Event Horizon

Volume 21, Number 4
February 2014

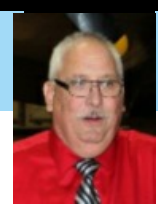
From The Editor

I hope everyone is surviving this Winter! The weather around here lately hasn't exactly been conducive to hands-on outdoor astronomy activities.

But this month's E.H. has lots of astronomical reading from the comfort of the indoor armchair, including the second of Dr. David Galbraith's articles about remote astronomy and astro-image acquisition.

Enjoy!

Bob Christmas, Editor



Chair's Report by Jim Wamsley

The Chair report this month will be a little shorter than most, just like the month.

Last month's meeting went well. Steve Germann's talk on his Sky Stopper equatorial wedge was well received, judging by the number of people who went up to ask questions, and have a closer look at the device, both at the break and at the end of the meeting. Matthew Mannering's sky this month was also well received, and very informative. Thanks to you both for your contribution, to make another successful H.A.A. meeting. We held the first Cosmology discussion group meeting Jan18th. Vladimir Pariev gave a short talk about planetary rings, with an impressive power point presentation, and a Q&A session and discussion after. This was followed with the group watching the second episode of Carl Sagan's Cosmos.

As far as observing this month, the only thing I have done is solar observing. I had an opportunity to join David Galbraith at the R.B.G. for Solar Thursday, and viewing the sun from my patio on the few clear moments we have had this past month. I must be feeling my age, as the thought of going out to observe with the temp's at -30 or more, is not as alluring as it once was, so I have been filling the astronomy compulsion with daytime observing and I at least have old Sol to help warm me, as I take in his wondrous face.

I have been working hard on the club's behalf. I have made arrangements for our speaker series, for every month through to November, with the exception of September. I think I have a good mix of technical and general interest, with several speakers from the McMaster University Astronomy & Physics Dept. and some club members *(Continued on page 2)*

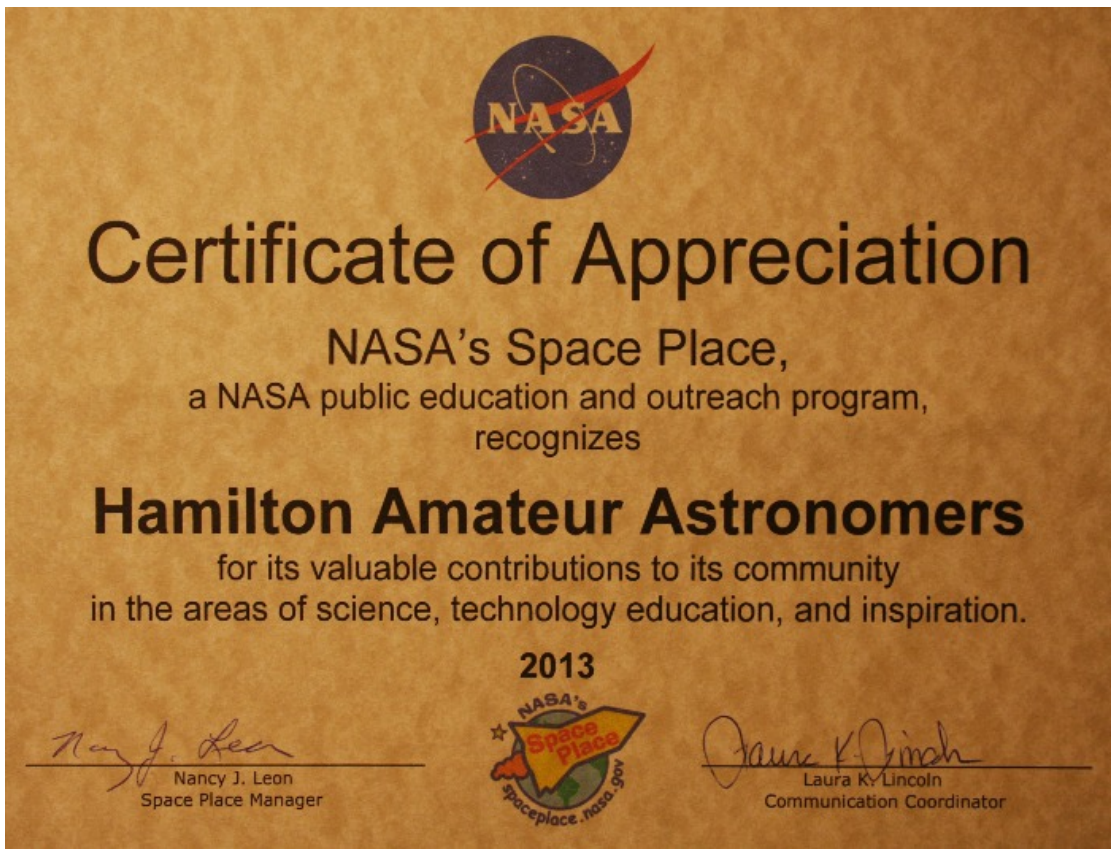
IN THIS ISSUE:

Chair's Report (continued)

willing to pass on their knowledge to us. I have an opportunity to bring in an excellent speaker from out of town. This gentleman is willing to make the drive from his home in cottage country, but will need a place to stay overnight, as it is impractical to drive home after the meeting. Unfortunately, I have no place for him to sleep to have stay with me, so if you have a spare bed and would like to have some interesting company for a night, please let me know, and I will see if we can make arrangements.

Upcoming in February we have Astronomy 101 starting Feb. 1st with 16 members registered. Our guest speaker at the February meeting will be Dr. Rob Cockcroft, talking to us about Ancient Egyptian Astronomy. We will also have our own young Kevin Salwach, giving us one of his fun presentations to amuse and enlighten us. Matthew Mannering, of course, will have the Sky This Month. Feb.15th will see the Astro Photo Group get together once more. Please feel free to join in. This group is an informal bunch of friends talking over the challenges and techniques of the hobby.

That's about all I have to report this month, as promised, a little shorter than most.



The HAA Recognized by NASA!

The HAA is pleased to be recognized, by way of a Certificate of Appreciation from NASA's Space Place program for our community outreach.

See the latest NASA Space Place article on Pages 15 and 16.

HAA Helps Hamilton

To support our community, we will be collecting non-perishable food items and cash for local food banks at our general meetings. Please bring a non-perishable food item to the meeting or a donation of cash and help us help others in these tough economic times.

If you would like to help or have any questions about this initiative, please contact Jim Wamsley at 905-627-4323.

Masthead Photo: *Supernova SN 2014J in M82, by David Galbraith.*
On 22 January 2014 a supernova, designated SN 2014J, was discovered in Messier 82 in Ursa Major (the Cigar Galaxy) by S. J. Fossey. This type-Ia supernova was a magnitude 11.5 object at the time. David requested this 20 second exposure of M82 on the public access MicroObservatory Network on 25 January and received this image on the 26th, using their icon-driven web interface. It was taken at 1:54 AM local time by one of the MicroObservatory 6" telescopes in Amado, Arizona. The supernova is the star midway between the hair lines, to the right of centre of the irregular galaxy.

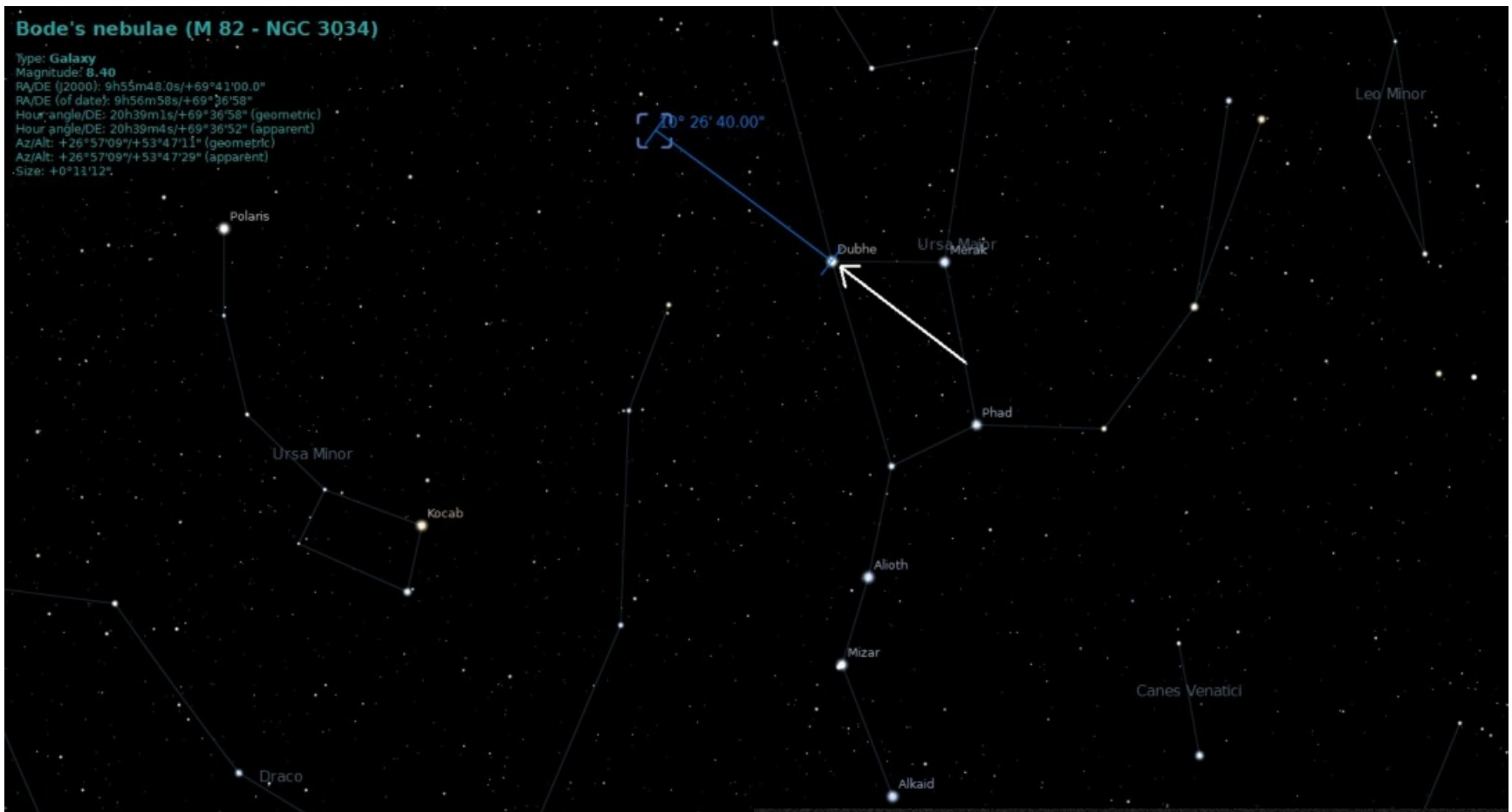
The Sky This Month for February 2014 by Matthew Mannering

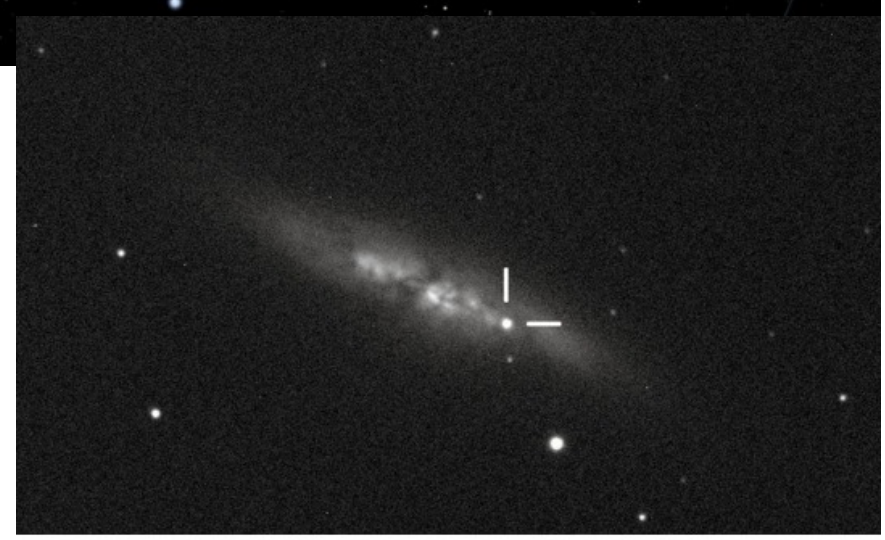
Well the sky just isn't cooperating with us North American Earthlings this winter. I think I saw the stars on three nights over the last couple of weeks. However, along with the cloudy nights, temperatures have been brutal as you all well know. After one severe cold snap, the Polar Vortex returned with a vengeance. Personally I think that "The Return of the Polar Vortex" sounds like the title of one of those really cheesy, made for TV, Sci-fi movies that have came out in the last few years. All I know is that it's too cold out there for me!

Back on January 22nd, a supernova was spotted in the nearby galaxy **M82** (aka the Cigar Galaxy). Apparently this is the closest supernova in 20 years at only 11.5 million light years away. According to what I've read online, by the time this issue of the Event Horizon comes out, the nova should have reached its maximum brightness of around magnitude 8. M82 and **M81** are two bright side by side galaxies in the constellation *Ursa Major* (the big dipper). You should be able to spot the supernova in any telescope or even with binoculars while it is at maximum brightness.

Make sure you take a look at M81 & M82 as well. The two galaxies are only about a half degree apart. M81 is a large spiral galaxy that may have interacted with M82 at some point causing a massive burst in star formation in M82.

(Continued on page 4)





UCL / University of London Observatory / Steve Fossey / Ben Cooke / Guy Pollack / Matthew Wilde / Thomas Wright

The Sky This Month (continued)

Towards the end of February, when the Moon rises later in the night, the Zodiacal Light should appear in the Western sky. Find a location with no sky glow in the West and look for a tall, tilted pyramid of light. The glow follows the plane of the ecliptic which contains the constellations of the Zodiac, hence the name. The current theory suggests that the glow is the result of light scattering off dust particles left behind by short period comets. Look for this effect after the 16th.
On a sad note, one of the most famous amateur astronomers of the last half of the 20th century passed away on January 15th at 98 years old. His name was John Dobson and he changed the way amateurs approached observing with the introduction of the Dobsonian mount. This eliminated the large and very expensive equatorial mount needed to hold a big Newtonian telescope. Amateurs could now afford a larger aperture scope which could be set up anywhere. A new era of sidewalk astronomy was born which has allowed a great number of people to get their first up close and personal look at the night sky.

Easy Targets

Once again we're going to look at the region between Orion and Leo. Next month we'll move east into Leo, Corvus, Virgo and the Realm of the Galaxies. But for now, let's look at some more targets in the winter sky (see the sky charts on Page 5). By the way, when you find an object remember to record the date and location on your chart, in a note book (or both).

The winter evening sky is somewhat lacking in Globular clusters, but there is one that is worth a look. You're going to need a clear view of the horizon below *Orion*. Look below Orion to the constellation *Lepus* (the Rabbit). Just under the quadrilateral section of Lepus is where you will find **M79**. This one isn't actually that easy if the horizon is hazy. I had to wait for one particularly clear night for it to appear.

Moving across into *Monoceros*, you might be tempted to look for the **Rosette Nebula**. Without filters and a very dark location, the best I've seen of the Rosette is a sort of outline against the background stars. However the cluster at the center of the Rosette has a distinctive shape and is easy to find. When I look at it, I see a rectangle of stars that resembles a 'six' on a dice. The official name for this one is **NGC 2244**.

M50 is a cluster about 4.5 degrees to the north east of the nose of *Canis Major*. Once you've found M50, head 3 binocular fields due east and then 1.5 fields down towards the horizon. There you'll find another cluster - **M48**.

Not as Easy Targets

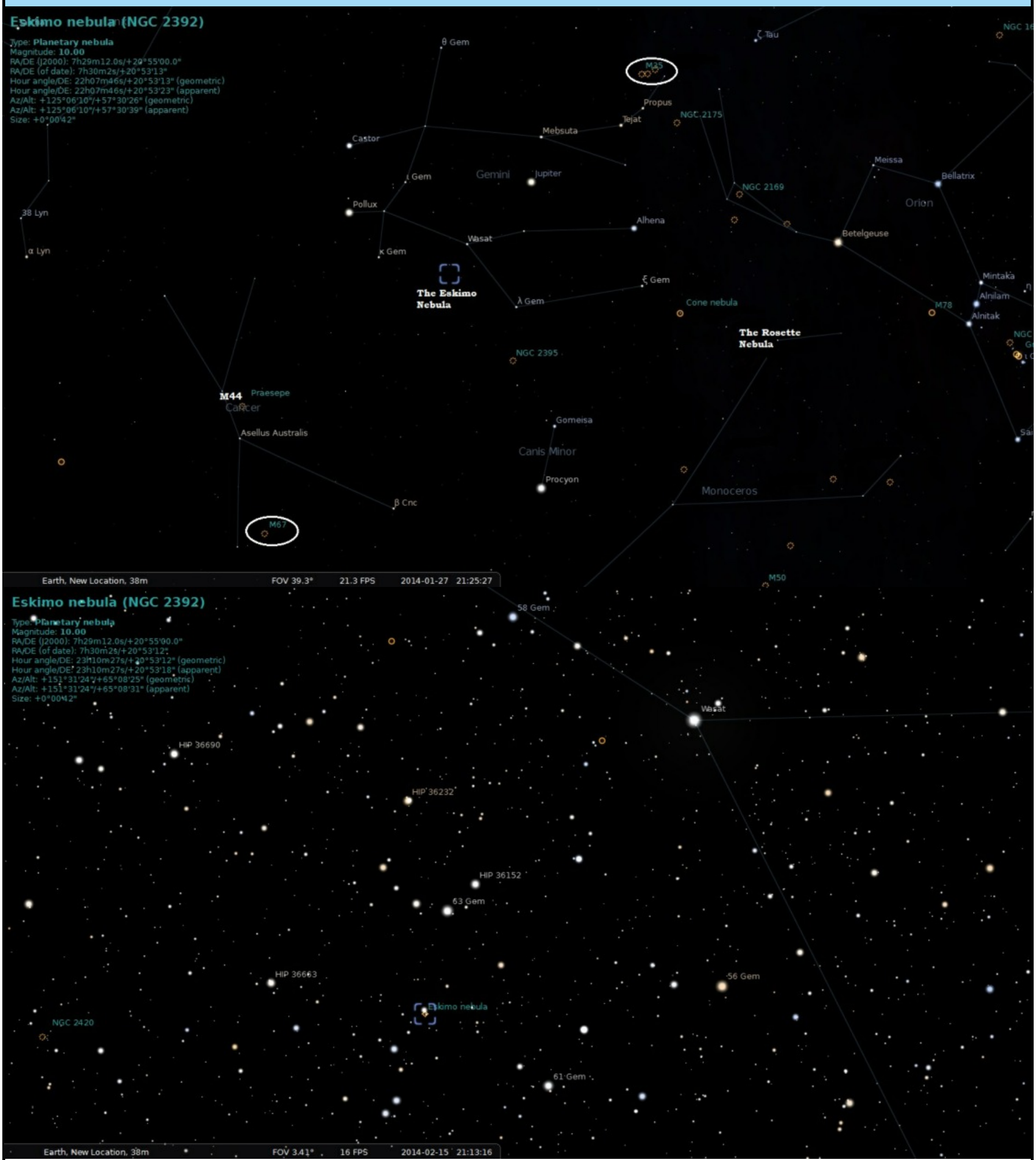
The next 2 clusters are a little more difficult to find. Both of these reside in the constellation *Cancer*. **M44** (the Beehive) is large and bright (see 1st sky chart at top of Page 5). Whereas **M67** is much smaller and fairly dim. Both are within the grasp of binoculars. So why are they more difficult to find? It's because Cancer is so dim that in town it becomes invisible to the naked eye. In order to find M44 and M67, you have to be able to find 2 bright stars. **Regulus** in *Leo* and **Procyon** in *Canis Minor*. Draw an imaginary line between them. Center your binoculars half way along that line and move them slightly up and to the left. There you will find M67. Next look up 2 fields and then slightly to the left. That should place you right in the Beehive.

A More Difficult Target

Lastly, try and find a very tiny planetary nebula in Gemini. It's named **NGC 2392** but is more popularly known as the Eskimo nebula (see 2nd sky chart on Page 5). First, use binoculars to find the general location of the Eskimo relative to the star 'Wasat'. Next, use your charts to identify the pattern of stars close to it. Then, center the Eskimo as accurately as possible using the finder scope on your telescope. Work from low power to high power eyepieces, looking for a pale blue disc right beside one of the stars. Don't expect to see any detail in the nebula. Instead give yourself a little pat on the back for finding it.

(Continued on page 5)

The Sky This Month (continued)



Sky Charts showing the Cancer-Gemini-Monoceros-Canis Minor region of the Winter Sky, including a close-up of the Eskimo Nebula location.

(Continued on page 6)

The Sky This Month (continued)

The Moon

Libration favours the North and East limbs early in the month. The South and West limbs are favoured later in the month.

The Planets:

- ***Mercury*** ended last month at its greatest elongation from the Sun. This means that visually, the angle between the Sun and Mercury, was at its maximum. From this point, until inferior conjunction on the 15th, Mercury will appear to move closer and closer to the Sun. After the 15th it will become visible very low in the Eastern sky at sunrise. People South of the equator will have a much better view during this period.
- ***Venus*** is low in the South East at about 6:30am all through the month.
- ***Mars*** spends the month in Virgo never straying very far from the bright star Spica. Look for it in the East South East just after midnight.
- ***Jupiter*** (in Gemini) is already 35 degrees above the horizon at sunset. Jupiter is visible all night now. If the clouds ever go away and the temperature climbs to tolerable levels, go out and enjoy the view.
- ***Saturn*** is in Libra at the moment. It rises in the East South East around 2am at the beginning of the month. Look for it about 28 degrees above the horizon after 6am in the South.
- ***Uranus*** is visible low in the West at 7:30pm in the constellation of Pisces while ***Neptune*** is disappearing into the evening twilight.

Other Events:

-*February 1st:* Mercury at 4 degrees South of the Moon just after sunset.
-*February 3rd:* Mercury at perihelion (point in its' orbit where Mercury is closest to the Sun). Interestingly, from our visual perspective, Mercury is about as far away from the Sun as it gets.
-*February 6th:* First quarter Moon.
-*February 11th:* Jupiter at 5 degrees (one binocular field of view) North of the moon at about 1 am.
-*February 14th:* Full Moon.
-*February 15th:* Mercury at inferior conjunction.
-*February 17th to end of the month:* The Zodiacal Light will be visible for the next two weeks in the Western sky.

Astronomical Highlights of 2014 by Ray Badgerow

March 10/20: Naked eye occultation of Regulus by 163 Erigone (Eastern Ontario)
April 8: Mars at opposition.
April 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
July 4: Pluto at opposition
July 6: Trio of Moon, Mars and Spica in morning sky
August 17/18: Close conjunction of Jupiter and Venus in morning sky
August 29: Neptune at opposition
August 31: Trio of Moon, Mars and Saturn
October 7: Uranus at opposition
October 8: Total lunar eclipse visible from the Pacific and most of the Americas
October 19: Comet C/2013 A1 Siding Spring near miss of Mars (0.001 AU!)
November 6: Asteroid 6 Hebe at favorable opposition.

Publicly Accessible Robotic Telescope Networks by David Galbraith

In the January 2014 issue of Event Horizon I described some of my experiences to date using public access remote observatories on the Sierra Stars Observatory Network (SSON). I became interested in this sort of application for amateurs in 2013, and have been continuing to explore what's possible with the increasing number of amazing instruments on-line. In this article I provide links to other on-line systems that might be interesting to try for personal or educational uses.

There are a variety of interesting on-line robotic observatory facilities now available to the public. Some are available free for public or educational use, such as the 6" reflectors that make up the MicroObservatory Robotic Telescope Network. Others consist of high-end professional instruments costing hundreds of dollars per hour that can be used by anyone with the financial resources. Quite a few are very good Cassegrain or Ritchey–Chrétien instruments between 20 and 40 cm objective diameter. Some are much larger, including two 2-meter instruments available to rent on-line via the Las Cumbres Observatory Global Telescope Network (assuming you can afford the minimum $500 per hour rental fee).

An RGB image of Messier 42, the Great Nebula in Orion (of course), prepared from three images taken with the MicroObservatory Network (described below), on 30 December 2013. The original images were processed, aligned and stacked with FITS software provided free by the network. The resulting image had several smeary artifacts, which have been manually retouched.

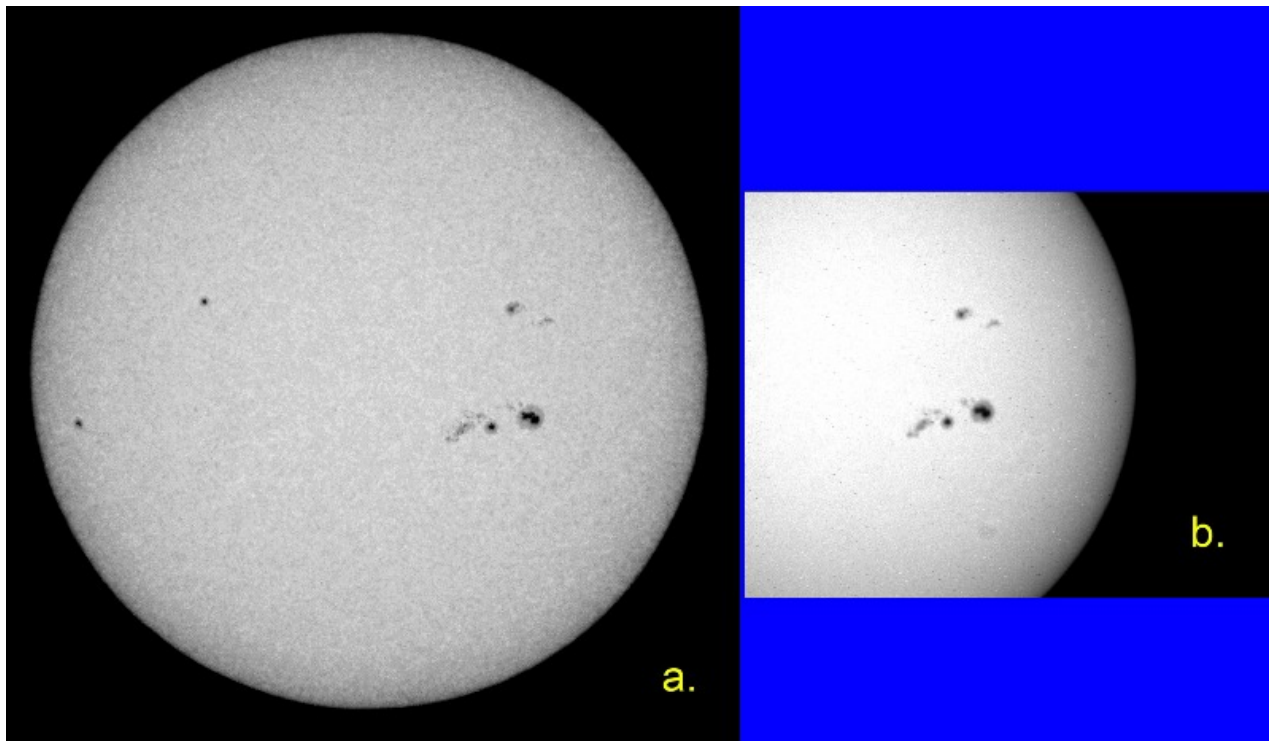
Of course, you should expect to get what you pay for. The 6” reflectors on the MicroObservatory Network are heavily pre-programmed, and the resulting images are low resolution. However, as free introductions they could be used as a great educational resource. The economics of using a robotic network is only part of the equation. These systems, for the most part, do not allow you to undertake real-time observing (but some do, such as SLOOH and Ontario's own ROBOSky). Most operate with on-line forms that allow you to program your request for an imaging run (using a particular telescope, your choice of target, and settings for exposure, filters, etc.) into the system.

I have not had the opportunity to make use of most of these systems. This report is based for the most part on Internet research only. The networks are listed here in alphabetical order, and I can make no guarantees as to how well any of these work. I am planning on making use of a couple of the lower-expense options in the coming month. The images illustrating this article were made with the MicroObservatory Network telescopes.

(Continued on page 8)

Publicly Accessible Robotic Telescope Networks (continued)

A global list of robotic telescopes is maintained by the Institute fr Astrophysik at the University of Goettingen, Germany: http://www.astro.physik.uni-goettingen.de/~hessman/MONET/links.html



Two while-light images of the sun, taken on 9 January 2014. *a*. the sun, showing the large sunspot group AR 1944, photographed at 12:30 PM Thursday 9 January 2014, during a Solar Thursday public viewing event at Royal Botanical Gardens in Burlington. This was taken using a mylar solar filter and 700mm telephoto lens on a Nikon D5100 dSLR. *b*. is a shot of the sun taken the same day with the free, educational MicroObservatory Network by a telescope in Arizona, and then processed with their FITS software. Image *b*. has been re-sized to match the radius of *a*.

AAVSOnet http://www.aavso.org/aavsonet

The American Association of Variable Star Observers operates the American Association of Variable Star Observers Robotic Telescope Network. The association is a large network of individuals who make observations of variable stars (hence the name). The network features telescopes in 11 locations in the USA, Argentina, Israel, and Australia. Instruments range in objective diameter from 29 cm to 80 cm. Observing runs are available to AAVSO members in good standing. A proposal for observing time must be prepared and submitted for approval by AAVSO.

Bradford Robotic Telescope http://www.telescope.org/

The Bradford Robotic Telescope, located on Mount Teide, Tenerife, consists of a 14-inch diameter Cassegrain reflecting telescope, on an equatorial mount with 3 cameras and 12 different filters. The telescope is inexpensive to join and use, at £3/month (£36/year). The on-line system is intended for educational uses. However, images produced with this telescope remain the copyright property of BRT; users may employ the images as they wish provided that a "reasonable copyright notice" is provided.

The BRT has an educational sister site: http://schools.telescope.org/login.php

Discovery Space (D-Space) Project http://www.discoveryspace.net/

The Discovery Space (D-Space) Project uses a series of telescopes around the world, including some that are included in other networks. The system is free to use. It was established with a “100 Hours of Observing” event in 2009 for the International Geophysical Year.

GLORIA http://gloria-project.eu/en/

The “GLObal Robotic-telescopes Intelligent Array” is an EU-funded educational and research program. This global robotic telescope network for citizen scientists presents some experiments that are pre-programmed, to which users are invited to contribute directly. However, users can also design their own observations. Users develop and submit an automatic observing program, a process termed "Authoring."

(Continued on page 9)

Publicly Accessible Robotic Telescope Networks (continued)

There are 17 telescopes on the network, but many are used by other programs and the available time for the GLORIA program is limited.

Itelescope http://iTelescope.net

iTelescope was formally called "Global Rent-A-Scope" (http://www.global-rent-a-scope.com/). It is a distributed network of telescopes, including 7 in California and New Mexico, 3 in Spain and 9 in Australia. Users purchase “points” under various monthly billing plans, at $1 per point. Telescope time is charged according to the telescope used, ranging from 17 points per hour to more than 100 per hour.

A single monochrome exposure of the Whirlpool Nebula (Messier 101), taken on the night of 40 December 2013 with the MicroObservatory network. The resulting FITS file was processed with the software provided by the web site.

MicroObservatory Robotic Telescope Network http://mo-www.cfa.harvard.edu/MicroObservatory/

The MicroObservatory Robotic Telescope Network has been in operation for more than a decade, run by the Harvard-Smithsonian Center for Astrophysics. The network consists of four 6” reflecting telescopes (named Ben, Cecilia, Donald, and Ed) in Amado, Arizona. Their program OWN - Observing With NASA – allows free, public access use of the telescopes. The images accompanying this article were all taken with this system. Users select targets from a number of preset objects, and select options such as filters and exposure times. Once an image has been taken, users are notified by email that their FITS file is ready to download. The network also supplies MicroObservatoryImage, a free FITS-processing program optimized for small images (650x500 pixels). This software adjusts the curves of the monochrome images and can also stack RGB images.

Las Cumbres Observatory Global Telescope Network http://lcogt.net/

The Las Cumbres Observatory Global Telescope Network has a mission of "building a global network of telescopes for professional research and citizen science.” Of the systems I encountered on-line, this one appears to be the most expensive to use and boasts the most advanced equipment. One and two meter objective diameter telescopes located in Hawaii, Chile, South Africa, and Australia are on-line in this system. Five 0.4 m scopes are to be added in 2014. This system is not cheap to use. According to their web site, the 10 m telescopes cost from $200 to $300 per hour to book, plus an annual administration fee of $3,000, with the smallest block of time that can be purchased running 20 hours. Time on the 2 meter telescopes starts ate $500 per hour for 100-400 hours per year, and $600 per hour for 20-99 hours booked, again with a $3,000 administration fee per account per year.

(Continued on page 10)

Publicly Accessible Robotic Telescope Networks (continued)

Lightbuckets Online Telescope Rentals http://Lightbuckets.com
Lightbuckets Online Telescope Rentals currently boasts five telescopes ranging from a 12" Newtonian to a 33" Cassegrain Nasmyth, all in the South Alpen region of France. The network also includes two apochromatic refractors. Users may purchase points for $1 each (or less on discounts); telescope time ranges from 50 points per hour for a 4.3" ED Doublet refractor to 350 points per hour for the 33" catadioptric. The web site notes that they are willing to add new remote telescopes to the network, and that the owners of such scopes will be paid for use.

MyTelescope.com http://MyTelescope.com
The MyTelescope.com network consists of telescope farms in both New Brunswick and New Mexico. All are 10" Schmidt-Cassegrain f/10 telesccopes, with focal lengths of ~2500 mm. Time on these telescopes can be purchased for from $10.50 per hour to $15.00 per hour depending on the selected observing package. This system employs a Java applet to control each telescope in real time. Users book time slots, and during that time are in direct control of a scope.

My Telescope http://my.telescope.org/
My Telescope is an educational interface for the Bradford Robotic Telescope in Tenerife (see above).

ROBOSky http://www.robosky.com/index.php
ROBOsky is the on-line interface for the Ontario's own robotic telescope farm, located in the Hockley Highlands, outside of Orangeville, Ontario. Clients are able to have their own telescope hosted at the farm. One of the telescopes on-site is available to be used for real-time remote observations using ACP Observatory Control Software. Potential users of this telescope must write to the web site managers to request observing time.

Sierra Stars Observatory Network http://sierrastars.com/
The Sierra Stars Observatory Network consists of three different telescopes in SW USA, profiled in detail in the January 2014 issue of The Event Horizon. One of these, the Iowa Robotic Observatory ("Rigel") has its own web site and interface for students or researchers:
http://astro.physics.uiowa.edu/rigel/

The British Astronomical Association has set up an arrangement with Sierra Stars Observatory Network (see above) for access by their members. A special interface can be reached at:
http://www.britastro.org/robotscope/

Skynet https://skynet.unc.edu/
In use since 2006, Skynet currently consists of 29 different telescopes in the USA, Chile and Europe. Set up by students, faculty and staff at the University of North Carolina at Chapel Hill, it is primarily intended for educational use by schools in North Carolina but includes public observing and educational use more broadly.

SLOOH Community Observatory http://slooh.com
The SLOOH Community Observatory is a highly-programmed web site providing many different features for members. Membership is purchased on a per-month fee basis. Users may book defined time slots for use of a remote telescope. During booked time slots, users assume real-time control and lose control at end of the allocated time. Members are encouraged to collaborate and function as a community. The site includes on-line forums and other events-oriented programming. Three instruments are in this network, located at the Mt. Teide at the Institute of Astrophysics of the Canary Islands (IAC). These include a 0.5 m f/6.8 corrected Dall-Kirkham telescope, a 0.35 metre f/11 Schmidt-Cassegrain telescope, and an 85mm f/5.6 apochromatic refractor.

(Continued on page 11)

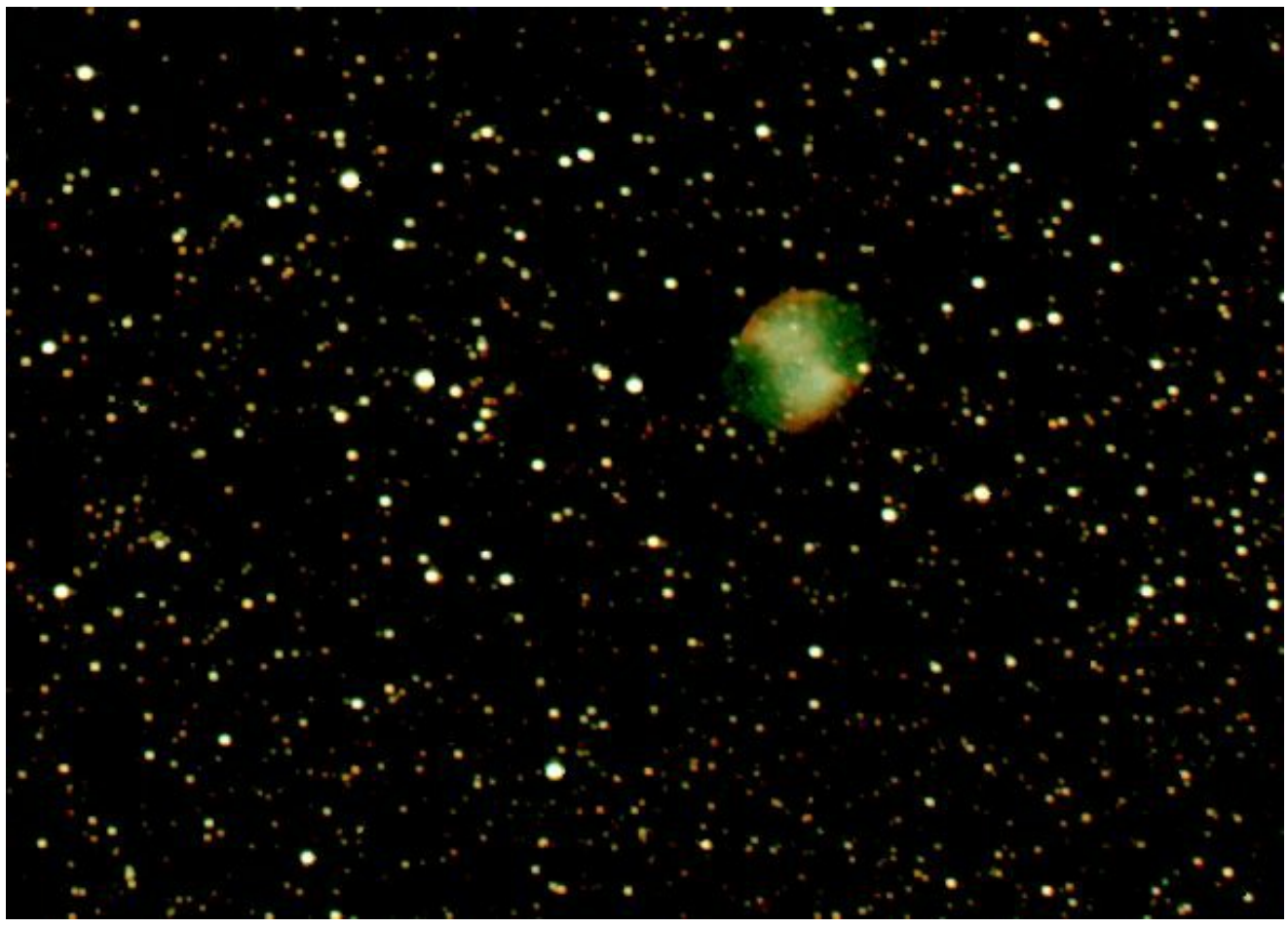
Publicly Accessible Robotic Telescope Networks (continued)

Sky Live http://skylive.it

Three telescopes based in Italy are available on-line in Sky Live. This on-line system appears to be available in Italian only. The site has its own interface client, "SkyLivePRO".

York University Observatory http://astronomy.blog.yorku.ca/public-viewing/

An honourable mention goes out to the observatory at York University in Toronto. On Monday nights, weather and scheduling permitting, a free web cast is set up in which viewers can both interact with observatory interpreters and also see in real time what the telescope is viewing. Not quite the same as directing your own remote observations, but the web site does promise that the observatory "may entertain" suggestions for observing targets from on-line participants.

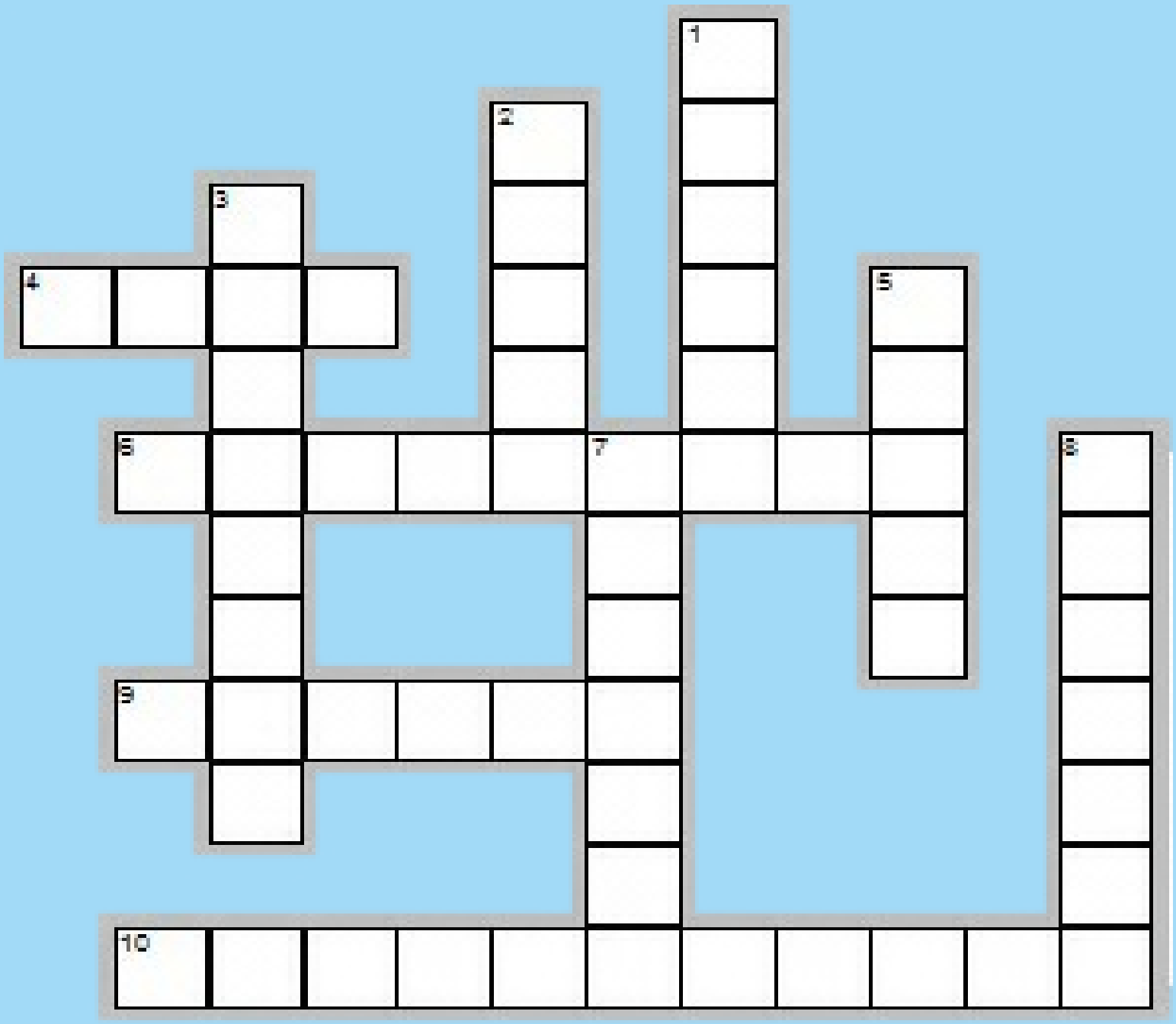


An RGB image of the Dumbbell Nebula (Messier 27) taken with the MicroObservatory Network on 3 January 2014. This was prepared by taking three different filtered images and then combining them with the free software available from the web site.

***Dr. David Galbraith** is Head of Science at Royal Botanical Gardens in Burlington, Ontario, and is an active member of the H.A.A. David contributed an article to EH in January on the Sierra Stars Observatory Network. He would be very happy to hear from anyone who tries out any of these services. He can be reached at: dr_d_a_galbraith@hotmail.com. You can follow more of his adventures on his own astronomy blog, http://pineriverobservatory.wordpress.com.*

[Editor's Note: This month's Masthead Photo at the top of Page 1 of David's remotely acquired image of Supernova SN 2014J in M82. See the photo's description at the bottom of Page 2.]

Astronomy Crossword by Mario Carr



Across

4. On Feb. 26 this object will be five degrees from Venus.
6. Rocking of the moon
9. In the morning sky of Feb. 21 this planet will be five degrees from the Moon
10. This rover recently celebrated a decade on Mars

Down

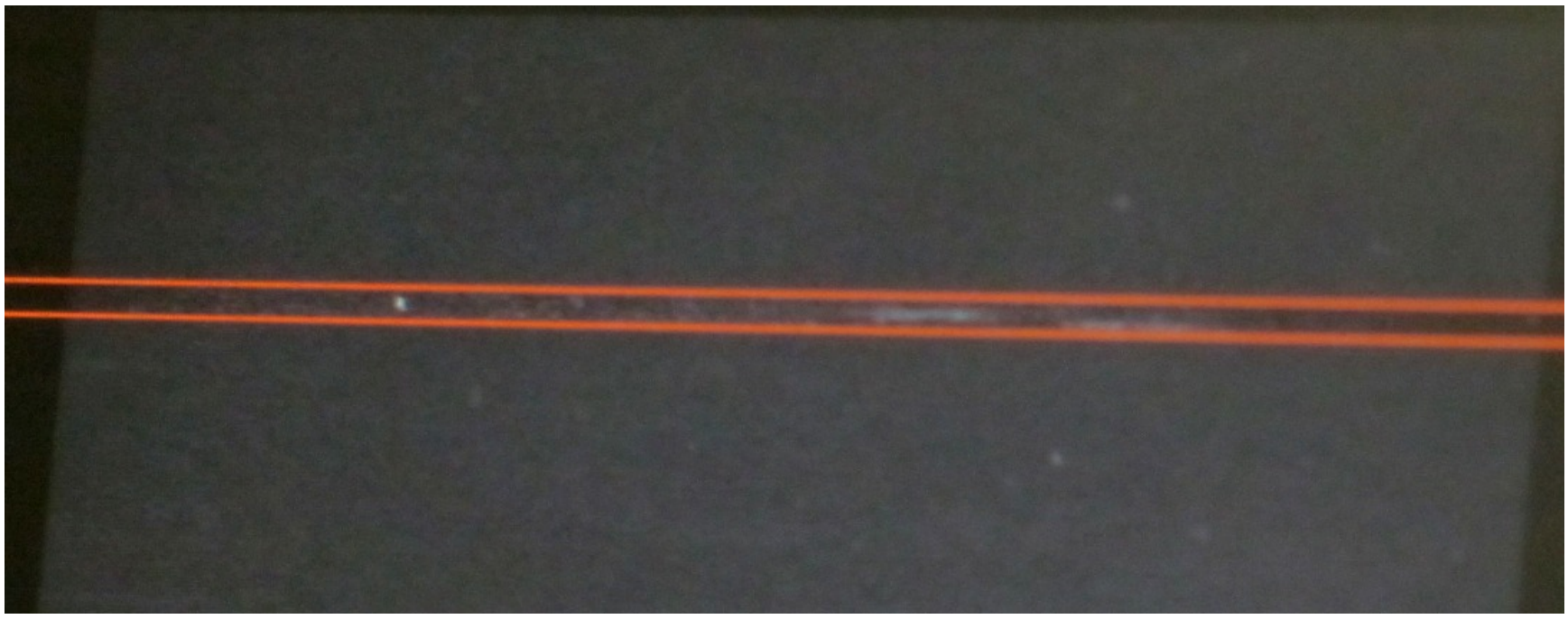
1. Until June, Jupiter will be in this constellation
2. On Feb. 18 the Moon, Mars and this star will form a triangle.
3. On Feb. 18 you can see this light at its best and you can see it for the next two weeks.
5. On the morning of Feb. 15 this planet will be at its maximum brightness.
7. On Feb. 6 you can see this double shadow on Jupiter
8. On Feb. 27 the Moon will be close to this object during dawn.

Answers can be found on page 17 . (No peeking!)

Nova Delphinus?? by Mike Jefferson

Having been involved with the spectroscopy of heavenly bodies for 10 years, now, I thought it might be a good idea to try to get a spectral signature of a nova or other out-bursting cosmic body. Comets remain interesting targets but I missed getting the fingerprints of our most recent visitor, Ison, after the sun obliterated it without leaving anything much in the way of visual magnitude to photograph.

The recent outburst of Nova Delphinus left me with a possible project to tackle. Did I get it? Did I miss it? I'm not sure. But here is what I have at present. Shooting any stellar apparition with a camera and getting it is a difficult task at best. You cannot see it in the camera viewfinder unless it is of very bright magnitude. So, I shot multiple exposures, all in and around Delphinus, in hopes of bagging the elusive prey. When I checked what I had in spectral signatures, it was very difficult to tell. So, I chose this image as the most likely candidate.



Picture 1

Why this image?

If you look carefully at picture #1, containing the 2 solid, horizontal capture lines you will note 1 bright spectrum and 1 bright star. That star is probably my target and is the cause of the bright spectral signature in centre right of the capture box.

The chart in picture #2 (next page) is the flux curve of both spectra and the star itself. The red spike on the very left is the target star. Although the spectral wave packets are tiny in this image, they both show emission as well as absorption features. It is the wave packet at centre left that we want. Why do I say this? Because it belongs to the target star and when we put different templates of star types and elements over it, the lines of the heavier and more developed elements, like magnesium and iron, sit right on top of that wave packet, indicating a star that has had time to develop these elements and to throw some of them off in a cyclical outburst.

That is my interpretation, in any event. Am I right? Is this the nova? I don't know. However, the beauty of doing spectroscopy is that it reveals the signatures and fingerprints of almost all bodies in the cosmos. At present, there is simply no better way to identify types of cosmic objects that are extant (or 'extinct') in the universe.

The spectra, although faint here, were even fainter in the raw image. They had to be brightened up and made more contrasty with the Olympus software on my computer. The image should have been ro-

(Continued on page 14)

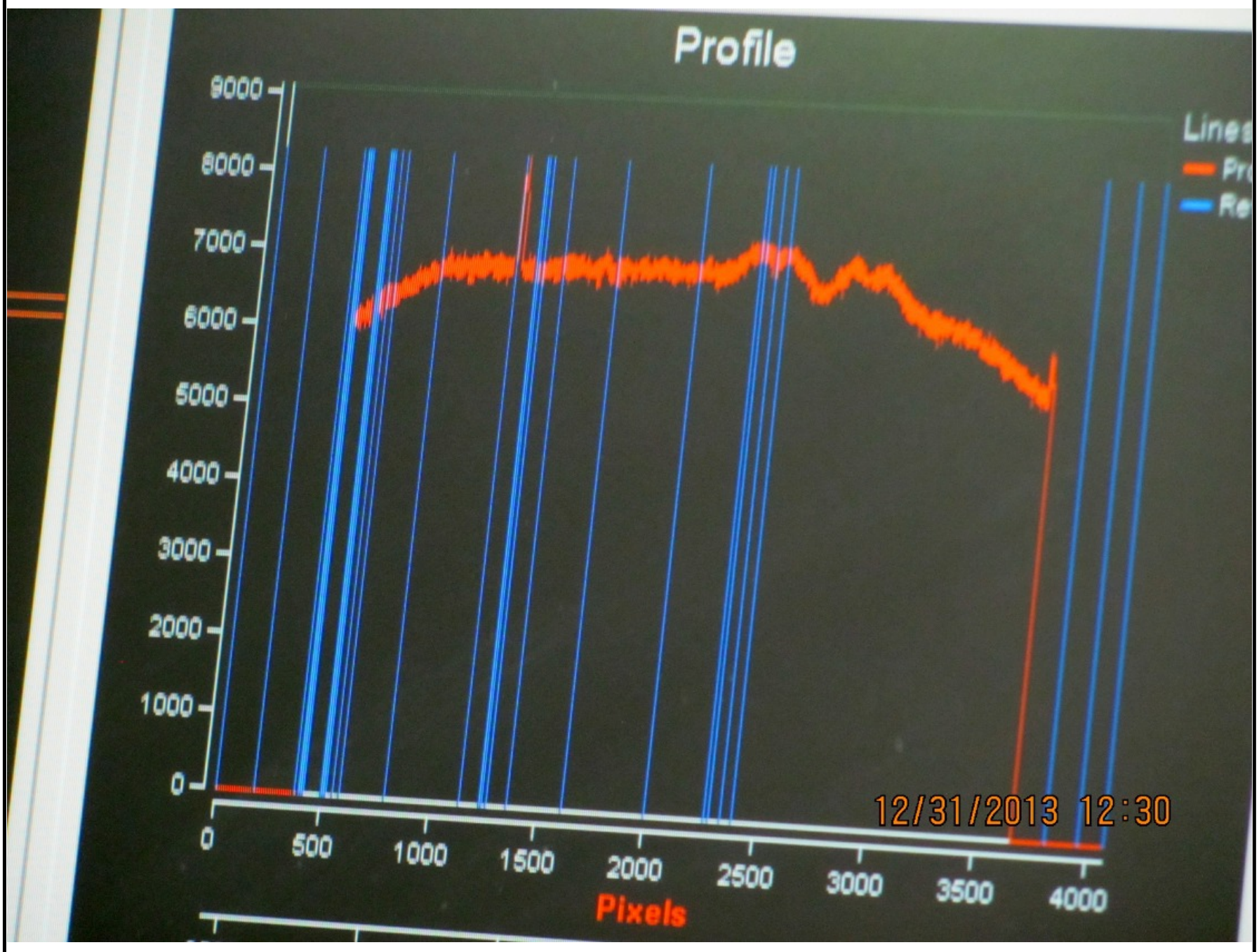
Nova Delphinus?? (continued)

tated about 25 degrees to the left so that flux chart and element lines were vertical instead of slanted to the right. They are off the vertical due to the camera angle that had to be used, when photographing the computer screen, to prevent a glare from the light in the room.

The camera was made by Olympus – a 4/3rds E500 – tripod mounted - ~30 sec. Exposures.

The spectral software is called Rspec and is available from Tom Field at tom@rspec-astro.com in the state of Washington.

The spectroscope is a Rainbow Optics instrument and was manufactured in California to a precision of ~200 l/mm.



Picture 2

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!

(Continued on page 16)

NASA's Space Place (continued)

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.

Treasurer's Report by Steve Germann

Treasurer's report for January 2014 (unaudited)

Opening balance:	$7345.34
Revenue:	$368.00
Expenses:	$105.05
Closing Balance:	$7608.29

Revenue included $160 for Calendars, $68 for 50/50, $110 for memberships and $30 for post-dated memberships.
Expenses included $105.05 for door prizes.

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- runs on 12v accessory power from your tank
- star, sun, moon, half-solar, and tuned rates
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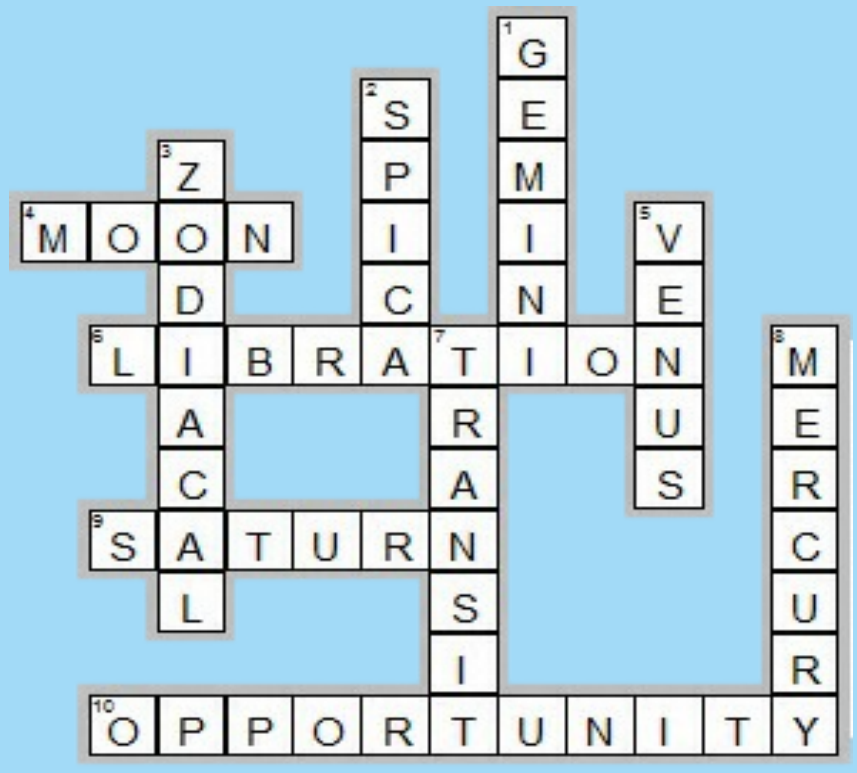
- adjustable bubble level allows quick setup at a variety of sites
- made in Canada, ships from Canada
- quick release magnetic linkage
- infra red remote control with audio acknowledgement
- pushbutton override possible instead of remote
- extra long levelling feet for range of latitudes
- high weight capacity and stability
- typically 90 minutes run time
- quick rewind or re-center
- low power
- dimmable led display

http://www.skystopper.ca/ or email smrg@cogeco.ca

Answers to Astronomy Crossword on Page 12



William J. McCallion

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- **Tickets $5 per person; private group bookings $100**
- **Different shows every week**
- **Upcoming shows include:**
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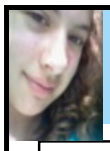
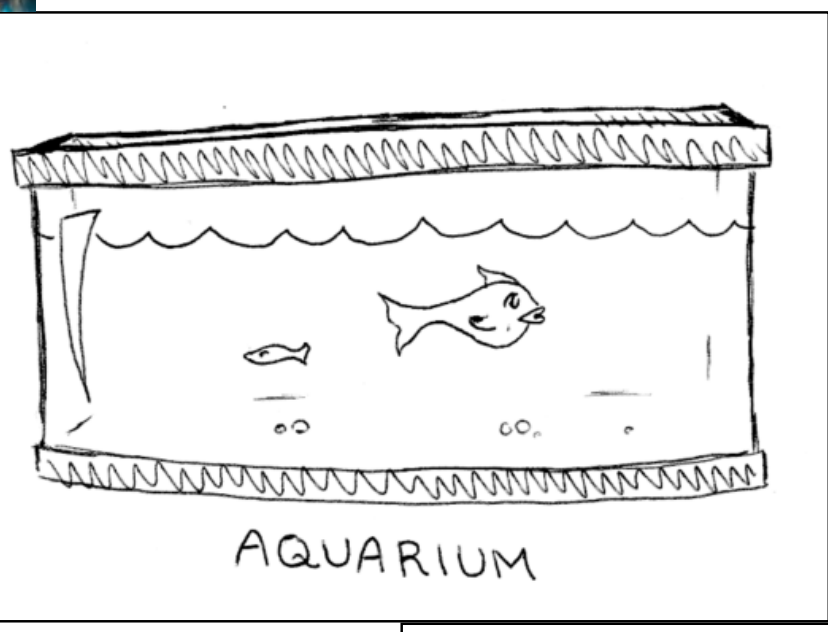
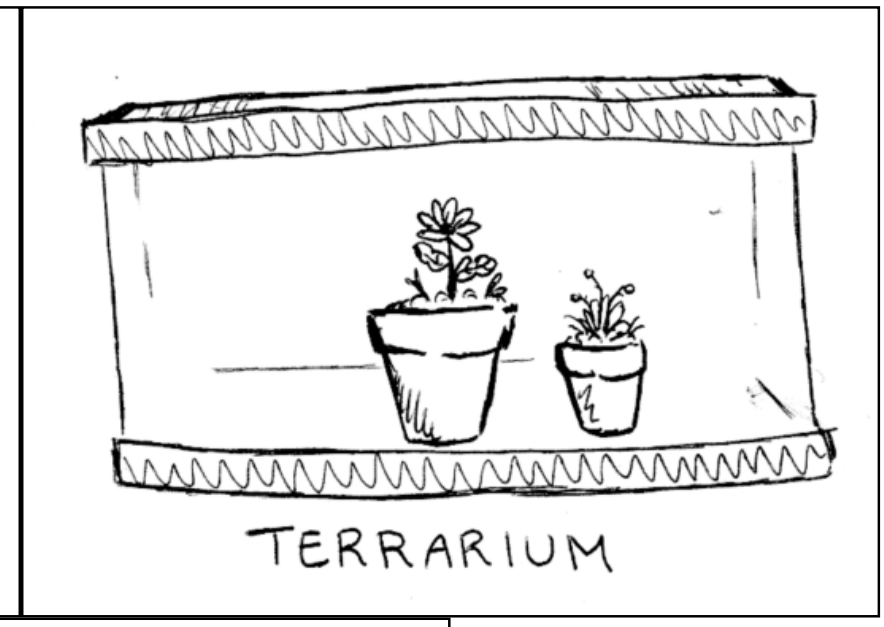
  - **Feb 12: She Is an Astronomer**
  - **Feb 19: Backyard Astronomy**
  - **Feb 26: Eclipses**
- **For more details, visit**

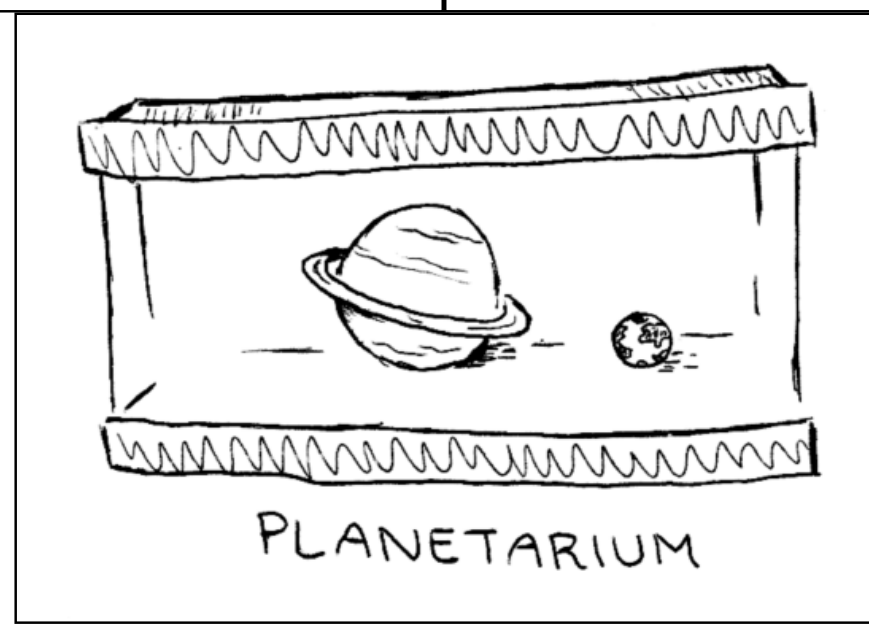
  www.physics.mcmaster.ca/planetarium



Cartoon Corner by Alexandra Tekatch







UPCOMING EVENTS

February 14, 2014 - 7:30 pm — *General Meeting* at the Hamilton Spectator Auditorium. Our main speaker will be **Dr. Rob Cockcroft**, a postdoctoral research fellow & lecturer at McMaster University's Department of Physics and Astronomy, and manager of the McCallion Planetarium. Rob's topic will be Ancient Egyptian Astronomy.

March 21, 2014 - 7:30 pm — *General Meeting* at the Hamilton Spectator Auditorium. Our main speaker will be **Rory Woods**, who will speak about galaxy simulations.

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