

Event Horizon

Volume 21, Number 6
April 2014



From The Editor

Milder temperatures are starting to set in, at last!

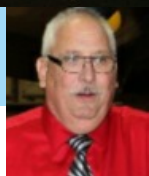
More astronomers around here are coming out of hibernation, including Yours Truly.

I was lucky enough to have a great night sky at the end of March, when it was *not* minus-20 out, and I did some *real* astronomy for a change!

Enjoy this month's issue!

Bob Christmas, Editor

editor 'at' amateurastronomy.org



Chair's Report by Jim Wamsley

"Spring has sprung, the grass has riz, I wonder where the clear sky is." My take on an old adage, leads me to think about another. *"April showers bring May flowers."* I don't know about you, but I could do with a few less tulips and daffodils, if we could get a few extra days, and nights of clear skies in April.

Weather is often the Bane or the Boon of amateur astronomers. On March 19th, a once in a lifetime event took place. An occultation of a first magnitude star by an asteroid. The bright star Regulus, completely disappeared from view for as long as 14 seconds, as the asteroid (163) Erigon



passed in front of it, was spoiled for both amateur and professional astronomers alike. Four H.A.A. members, John Gauvreau, Matthew Mannering, Leslie Webb and I, had made extensive plans to record this event.

We pored over maps, gleaned info from the internet, tested our equipment, and set up the logistics, all for nought! The weather, *(Continued on [page 2](#))*

IN THIS ISSUE:

- March Meeting Summary
- The Sky This Month
- Astronomy Crossword
- NASA's Space Place

- Evening Sightings for the I.S.S. from Hamilton
- Treasurer's Report
- Upcoming McCallion Planetarium Shows
- Cartoon Corner
- Upcoming Events
- Contact Information

Chair's Report (continued)

both the day before and the day after was fine, but the day of the event, a freezing rain and snow weather system spoiled the view for everyone from New York City through to northern Canada.

Club events this past month include a well attended monthly meeting. I think everyone had a great time. The speakers all put on a good show, and many members extended the evening at Kelsey's for food and conversation. The next night, Saturday, 16 club members met in my recreation room for the Cosmology discussion group. We watched the 3rd episode of Carl Sagan's Cosmos, The conversation afterwards was very animated, as we went over the subject matter and inevitably made comparisons to the current series. I'm quite sure all enjoyed themselves, as it was very late when the last hangers-on went home. Your council met March 18th to continue in our efforts to make the H.A.A. the best astronomy club in the country. The next council meeting will be April 16th. Remember, all club members are welcome to attend council meetings. The Astronomy 101 class had meetings on the 15th and 29th this month. A wide variety of subjects have been covered, giving the group a good grounding, and I think they will be able to put all they have learned to use, as they go forward in this great hobby.

The H.A.A. sponsors the James A. Winger award annually at the Bay Area Science and Engineering Fair. This year Matthew Mannering and I judged the event on behalf of the H.A.A. All the projects in the fair were impressive, and it was very difficult to pick a winner. After all was said and done, we chose a physics related project by Seth Stefanchuk. The project was about airfoil design, looking at designs that produce the most lift. Seth used good scientific principles and procedures to reach his conclusions, and is very deserving of the award.

Coming up in April, we have the spring Telescope clinic on April 4th 7:30 pm. at the Spectator building. As in all our past scope clinics, there will be many members displaying their pride and joy telescopes (we all take pride in the equipment that gives us such satisfying views). This is also an opportunity for those of us that may be having problems with a scope we have just acquired. There are many knowledgeable members in the club to help you out, so bring that scope along and see if we can help. The general meeting this month is on April 11th. Our speaker will be Leslie Webb, with a talk about Obstacles in Visual Astronomy or seeing. This subject will be of special interest to the novice observer. Leslie is a very talented astronomer and a long time member of the H.A.A.

Let's all hope that the April weather will cooperate, and we can get out to the observing site at Binbrook and get some good telescope time. I hope to see you out there.



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: *The Orion Nebula (M42 & M43) and the "Running Man" Nebula (NGC 1973, 1975, 1977), imaged on March 30, 2014 in Mountsberg, Ontario, by Bob Christmas.*

Taken with a Canon 40D with an Astronomik CLS anti-light-pollution clip filter, through a Tamron 300 mm f/2.8 telephoto lens on a Super Polaris EQ mount. Exposures: 18 X 1 minute = 18 minutes total. North is to the right.



March 21st HAA Meeting Summary by Bob Christmas

The March HAA meeting was started at 7:30 p.m. by Chair Jim Wamsley, who made various announcements, and then handed the floor to Kevin Salvach, who talked about the club's plans for the Messier Marathon, which is an all-night attempt to observe all 110 Deep-Sky Objects in French comet-hunter Charles Messier's list of DSO's. This feat can be accomplished only at this time of year.

After that, Matthew Mannering, our Observing Director, gave his monthly presentation of The Sky This Month, during which he talked about Spring constellations such as Virgo, Hydra and Corvus, as well as various DSO's, especially galaxies, that are visible. He specifically mentioned Markarian's Chain, in the heart of the Virgo Cluster of galaxies. He talked about M104, the Sombrero Galaxy, and a neat little star asterism called the Stargate right beside it. He mentioned the positions of Jupiter, Mars and Saturn as well.

After Matthew's talk, we had our usual intermission, and then Les Webb & Alex Tekatch drew tickets for the door prizes and 50/50.

In the second half of our March meeting, our main speaker of the night, HAA member Don Pullen, gave his talk entitled "Cosmic Doom – Some of the Ways the Universe is out to get YOU". During Don's talk, he outlined various space phenomena that can end human life here on Earth. He mentioned asteroids that cross the path of Earth's orbit, as well as the high unlikelihood of a nearby gamma-ray burst occurring, which would fry our planet with radiation, amongst other extraterrestrial events we should worry about (or not!).

Jim then closed the meeting by reminding the audience of the Cosmology Group night at his place on Sat. March 22nd.



Photo courtesy of Steve Germann



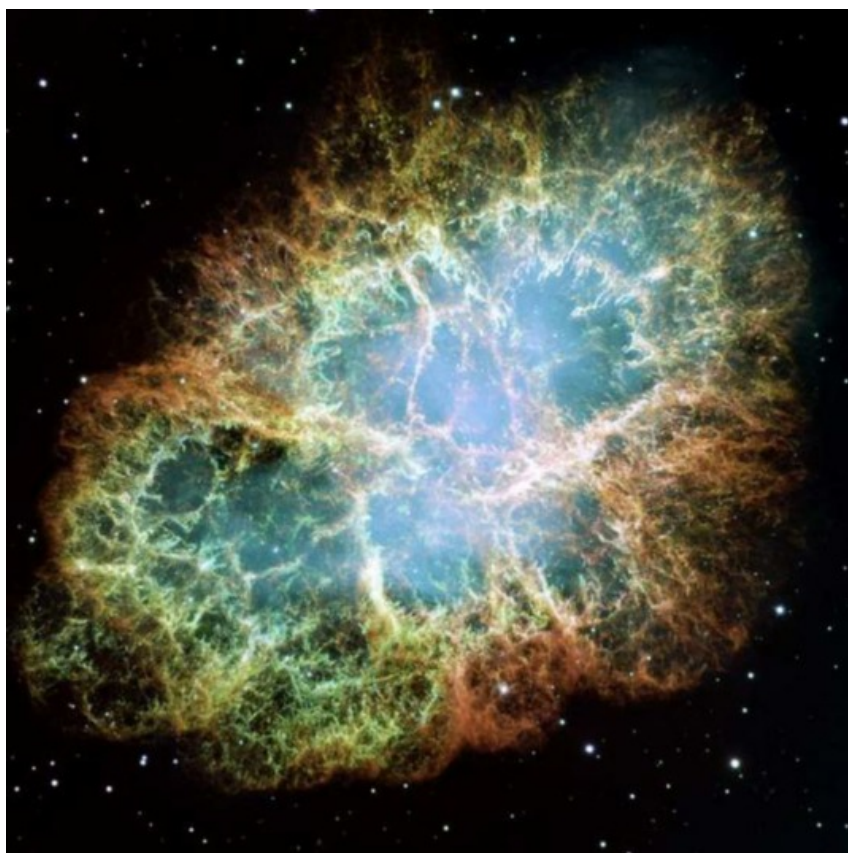
The Sky This Month for April 2014 by Matthew Mannering

Last month I talked about the upcoming occultation of Regulus by Asteroid 163 Erigone. Unfortunately, the weather was terrible and it looks like no one from New York City through to Ontario saw it. But don't despair, you only have to wait one thousand years for the next similar event to occur over North America.

On the Sunday evening of March 23rd I ventured out into the cold to see the double shadow transit occurring on Jupiter. I saw both shadows but only one at a time. It turns out that the one shadow was close to exiting Jupiter's face on one side of the planet while the other shadow was starting to appear on the far side.

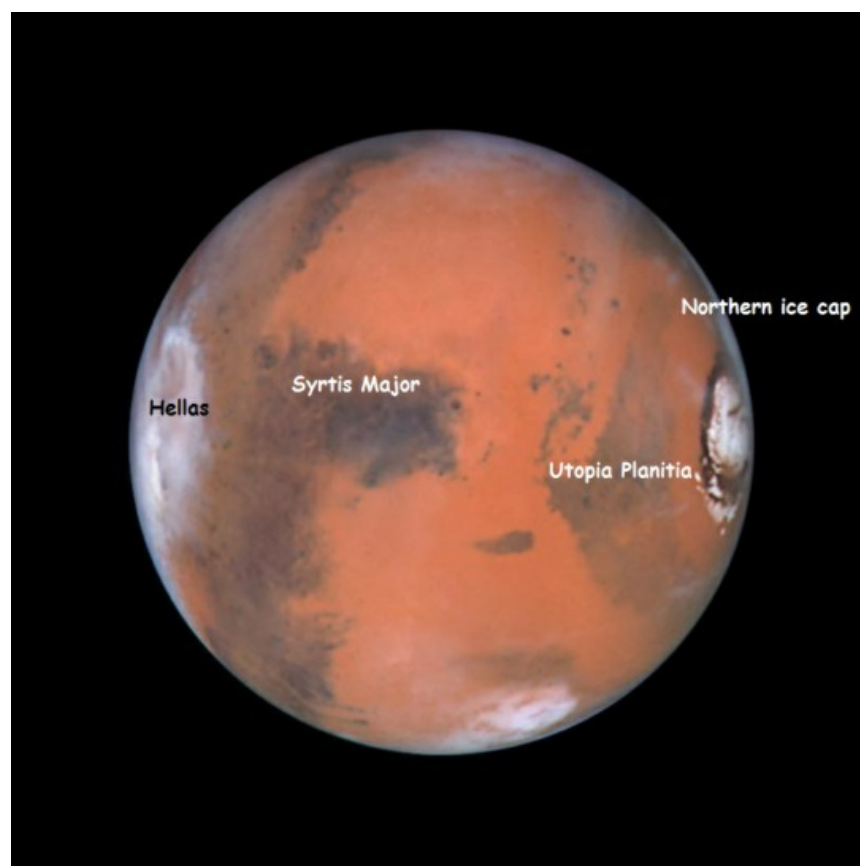
The sky was very steady that evening and the transparency was excellent. I took the opportunity to look at the **Orion Nebula** and saw a wealth of detail even without a nebula filter. I was also able to see the galaxy **NGC 2903** that I mentioned in last month's column near the nose of Leo.

I've only seen the **Crab Nebula (M1)** a few times over the years and never in town. I thought I'd try my luck. I pointed my Dob to where M1 is positioned in Taurus and looked through the eyepiece and there it was, an oval "faint fuzzy". I could actually see the shape of the crab that you see in pictures. Here's a Hubble picture of the Crab.



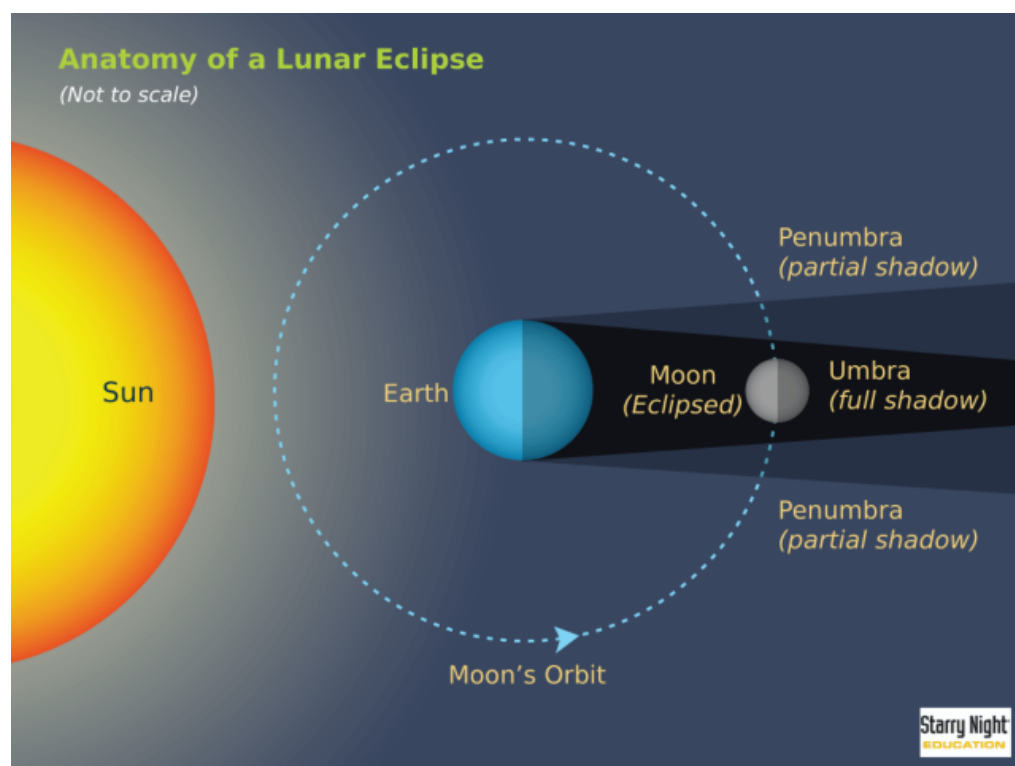
It turns out that I saw a lot. I verified my sightings with amateur photos taken at the same time which showed far more detail. The dark areas were **Utopia Planitia** in the north and **Syrts Major** and **Hesperia Planus** in the south. Hellas Basin was definitely covered in cloud or frost and the reflection I saw along the eastern limb was cloud. This has been the realization of a life time, of waiting to see the surface of Mars. It rates as one the best observing sessions I've ever had in my own backyard. This Hubble image of Mars shows the surface features I saw that night and is oriented as seen through my eyepiece.

These evenings come rarely and it would have been a pity to have missed the chance to observe. None of these sightings were the highlight of the evening though. I have never seen any detail on **Mars** other than the glint of a polar cap. This night was different. When I looked through the eyepiece I immediately saw dark and light detail in both hemispheres. I saw the northern polar ice cap and the clouds or frost where **Hellas Basin** should be. I also saw a reflection on the eastern limb near the equator. This is one of the few times I have sketched an object. It wasn't pretty but I wanted to try and identify the features I had seen.



(Continued on [page 5](#))

The Sky This Month (continued)



So as if this fabulous opportunity to see Mars wasn't enough, we will all have the chance to see a **total lunar eclipse**. Make sure that you mark the night of **April 14/15** because the eclipse starts early on the **15th**. The Eclipse is made up of four phases. The Penumbra is the lighter outer portion of Earth's shadow. The Umbra is the dark central portion of the shadow. First the Moon is engulfed in the Penumbral shadow. The eclipse while the Moon is in the Penumbra won't be nearly as obvious as when it enters the Umbra. About an hour and a quarter later, it enters the Umbral shadow which is called totality. Once it is completely in the Umbra, the Moon will turn an orange-red colour. Later on, it will move back into the Penumbra eventually leaving the

Earth's shadow altogether.

Above is a diagram of a lunar eclipse, and at right is a photo of the stages of a lunar eclipse.

Take note that the bright star **Spica** sits only one degree from the Moon while **Mars** is north-west nine degrees away. The following is a list of times for the eclipse (EDT).

12:53am (April 15th)

The Penumbral eclipse begins.

1:58am

Partial total eclipse begins.

3:06am

Totality begins.

4:25am

Totality ends.

5:33am

Partial total eclipse ends.

6:37am

The Penumbral eclipse ends.



Credit: Universidad de Sonora, Mexico

(Continued on [page 6](#))

The Sky This Month (continued)

Easy Targets

So you won't be bored on the night of the eclipse, take a look at Mars just a day from closest approach. Then try to find **Vesta** (an Asteroid) and **Ceres** (a Dwarf planet) only three degrees apart in Virgo. I've included a finder chart for them. Both are easy binocular targets with Vesta at magnitude 5.8 and Ceres at magnitude 7.

The 1st picture shows an overall view of the south east sky. The image is a snap shot of the sky just four and a half hours before totality begins. Notice Saturn just coming up over the horizon. Ceres and Vesta



(Continued on [page 7](#))

The Sky This Month (continued)

are positioned just a few degrees east of the Moon in Virgo. Mars lies nine degrees to the north-west. The 2nd image at the bottom of Page 6 is a close up of the region around Ceres and Vesta. Notice how you can bisect the imaginary line between the two stars of Virgo and then look up. There will be two bright objects very close to each other. The lower one is Vesta. Ceres is dimmer but if you star hop to it as shown in the image, you shouldn't have any problem finding it.

The Moon

This month we get a rare treat! In the early hours of April 15th the moon will go through a total eclipse. Libration favours the North limb on the 8th. The East limb is favoured on the 2nd and 29th. The South limb is at its best on the 22nd while the West limb is favoured at mid-month.

The Planets:

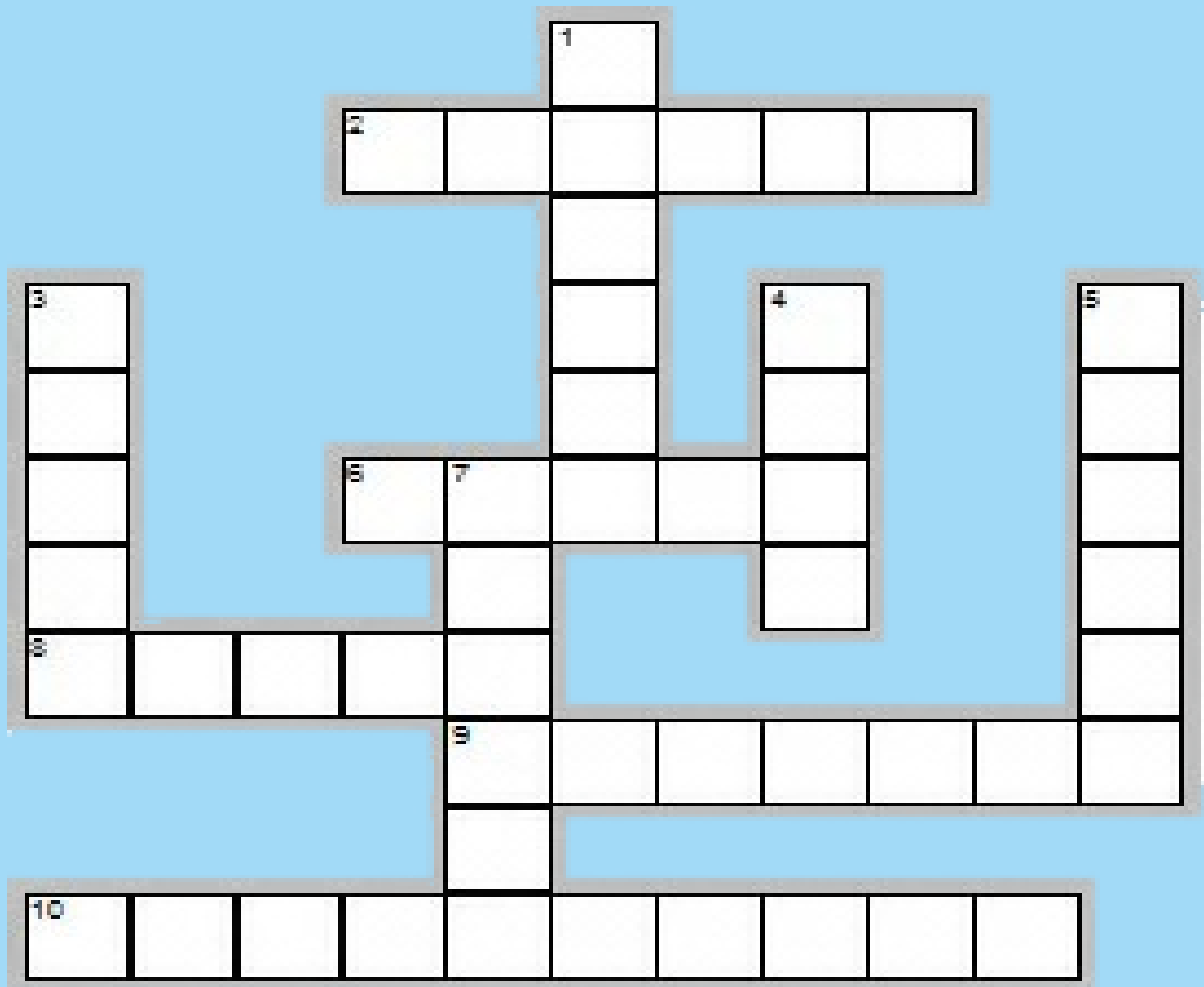
- **Mercury** is heading towards superior conjunction on the 25th at 10pm. As a result of this, Mercury will disappear from the morning sky by mid-month. Superior conjunction occurs when an inner planet (Mercury or Venus) moves to the far side of the Sun from our position and the Earth, Sun and planet all line up. When an outer planet is involved it is simply called a conjunction (see Uranus below).
- **Venus** appears in the morning sky just before dawn. On the 12th Venus will be about 0.7 degrees above Neptune. The best time for viewing appears to be between 6 and 6:30am. Be aware of the Sun rising just to the east at 6:30am.
- **Mars** in Virgo starts the month with a diameter of 14.7 arc seconds and at closest approach on the 14th will be about 15.2" across. It rises at sunset and remains visible all night. Try a yellow filter to improve the contrast of surface features.
- **Jupiter** is still high in the south west in Gemini and set just after midnight.
- **Saturn** rises at about 11pm on April 1st. By months' end, it will rise at 9pm. You will need to wait about 2 hours after Saturn rises to see it clearly. It never gets more than 31 degrees above the horizon on any evening during the month. Allow 5 hours after it rises to reach this point.
- **Uranus** is at conjunction with the Sun on the 2nd and is gone for the next month and a half.
- **Neptune** is in Aquarius at dawn. However it will remain low to the horizon and the viewing window will be very short each morning.

Other Events:

- | | |
|---------------------|--|
| -April 4th: | Aldebaran is in Taurus 2 degrees south of the moon at 2:00am. |
| -April 6th - 7th: | First Quarter Moon. |
| -April 8th: | Mars is at opposition. |
| -April 13th: | Vesta is at opposition. |
| -April 14th - 15th: | Mars is at closest approach to the Earth.
Ceres is at opposition.
Mars is about 3 degrees north of the Moon at 10:00pm on the 14th, just after the Moon rises in the East.
Full Moon very close to Spica (in Virgo) and a Total Lunar Eclipse (see detail in 'The Moon' section above). |
| -April 17th: | Saturn only 0.9 of a degree north of the Moon between 2 and 3am. |
| -April 21st - 22nd: | Last Quarter Moon. |
| -April 28th - 29th: | New Moon. |



Astronomy Crossword by Mario Carr



Across

2. On April 3, the crescent Moon will be in this star cluster?
6. During a full Moon on April 14/15 there will also be one of these eclipses?
8. This month's full Moon will be close to this star?
9. On April 12, Venus is really close to this planet?
10. On April 8, Mars be its brightest and at . . .?

Down

1. On April 16, the Moon will be near this planet?
3. On April 25, the Moon will be above this planet in the dawn sky?
4. On April 14, this planet will be 92.4 million km from Earth?
5. During this month, Mars will look like this bright color?
7. On April 2, this planet will be behind the Sun?

Answers can be found on page 12. (No peeking!)



Old Tool, New Use: GPS and the Terrestrial Reference Frame

By Alex H. Kasprak

Flying over 1300 kilometers above Earth, the Jason 2 satellite knows its distance from the ocean down to a matter of centimeters, allowing for the creation of detailed maps of the ocean's surface. This information is invaluable to oceanographers and climate scientists. By understanding the ocean's complex topography—its barely perceptible hills and troughs—these scientists can monitor the pace of sea level rise, unravel the intricacies of ocean currents, and project the effects of future climate change.

But these measurements would be useless if there were not some frame of reference to put them in context. A terrestrial reference frame, ratified by an international group of scientists, serves that purpose. "It's a lot like air," says JPL scientist Jan Weiss. "It's all around us and is vitally important, but people don't really think about it." Creating such a frame of reference is more of a challenge than you might think, though. No point on the surface of Earth is truly fixed.

To create a terrestrial reference frame, you need to know the distance between as many points as possible. Two methods help achieve that goal. Very-long baseline interferometry uses multiple radio antennas to monitor the signal from something very far away in space, like a quasar. The distance between the antennas can be calculated based on tiny changes in the time it takes the signal to reach them. Satellite laser ranging, the second method, bounces lasers off of satellites and measures the two-way travel time to calculate distance between ground stations.

Weiss and his colleagues would like to add a third method into the mix—GPS. At the moment, GPS measurements are used only to tie together the points created by very long baseline interferometry and satellite laser ranging together, not to directly calculate a terrestrial reference frame.

"There hasn't been a whole lot of serious effort to include GPS directly," says Weiss. His goal is to show that GPS can be used to create a terrestrial reference frame on its own. "The thing about GPS that's different from very-long baseline interferometry and satellite laser ranging is that you don't need complex and expensive infrastructure and can deploy many stations all around the world."

Feeding GPS data directly into the calculation of a terrestrial reference frame could lead to an even more accurate and cost effective way to reference points geospatially. This could be good news for missions like Jason 2. Slight errors in the terrestrial reference frame can create significant errors where precise

(Continued on [page 10](#))

NASA's Space Place (continued)

measurements are required. GPS stations could prove to be a vital and untapped resource in the quest to create the most accurate terrestrial reference frame possible. "The thing about GPS," says Weiss, "is that you are just so data rich when compared to these other techniques."

You can learn more about NASA's efforts to create an accurate terrestrial reference frame here: <http://space-geodesy.nasa.gov/>.

Kids can learn all about GPS by visiting <http://spaceplace.nasa.gov/gps> and watching a fun animation about finding pizza here: <http://spaceplace.nasa.gov/gps-pizza>.



Artist's interpretation of the Jason 2 satellite. To do its job properly, satellites like Jason 2 require as accurate a terrestrial reference frame as possible. Image courtesy: NASA/JPL-Caltech.



Evening Sightings for the ISS from Hamilton in April by Joe McArdle

Here is data for evening sightings of the International Space Station (ISS) in the Hamilton area. The ISS begins to make evening passes on Friday April 4, 2014. However the first couple of nights the passes are low in the sky and only last 1 minute or less. These 6 sightings are 3+ minutes long and almost reach zenith making them easy to spot:

Date: Sunday Apr 6, 2014

Time: 9:27 PM

Duration: 4 minutes

Maximum Elevation: 80 °

Approach: 10 ° above SW

Departure: 49 ° above ENE

Date: Tuesday Apr 8, 2014

Time: 9:26 PM

Duration: 6 minutes

Maximum Elevation: 45 °

Approach: 10 ° above W

Departure: 15 ° above NE

Date: Monday Apr 7, 2014

Time: 8:38 PM

Duration: 6 minutes

Maximum Elevation: 45 °

Approach: 10 ° above SW

Departure: 11 ° above ENE

Date: Wednesday Apr 9, 2014

Time: 8:36 PM

Duration: 6 minutes

Maximum Elevation: 71 °

Approach: 10 ° above WSW

Departure: 11 ° above NE

Date: Monday Apr 7, 2014

Time: 10:15 PM

Duration: 2 minutes

Maximum Elevation: 30 °

Approach: 11 ° above W

Departure: 30 ° above NW

Date: Friday Apr 11, 2014

Time: 8:37 PM

Duration: 3 minutes

Maximum Elevation: 34 °

Approach: 33 ° above NW

Departure: 11 ° above NE



Treasurer's Report by Steve Germann

Treasurer's report for March 2014 (unaudited)

Opening balance:	\$7,747.63
Revenue:	\$310.00
Expenses:	\$5.28
Closing Balance:	\$8,052.35

Major Revenue consisted of Memberships, \$215, Donations, \$25, and 50/50 \$70. The expense consisted of stationery supplies.



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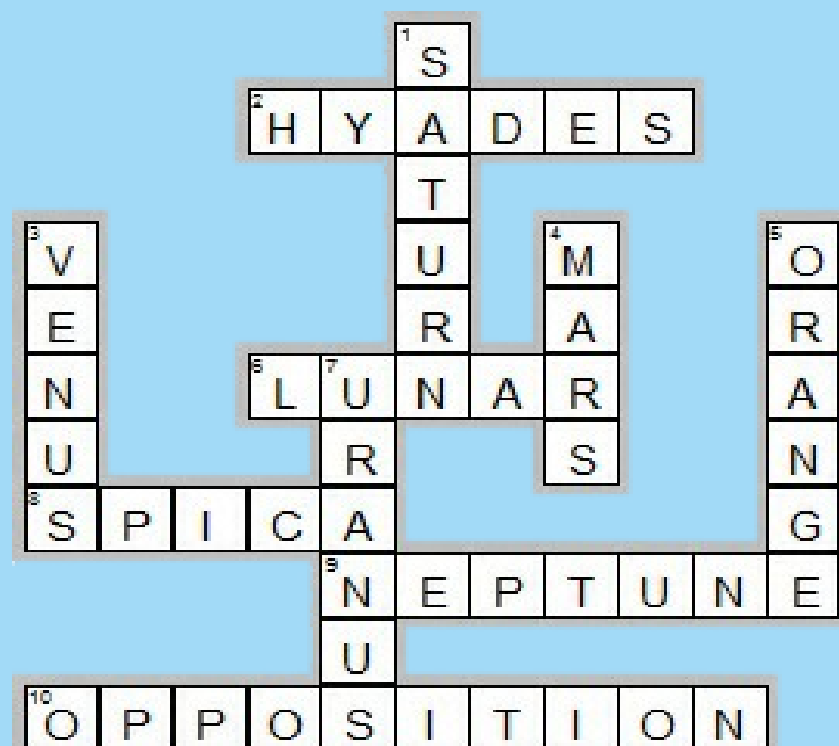
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- runs on 12v accessory power from your tank
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- easy to assemble, adjust and maintain
- adjustable bubble level allows quick setup at a variety of sites
- made in Canada, ships from Canada
- quick 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



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Answers to Astronomy Crossword on Page 8





William J. McCallion Planetarium

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- Public shows every Wednesday (7:00pm)
- Public transit available directly to McMaster campus
- Tickets \$5 per person; private group bookings \$100
- Different shows every week
- Upcoming shows include:
 - **Apr 2: Introductory Astronomy for Kids (1st Wed of every month)**
 - **Apr 9: The Astronomy of Shakespeare**
 - **Apr 16: Galileo's Astronomy**
 - **Apr 23: Stars Aren't All Lonely**
- For more details, visit
www.physics.mcmaster.ca/planetarium



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UPCOMING EVENTS

April 4, 2014 - 7:30 pm – *The Spring Telescope Clinic* at the Hamilton Spectator Auditorium. Spring is here, and members of the H.A.A. will have many types of telescopes on display, and will be on hand to answer questions. You can also bring your own telescope and get tips and pointers about its use.

April 11, 2014 - 7:30 pm – *General Meeting* at the Hamilton Spectator Auditorium. Our main speaker will be **Leslie Webb**, whose talk will be “Obstacles in Visual Astronomy”. Having been a member of the Hamilton Amateur Astronomers for 6 years, Leslie is currently serving as the Membership Director.

2013-2014 Council

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Come observing with the HAA and see what a great location this is for stargazing, a family day or an outdoor function.

Please consider purchasing a season's pass for \$79 to help support the park.

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