behind our backs, laughing as we run, stumbling
To our telescopes, desperate to know more,
Desperate to drink in its beauty while trying hard
Not to think of the fate of its family of worlds,
Or wonder if that star had been a civilization’s Sun
Before it turned itself inside out,
Its neutrino-drenched death met with the terrified shouts
And screams of billions of beings as the ground
Beneath their feet blistered then shattered,
Their planets’ dusty remains scattered like crushed dry leaves...

Could you pass Grade 9 Science? - Ed Mizzi

The following questions are taken directly from grade 9 science test banks and deal with the space unit. How well can you do? Try not to use any outside help (no books, internet, phone a friend, etc.) Answers next month!

- 1) Many dates in the celestial calendar are marked by the amount of daylight. In the Northern Hemisphere the longest day occurs around June 21 and is called ...
A. Vernal equinox B. Autumnal equinox
C. Summer solstice D. Winter solstice
- 2) The Mayans of Central America built an enormous cylinder-shaped tower at Chichén Itzá to celebrate the occurrence of the ...
A. solstices B. equinoxes
C. Solar eclipse D. Lunar eclipse
- 3) The width of a mitt was used by the Inuit peoples in the high Arctic to gauge the height of the Sun above the horizon. When it rose to one mitt-width high it meant ...
A. The days would get longer and warmer B. The nights would get colder and shorter
C. Seal pups would be born in two lunar cycles D. The Northern Lights would shine their brightest
- 4) Aristotle's proposed model of the solar system to explain planetary motion was the Geocentric Model. At the center was the Earth and ...
A. water B. wind C. fire D. gas
- 5) Copernicus proposed a different model to explain planetary motion. His model, called the Heliocentric model. Galileo Galilei later confirmed his model, in his observations with one of the first telescope. But it was this Johannes Kepler, who put in place what was missing from Copernicus' model. He realized that the orbits of the planets were ...
A. circular B. geocentric C. intersecting D. ellipses
- 6) The unit used to measure 'local distances' in space (inside our solar system) is called an astronomical unit. One astronomical unit is equal to the average distance from the centre of the Earth to the center of the Sun. The largest planet, Jupiter, is approximately ...
A. 5 AU's from the Sun B. 10 AU's from the Sun
C. 19 AU's from the Sun D. 30 AU's from the Sun
- 7) In the 2nd Century A.D. Egyptian astronomers used an instrument, called a quadrant to ...
A. measure the angle between the Moon and any given star
B. identify details in the far reaches of the night sky
C. chart astronomical position and predict the movement of stars
D. measure a star's height above the horizon
- 8) Arabian Astronomers used an instrument, called an astrolabe to ...
A. measure the angle between the Moon and any given star
B. identify details in the far reaches of the night sky
C. Make accurate charts of star positions predict the movement of stars
D. measure a star's height above the horizon
- 9) The light from our sun takes about 8 minutes to reach the Earth. Light from Pluto takes...
A. 5 hours B. 5 days C. 5 weeks D. 5 months
- 10) When measuring the diameter of the sun, we use an indirect method (not measuring it directly). What do you calculate to show how far from the real value your measured value is?
A. actual error B. estimated error C. percent error D. adjusted error



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 Dave Surette, Secretary
 Andy Blanchard, Past President / AstroCATS Co-Chairman

Calendar for January, 2014

Mon	Tue	Wed	Thu	Fri	Sat	Sun
		01 ☉	02 • 8pm » Public Monthly Meeting	03	04	05
06	07	08 ☾	09 • 8pm » RASC Board Meeting	10	11	12
13	14	15	16 ☀	17	18	19
20	21	22	23 ☾	24	25	26
27	28	29	30 ☉	31		