

Event Horizon



Volume 24, Number 6
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From The Editor

With the arrival of April, winter skies and weather give way to the Spring constellations and Spring weather ...and hopefully clearer skies!

Happy Reading!

Bob Christmas, Editor

editor 'AT'
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Chair's Report by Bernie Venasse

Hamilton Amateur Astronomers General Meeting for April 7th 2017.

Note that this occurs on the FIRST Friday of the month.....

Our scheduled speaker this month is Dr. Pauline Barmby, visiting us from Western University in London, Ontario. Her presentation will focus on the past, present, and future of big data in astronomy.

"Big data" is the hot new thing in finance, health care, advertising and more. But as one of the first observational sciences, astronomy has been dealing with big data for thousands of years. New and imminent facilities for capturing and storing astronomical observations will lead to what some call the "tsunami of data" in astronomy. Techniques like machine learning and citizen science are needed to get the most science out of these enormous datasets. You will learn how big our big data in astronomy really is, and about some of the discoveries that it has enabled.

Pauline Barmby is an associate professor in Western's Department of Physics & Astronomy and associate dean (graduate and postdoctoral studies) in Western's Faculty of Science. She received her BSc in Physics and Astronomy

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Chair's Report (continued)

from UBC (1995) and her PhD in Astronomy from Harvard University (2001). Dr. Barmby's research uses telescopes all over the world and in space to capture detailed images of nearby galaxies to determine how their stars, gas, dust, and black holes affect each other. She is interested in the use of computer data-mining techniques and community-developed software to facilitate knowledge extraction from astronomical data. She received the Faculty of Science's Florence Bucke Prize in 2014. Her non-astronomical interests include knitting, curling, and running.

Place and Time

We'll be meeting at The Hamilton Spectator Building located at 44 Frid St, near the junction of Highway 403 and Main St West in Hamilton. Starting time is at 7:30pm. Admission is free and everyone is welcome!

Door Prizes

There will be a draw for door prizes at the meeting and a free door prize ticket to all who arrive before the 7:30 start time!

Food Share Donations

Donations of non-perishable food for the Hamilton Food Share program will be collected at this meeting. Please drop off any items at the drop-box located near the entrance of the auditorium. All donations gratefully accepted and thanks to your generosity we've collected thousands of pounds of food since we began. Let's keep up the great work as the need continues.

Other Happenings ... BASEF

On March 31, Ann Tekatch, Denise White and I will be judging entries at the Bay Area Science and Engineering Fair being held at Mohawk College. We will be deciding the recipient of our contributed prize for the best astronomy related project. Our trio had a very uplifting experience last year speaking with these scientists of tomorrow. Report to follow.....

H.A.A.'s Loaner Scope Program



We at the HAA are proud of our Loaner Scope Program.

If you don't have a telescope of your own and want to make use of one for a month or so, you can borrow one of our fine loaner scopes.

Please contact Jim Wamsley, at 905-627-4323, or e-mail Jim at:

secretary 'AT'
amateurastronomy.org

and we'll gladly get one signed out for you.

HAA Helps Hamilton



To support our community, we collect 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.



Our donations go to [Hamilton Food Share](#), which delivers them to various food banks around the Hamilton area.

If you would like to help or have any questions about this initiative, please contact the H.A.A.

Masthead Photo: *Star clusters M44 (the Beehive) and M67, April 25, 2001, by Bob Christmas.*

M44 is at lower right, and M67 in the upper left. A chance meteor was caught near M44. North is at right. Taken with a Canon AE1 & a Soligor 200mm telephoto lens, with Kodak MAX 800 film; 7 minute exposure.

Announcement of Opportunity

Application deadline: April 10, 2017

This year, the Canadian Space Agency (CSA) will be awarding grants to students wanting to attend the International Astronautical Congress (IAC). IAC is organized by the International Astronautical Federation (IAF), the International Academy of Astronautics (IAA), and the International Institute of Space Law (IISL). It is the largest space-related conference world-wide and selects an average of 1000 scientific papers every year. The upcoming IAC will be held September 25-29, 2017 in Adelaide, Australia.

This international Congress is billed as an excellent gathering point for all specialists in space sector. For students, it is an opportunity to forge valuable links with professionals and other students from all over the world who share their interests. Throughout the Congress, students will have a chance to discuss with professionals, learn from their expertise and listen to their vision of the future of space exploration. Students are full participants in the Congress, lending its workshops and plenary sessions a new energy and outlook that are greatly appreciated.

The IAC draws mainly students specializing in space-related disciplines. In recent years, however, many students from outside these disciplines, though in associated fields (e.g.: engineering, law, medicine), have taken part. For many students, the IAC is a motivating event inspiring them to pursue their studies in space-related disciplines and set their career goals accordingly.

The CSA intends to support a new group of students to give them the opportunity afforded by the Congress to learn more about the future of the great space adventure and participate during the IAC 2017 in specific activities organized by the CSA and other space agencies through the International Space Education Board (ISEB).

As part of its commitment to helping train the rising generation of space professionals, the CSA is inviting university students (undergraduate, master and doctoral) to apply. It is therefore our great pleasure to invite you to the 68th IAC on the theme of "Unlocking imagination, fostering innovation and strengthening security".

In addition, once selected for a grant, recipients will be offered the opportunity to participate in the Space Generation Congress (SGC) which will be held September 21-23, 2017, a few days before IAC 2017. SGC is the annual meeting of the Space Generation Advisory Council, which is a non-profit organisation developing networks amongst university students and young space professionals and, being in support of the United Nations Programme on Space Applications.

The eligibility criteria, the application process and the selection criteria are outlined hereinafter.

More information at <http://asc-csa.gc.ca/eng/ao/2017-iac.asp>



The March 2017 General Meeting of the HAA by Matthew Mannering

Jim talked about the Astro 101 classes. There will be one more class for review and general questions. This has been moved back to early April.

Bernie then talked about the Grimsby public night. The scopes were turned to various targets such as Jupiter, the Pleiades, M42 and Venus. There were roughly eight club members in attendance with a good mix of scopes. Later in the evening from 23:11 to 23:23 the group watched the Moon occult Aldebaran. Denise called Aldebaran's contact with the night side of the Moon.

Our guest speaker this month was Parchati Patel whose talk was titled 'The Tale of Disks around Massive Stars'. Dr. Patel received her Hons. B.Sc. in Physics and Astronomy from University of Toronto, M.Sc. in Astronomy and Planetary Science from the Western University and her Ph.D. in Astronomy and Planetary Science & Exploration from the Western University. During her graduate studies, she studied protoplanetary disks around young, massive pre-main sequence (Herbig Ae/Be) stars as well as circumstellar disks around massive main sequence stars. She is currently the Public Education and Outreach Program Coordinator at the Centre for Planetary Science and Exploration at the Western University.

Any errors in the following description are mine and are a result of the furious pace at which I was taking notes.

The theory and time line for systems involving Blue Giant stars is based on jpeg science. Meaning that we look at pictures and work on theories that match the observations.

- Blue Giant stars churn up the nebula.
- Molecular cloud core collapse occurs.
- Pre main sequence disk accretion begins but there still is no star.
- So much material moves to the center that some of it is ejected at right angles to the accretion disk.
- A protoplanetary disk leads to planet formation.
- Finally there is a planetary system along with asteroids, comets, Kuiper belt and Oort cloud equivalents.

Massive O and B class stars may have an accretion phase but we don't see it due to the speed with which events occur in the early life of a giant star. Smaller B type stars act as a bridge between O and A type stars which allows us to see disk formation before ignition of the star.

Herbig B(e) stars are a sub group of Be stars (where 'e' represents emission lines in the star's spectra). Herbig B(e) stars differ from Be stars in that they are pre main sequence and the excess Infra Red emission is the result of the dusty disk that are in close to the star.

The excess IR of regular Be stars results from the heating of a gaseous disk that surrounds the star in place of the dusty disk. The gas is ejected from the star due to its fast rotation (80% of max before the star tears itself apart). When looking edge on at the accretion disk you have to take into account gravitational darkening as this affects models. This occurs when the equator of the star looks darker than the poles. The star is oblate due to the fast rotation of the star and this affects the apparent brightness of the star.

Ms. Patel decided to study Herbig stars and quickly found out that there was very little information available to build on. Herbig stars are an important bridge between how planetary systems are formed in high and low mass star systems.

She is trying to determine the evolution of the accretion disk, the structure of the gaseous disk portion and the effect of interaction between the gaseous and dusty disks. Models are being generated that try

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H.A.A. Recognized by NASA Space Place Once Again!



The Hamilton Amateur Astronomers have been recognized by the Space Place team at NASA for our public outreach in the Hamilton, Ontario area during the calendar year of 2016.

See this month's NASA Space Place article on pages 14 and 15.

The March 2017 General Meeting of the HAA (continued)

to mimic the disk formation as seen in images. Also of interest is the determination of the switch over point between a star having a magnetic field or not.

The goal is to unify various models for different materials, gases and metals into one model.

Lastly, Steve Germann presented 'The Sky This Month' after the break.

- He talked about grazing occultations and how the outline of the Moon at its limb determines the blinking on and off of the star.
- Monitoring the event can allow you to find double stars.
- Asked Matthew and John to talk about the March 4th grazing occultation that five of us viewed from Mississauga.
- Steve mentioned that Mercury will be visible by months end.
- Mira in Cetus has peaked at mag four and will start fading now.
- Look for comet 45P at mag nine around midnight.
- Vesta is in Gemini.



Grazing Occultation

Last month I mentioned Aldebaran grazing the moon.

I was delighted to hear reports of its observation by 5 of our club's members, at the ideal location in Mississauga. Kudos to Matt, Les, Jim, John and Rob. Their description, and the videos I showed at our last meeting, remind us that traveling to the expected site of an astronomical event can be very worthwhile.

Which brings me to mention the coming eclipse of August 2017. There's still a small number of camping spots left, and I saw a 'tent cot' for sale at Canadian Tire yesterday, for use of those who prefer it to a car seat. It raises the level of the bed up a few feet off the ground. Perfect for someone who does not need to store gear in the tent.

I posted links to the graze videos. The star winked out several times, and in one case it must have encountered a gradual slope because John and others reported the fade was gradual.

Tour almost all of the Messier objects this month.

April is part of the 2 month period each year when it is possible, (especially from tropical latitudes) to easily see all 110 Messier objects in a single night. April's New Moon is another chance, on April 25th or within 4 days of that time, to see them all.

As you move further along the calendar, it becomes progressively harder to find M74 and M77 in the evening twilight, and progressively easier to find M71 in the morning twilight. Both are exquisitely difficult to star hop from our latitude though, at that time of year, because even other nearby reference stars are hard to see.

At our latitude, it is very challenging, because the earth's surface tilts in such a way to place some of the objects very near the horizon at dawn. Not to discourage you, just setting expectations.

If you are skilled at star hopping, or determined to learn, you can hope to see 100+ messier objects in a single night any time from March 1 to April 30th.

Or take your goto scope and do a 'glam' Messier Marathon just for fun. It's all good.

Minor Planet Vesta

Vesta is still at magnitude 7.6. It is the brightest minor planet in the sky still, but getting past opposition now. It is an easy binocular object in *Gemini* not far from Pollux (Gemini's twin bright star on the east). Use heavens-above to get an up-to date star chart for the time you plan to observe. Don't forget to visit the HAA blog for links, and highlights of upcoming astronomy events.

The Moon

This month, at the time of Full Moon, the libration tilts towards us most favourably the south limb of the moon. A few days later on the 15th of April you will see the most of the South part of the Moon's far side.

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The Sky This Month (continued)

Mark your calendars for 'International Observe the Moon Night' which will be held on 28 October 2017, at the First Quarter Moon. That's the time we usually plan our public outreach sessions.

(InOMN) is a worldwide, public celebration of lunar science and exploration held annually since 2010. One day each year, everyone on Earth is invited to observe and learn about the moon together, and to celebrate the cultural and personal connections we all have with Earth's nearest neighbor. Everyone, everywhere is invited to participate, and anyone, anywhere can host an InOMN event.

- [Attend INOMN](#)
- [InOMN Events](#)
- [NASA's Moon Toolkit](#)

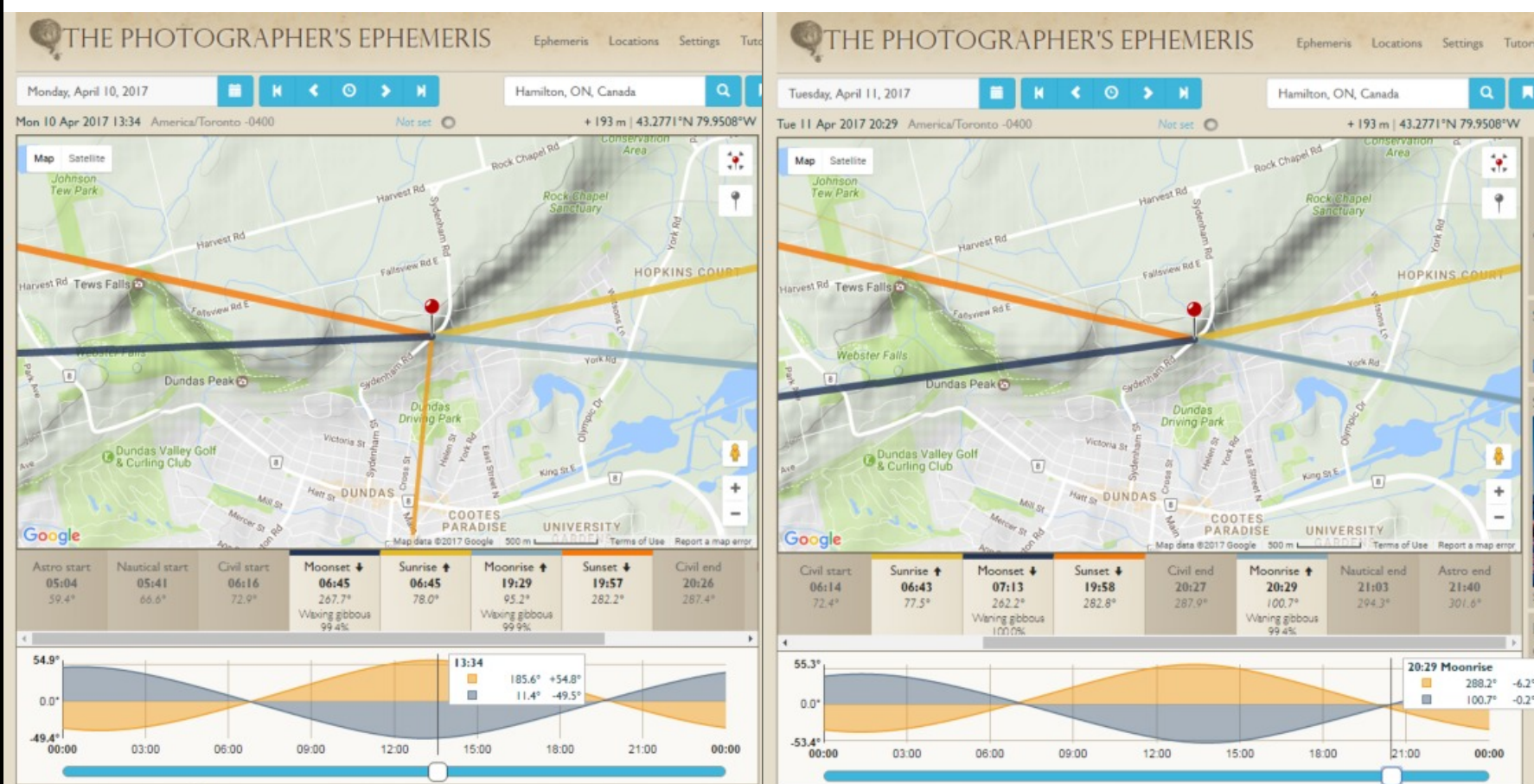
Moonrise Photography

The best place to photograph the Full Moon rising is at the lake shore, because the amount of air is reduced between you and the moon clearing the horizon.

This month, the full moon will rise on April 10th and April 11th. I am showing maps for the viewing angles from the look-out on Sydenham Road, which will allow you to photograph both the Moon and some surrounding city.

The "Photographer's Ephemeris" never fails to deliver useful information. I plan to seek a good view of it on the evening of April 10. Please join me, about a half-hour in advance to get your cameras and tripods set up.

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Maps generated from the Photographer's Ephemeris website.
<http://photoephemeris.com/>

The Sky This Month (continued)

Meteor Showers

This month also features an obscure but surprising meteor shower. With April being known for its rainy days, you will find out... April Shower or Meteor Shower... April 22 will bring the April *Lyrids*, and within a half day of the peak, it's still above 10 meteors per hour. Will you see one?

The radiant for this shower (the point on the sky where the meteors seem to be coming from) is above the horizon all night. As you might surmise, the radiant is in *Lyra*, which features the bright star Vega and for us, goes almost through the zenith each night.

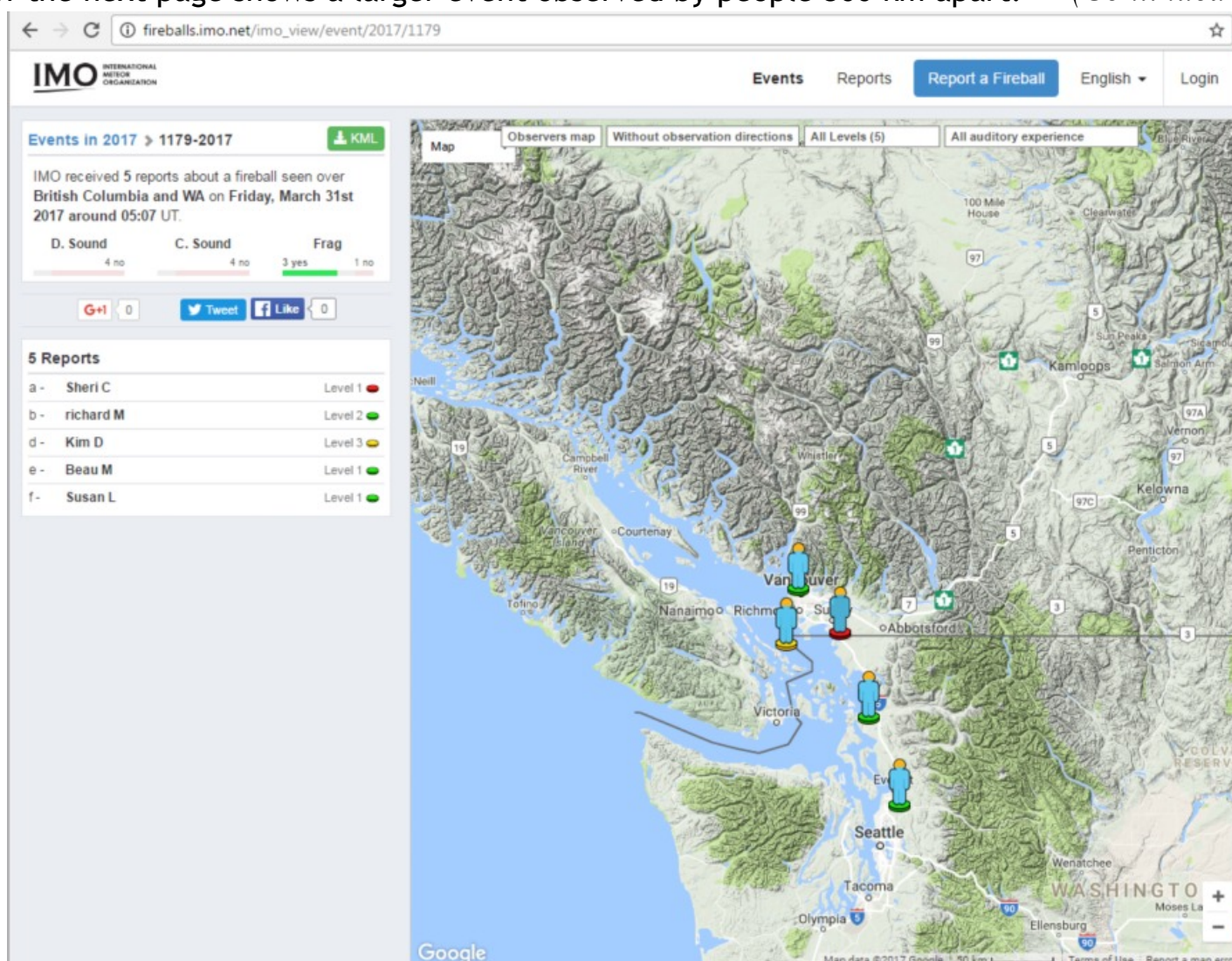
Speaking of meteors, I want this month to bring your attention to a related issue.

Reporting a fireball

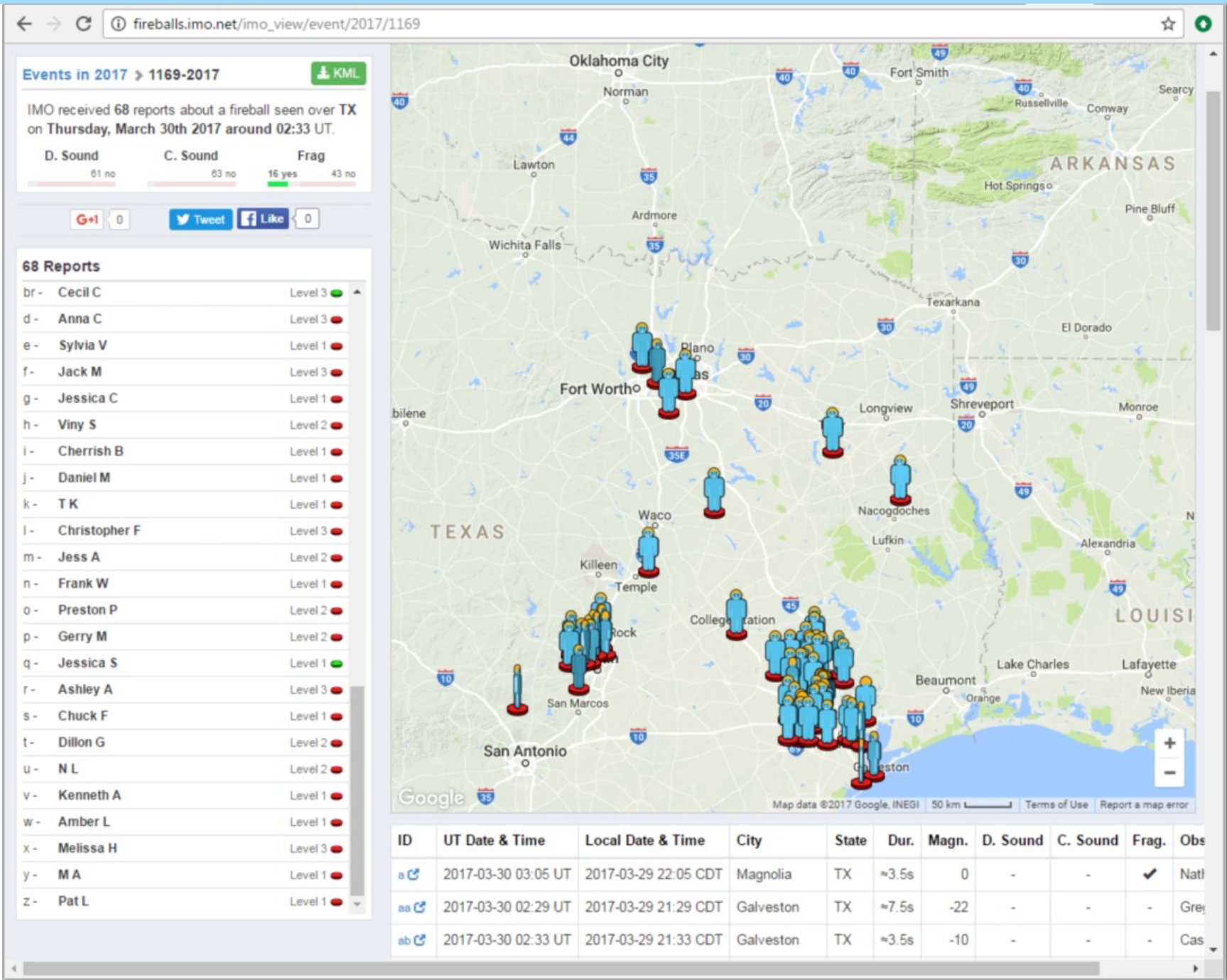
Being amateur astronomers, we (as a group) spend more time outside under the stars (when it's clear) than members of the general public do, and we have an enhanced probability of seeing a bright meteor (fireball or bolide) and understanding what it is. The chance of a non-astronomer seeing one is tiny. Most of the world's population has on average, a chance to see about one fireball per lifetime.

There is an international network of meteor observers which accumulate information about bright meteors, and this month I would like to let everyone know how to report a bright meteor when they see it, so that they can contribute to the body of knowledge about meteor orbits and probable location of landfall for fragments. The link is http://fireballs.imo.net/members/imo/report_intro.

This map shows the locations of observers for a recent fireball in the Vancouver area, and the map at the top of the next page shows a larger event observed by people 300 km apart. (Continued on [page 9](#))



The Sky This Month (continued)



This map and the map on the previous page show examples of multiple-reported meteor events, including times and locations, from the International Meteor Organization website.

In addition, you can browse this site and get information about recently reported fireballs and it is interesting to read about them.

There are pearls of good information that appear in these reports. Some people can accurately estimate the directions and altitudes where the track started and ended, and with several reports, it is possible to determine what the ground track (the line under the meteor) is, and what the approximate altitudes of start and end were.

The researchers have access to real time weather radar data, and can detect the fragments falling, subsonic, after they stop shining, since they reflect radar a little like snow and rain does.

There are 3 components to the system.

First, there's a list of reports, sorted by date, of recent events, which you can browse out of interest.

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The Sky This Month (continued)

Second, there's a 12 page questionnaire designed to assist a novice to enter a report of a bright meteor so that it can be part of that list.

Browsing the questionnaire is more difficult, since you need so start by giving the time and location of the fireball, so I did not want to mess up their records just to see what questions they ask.

Third, there are maps (called heat maps) showing where the observers were, and maps with little cartoons showing which direction people were facing when they were seeing the path.

Add to that, some dash-cams and all night security cameras, which pick up the track, and eventually get publicized, and an accurate determination both of end point and probable original orbit, can be determined.

Then we can consider what speed it entered the atmosphere at, and how big it might have been, and what composition.

Iron meteor fragments sell at a bit more than 10 dollars a gram, and in some cases researchers will pay to 'borrow' them.

In our part of the world, the skies are monitored for meteor falls thanks to the meteor observation network of the University of Western Ontario, and we have heard from them in our invited talks several times. Dr Peter Brown leads the team of researchers there.

So the next time you see something, in addition to being able to report it, you will be able to see who else saw it, by using those resources.



Treasurer's Report by Ann Tekatch

Treasurer's Report for March 2017 (Unaudited)

Opening balance:	\$8,297.81
<u>Revenue:</u>	
Memberships:	\$105.00
Calendar Sales:	\$20.00
50/50 Draw:	\$51.00
<u>Expenses:</u>	
Speaker's Honorarium:	\$50.00
Closing Balance:	\$8,423.81



Easter and Astronomy by Bernie Venasse

Easter is a moveable celebration, and each year can fall anywhere between 22nd March and 25th April. The reason for this is that the dates of Easter, like the Jewish holiday of Passover, vary according to astronomical occurrences.

The New Testament states that Jesus rose from the dead on a Sunday around the time of the Jewish Passover. Naturally, the early [church](#)¹ wanted to preserve chronological order by celebrating Easter after the moveable feast of Passover (first full moon following the vernal equinox) and so determined the best way of doing so was by establishing the date of Easter as the first Sunday after the full [moon](#)² following the March equinox. Incidentally, the first full Moon of spring is also known as the Paschal Full Moon, as it is used to set the date of Easter in any given year. In addition, if the Paschal Moon occurs on a Sunday, then Easter takes place the following Sunday.

Associating Easter with the Vernal, or Spring equinox, made sense as this time represented renewal and rebirth for the Christian church. Interestingly, though, the council of Nicaea (325AD) involved the full moon so as to provide early Christian pilgrims traveling to Jerusalem, with more night sky light to facilitate a safer journey.

Unfortunately, Roman [astronomy](#)³ at the time was not advanced enough to realize axial precession caused the date of the equinox to change slightly every year from March 19th, 20th or 21st so the church simply fixed the date for the spring equinox at March 21st. Further complicating matters when determining the date of Easter is the fact Western Christianity now follows the Gregorian calendar, while Eastern Christianity continues to use the Julian calendar, which has accrued 13 days out of sync since 325AD. Therefore, in Western Christianity Easter falls on a Sunday between March 22nd and April 25th, while in Eastern churches it varies between April 4th and May 8th.

The Date of Easter

The date of Easter is primarily used for liturgical purposes. Up to the 8th century AD there was no uniform method for determining the date of Easter making things difficult at best.

The method favoured by the Council of Nicaea in AD 325 gradually became the accepted method. The adoption of the Gregorian calendar necessitated some modifications to this scheme but it is still basically the same.

The simple standard definition of Easter is that it is the first Sunday after the [Full Moon](#)⁴ that occurs on or after the vernal equinox. If the full moon falls on a Sunday then Easter is the next Sunday.

Unfortunately this simple definition is not strictly speaking correct. The vernal equinox used is not the [true equinox](#)⁵ but an artificial one always assumed to be on 21 March. The full moon used is not the true full moon but an artificial construct based on the [Metonic cycle](#)⁶ (below).

The reasons for this are that the method is then independent of longitude on the Earth and is thus independent of time zone. It also allows the date of Easter to be calculated in advance regardless of the actual motion of the Earth around the Sun.

The method quoted here is valid for the determination of the date of Easter in Western Christian churches; the date used by the Eastern churches can be one, four or five weeks later.

In 1582, Christopher Clavius and a council working at the direction of Gregory XIII (Pope of the Roman Catholic Church) completed a reconstruction of the Julian Calendar producing new Easter tables. The new
(Continued on [page 12](#))

Easter and Astronomy (continued)

calendar was issued in February in the papal bull called "Inter Gravissimas". This new calendar is referred to as the [Gregorian Calendar](#)⁷. One major difference between the Julian and Gregorian Calendars is the "leap year rule". Universal adoption of this Gregorian calendar occurred slowly. By the 1700's, though, most of western Europe had adopted the Gregorian Calendar. The Eastern Christian churches still determine the Easter dates using the older Julian Calendar method.

The statement that Easter Day is the first Sunday after the full moon that occurs next after the [vernal equinox](#)⁸, is only an approximate statement of the actual ecclesiastical rules. The full moon involved is not the astronomical Full Moon but an ecclesiastical moon that keeps, more or less, in step with the astronomical full Moon.

The ecclesiastical rules are:

- The vernal equinox is occurs on March 21,
- the ecclesiastical full moon is the 14th day of a tabular lunation (new moon), and
- Easter falls on the first Sunday following the first ecclesiastical full moon that occurs on or after the day of the vernal equinox.

Easter can never occur before March 22 or later than April 25. The Gregorian dates for the ecclesiastical full moon are determined using the tables in the Papal bull Inter Gravissimas. The Western (Roman Catholic and Protestant) Christian churches use the Gregorian tables while many Eastern (Orthodox) Christian churches use older tables based on the Julian Calendar. Thus, the civil date of Easter depends upon which tables - Gregorian or pre-Gregorian - are used.

In a congress held in 1923, the Eastern Churches adopted a modified Gregorian Calendar and decided to set the date of Easter according to the astronomical full moon at the [meridian](#)⁹ of Jerusalem. However, a variety of practices remain among the Eastern Churches.

There are three major differences between the ecclesiastical and the astronomical systems.

- The times of the ecclesiastical full moon are not necessarily identical to the times of astronomical full moons. The ecclesiastical tables do not account for the full complexity of the lunar motion.
- The astronomical definition of the vernal equinox is the instant when the Sun, as seen from the Earth, has a zero apparent ecliptic longitude. (Yes, the Sun's [ecliptic longitude](#)¹⁰, not its declination, is used for the astronomical definition.) This instant shifts slightly from year to year within the civil calendar. In the ecclesiastical system the vernal equinox does not shift. It is fixed on March 21 regardless of the actual position of the Sun.
- The date of Easter is a specific calendar date. Easter starts when that date starts for your local time zone. The astronomical vernal equinox occurs at same instant everywhere on the Earth.

Inevitably, the date of Easter occasionally differs from a date that depends on the astronomical full moon and astronomical vernal equinox. In some cases the difference may apply to some parts of the world and not to others because two different dates separated by midnight are always simultaneously in progress on the Earth.

For example, in 1962 the astronomical full moon occurred on March 21, UT=7h 55m - about six hours after astronomical [equinox](#)¹¹. The ecclesiastical full moon, taken from the tables, however, occurred on March 20, before the ecclesiastical equinox on March 21. In the astronomical case, this full moon occurred after the equinox, but in the ecclesiastical case, it preceded the equinox. Following the ecclesiastical rules, Easter was not until the Sunday that followed the next ecclesiastical full moon (Wednesday, April 18) making Easter Sunday, April 22.

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Easter and Astronomy (continued)

Similarly, in 1954 the first ecclesiastical full moon after March 21 fell on Saturday, April 17. Thus, Easter was Sunday, April 18. The astronomical equinox also occurred on March 21. The next astronomical full moon occurred on April 18 at UT=5h. So in some places in the world Easter was on the same Sunday as the astronomical Full Moon.

Computing the Date of Easter

The lunar cycles used by the ecclesiastical system are simple to program. The following algorithm will compute the date of Easter using the Gregorian Calendar.

The algorithm uses the year, y , to determine the month, m , and day, d , of Easter. The symbol $*$ means multiply.

Please note the following: This is an integer calculation. All variables are integers and all remainders from division are dropped. For example, 7 divided by 3 is equal to 2 in integer arithmetic.

```
c = y / 100
n = y - 19 * ( y / 19 )
k = ( c - 17 ) / 25
i = c - c / 4 - ( c - k ) / 3 + 19 * n + 15
i = i - 30 * ( i / 30 )
i = i - ( i / 28 ) * ( 1 - ( i / 28 ) * ( 29 / ( i + 1 ) )
    * ( ( 21 - n ) / 11 ) )
j = y + y / 4 + i + 2 - c + c / 4
j = j - 7 * ( j / 7 )
l = i - j
m = 3 + ( l + 40 ) / 44
d = 1 + 28 - 31 * ( m / 4 )
```

For example, using the year 2010,

$y=2010$,
 $c=2010/100=20$,
 $n=2010 - 19 \times (2010/19) = 2010 - 19 \times (105) = 15$, [see note above regarding integer calculations]
etc. resulting in Easter on April 4, 2010.

According to a British correspondent, the Book of Common Prayer (enshrined in English Law around 1526) defines Easter day as the first Sunday after the [full moon](#)¹², which happens upon, or next after the twenty first day of March; and if the [full moon](#)¹³ happens upon a Sunday, Easter Day is the Sunday after. This would appear to contract the use of the [Paschal full moon](#)¹⁴.

This information has been culled from several sources on the web.....

1. <http://www.astronomytrek.com/vatican-astronomer-sees-link-between-science-and-religion/>
2. <http://www.astronomytrek.com/top-7-night-sky-objects-for-stargazing/>
3. <http://www.astronomytrek.com/history-of-astronomy/>
4. http://en.wikipedia.org/wiki/Full_moon
5. <http://www.rmg.co.uk/explore/astronomy-and-time/time-facts/equinoxes-and-solstices>
6. <http://www.rmg.co.uk/discover/explore/time/measuring-time>
- 7, 8, 9, 10, 11. <http://asa.usno.navy.mil/SecM/Glossary.html>
- 12, 13. <http://scienceworld.wolfram.com/astronomy/FullMoon.html>
14. <http://scienceworld.wolfram.com/astronomy/PaschalFullMoon.html>



What It's Like on a TRAPPIST-1 Planet

By Marcus Woo

**This article is provided
by NASA Space Place.**

With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.

Visit spaceplace.nasa.gov to explore space and Earth science!



With seven Earth-sized planets that could harbor liquid water on their rocky, solid surfaces, the TRAPPIST-1 planetary system might feel familiar. Yet the system, recently studied by NASA's Spitzer Space Telescope, is unmistakably alien: compact enough to fit inside Mercury's orbit, and surrounds an ultra-cool dwarf star—not much bigger than Jupiter and much cooler than the sun.

If you stood on one of these worlds, the sky overhead would look quite different from our own. Depending on which planet you're on, the star would appear several times bigger than the sun. You would feel its warmth, but because it shines stronger in the infrared, it would appear disproportionately dim.

"It would be a sort of an orangish-salmon color—basically close to the color of a low-wattage light bulb," says Robert Hurt, a visualization scientist for Caltech/IPAC, a NASA partner. Due to the lack of blue light from the star, the sky would be bathed in a pastel, orange hue.

But that's only if you're on the light side of the planet. Because the worlds are so close to their star, they're tidally locked so that the same side faces the star at all times, like how the Man on the Moon always watches Earth. If you're on the planet's dark side, you'd be enveloped in perpetual darkness—maybe a good thing if you're an avid stargazer.

If you're on some of the farther planets, though, the dark side might be too cold to survive. But on some of the inner planets, the dark side may be the only comfortable place, as the light side might be inhospitably hot.

On any of the middle planets, the light side would offer a dramatic view of the inner planets as crescents, appearing even bigger than the

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NASA's Space Place (continued)

moon on closest approach. The planets only take a few days to orbit TRAPPIST-1, so from most planets, you can enjoy eclipses multiple times a week (they'd be more like transits, though, since they wouldn't cover the whole star).

Looking away from the star on the dark side, you would see the outer-most planets in their full illuminated glory. They would be so close—only a few times the Earth-moon distance—that you could see continents, clouds, and other surface features.

The constellations in the background would appear as if someone had bumped into them, jostling the stars—a perspective skewed by the 40-light-years between TRAPPIST-1 and Earth. Orion's belt is no longer aligned. One of his shoulders is lowered.

And, with the help of binoculars, you might even spot the sun as an inconspicuous yellow star: far, faint, but familiar.

Want to teach kids about exoplanets? Go to the NASA Space Place and see our video called, “Searching for other planets like ours”: <https://spaceplace.nasa.gov/exoplanet-snap/>



This artist's concept allows us to imagine what it would be like to stand on the surface of the exoplanet TRAPPIST-1f, located in the TRAPPIST-1 system in the constellation Aquarius. Credit: NASA/JPL-Caltech/T. Pyle (IPAC)



Snippets from April Fools' Day by Bernie Venasse

Snippets from a few April Fools' Day articles I found in the archives.....

The Great Moon Hoax (1835)

In 1835, The Sun newspaper published a series of articles later called "The Great Moon Hoax" that vividly described an ecosystem of trees, rivers, beaches, bison, goats and unicorns, as well as winged, bat-like humanoids living on the moon. Claiming them to have been discovered by astronomer Sir John Herschel using a magnificent new telescope at the Cape of Good Hope in South Africa, the paper generated a lot of interest owing to its sensational reporting. They later said that the series was an attempt to satirize the multitude of ridiculous scientific news stories that were going around at the time.

World To End Tomorrow (1940)

On March 31, 1940 the Franklin Institute issued a press release warning that the world would end the next day. The release was picked up by radio station KYW which announced, "Scientists predict that the world will end at 3 P.M. Eastern Standard Time tomorrow. This is no April Fool joke. Confirmation can be obtained from Wagner Schlesinger, director of the Fels Planetarium of this city." The public reaction was immediate. Local authorities were flooded with frantic phone calls. The panic only subsided after the Franklin Institute assured people that it had made no such prediction.

Flight to the Moon (1941)

New York City's Hayden Planetarium advertised that at 2 o'clock on April 1st the "first non-stop rocket ship flight to the moon" would take place, leaving from the planetarium. The announcement was accompanied by an illustration by artist Tom Voter. Before the actual "flight," the Planetarium offered a clarification: "The only April Fool element in this miracle flight is that the 240,000 miles of space between the earth and the moon will be spanned in the comfort of the imagination, aided by trick photography, weird lighting effects and a realistic reproduction of the fantastic lunar landscapes."

Beeping Cylinder (1958)

W.D. Loy of Charlotte, North Carolina first heard a loud bang, then a series of beeps coming from his front yard. He went out to investigate and found on his lawn a silvery cylinder shaped like a missile with an antenna protruding from the top. Suspecting it was some kind of Soviet satellite, similar to Sputnik, Loy sent his family into the basement to hide, then called the police. When they arrived, they unscrewed the bolts holding the object together and found inside a beeping electric bicycle horn, as well as a note that read, "All work and no play makes Jack a dull boy. April fool!"



Swiss Lunar Landing Hoax. (1967)

An hour-long Swiss Radio broadcast announced that U.S. astronauts had just landed on the moon. The announcement generated enormous excitement. Telephone exchanges became jammed as people tried to phone friends to share the news. Even U.S. authorities in Switzerland initially weren't sure if the news was true or false. The broadcast concluded with the report that the moonship would take off from the moon at 7 p.m. Listeners were urged to climb to a high vantage point, away from the city lights, to watch it return to Earth. As a result, there was a huge rush of people who tried to leave Zurich and get to the top of Mt. Uetliberg, overlooking the city.

(Continued on [page 17](#))

Snippets from April Fools' Day (continued)

Planetary Alignment Decreases Gravity (1976)

During an interview on BBC Radio 2, astronomer Patrick Moore revealed that at exactly 9:47 a.m. Pluto would pass behind Jupiter, and that this alignment would result in a stronger gravitational pull from Jupiter, counteracting the Earth's own gravity and making people momentarily weigh less. He told listeners that if they jumped up and down while this was happening, they would experience a strange floating sensation. When 9:47 a.m. arrived, BBC2 began to receive hundreds of calls from listeners who claimed to have felt the sensation. One woman insisted that she and her friends had floated around the room. Another caller complained that he ascended so rapidly that he hit his head on the branch of a tree!



Space Shuttle Lands in San Diego (1993)

Dave Rickards, a deejay at San Diego's KGB-FM, announced that the space shuttle Discovery had been diverted from Edwards Air Force Base and would land instead at Montgomery Field just outside the city at 8:30 am. Thousands of commuters immediately headed there, causing enormous traffic jams that lasted for almost an hour. Of course, the shuttle never landed. Montgomery Field is far too small for the shuttle to have even considered landing there, and there wasn't a shuttle in orbit at the time. The police weren't amused. They announced they would be billing the radio station for the cost of forcing officers to direct the traffic.



Life Discovered on Jupiter (1996)

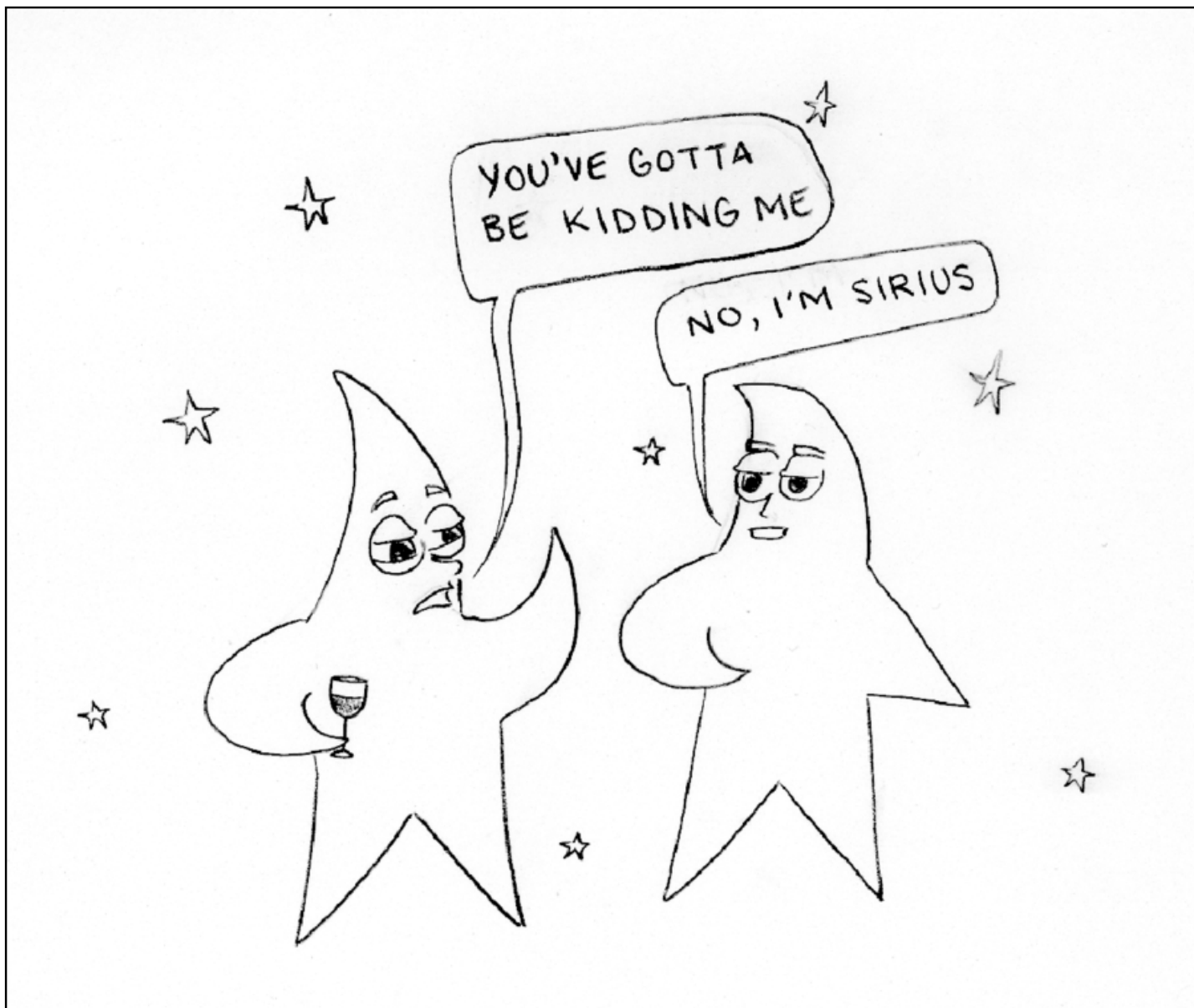
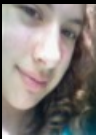
When America Online subscribers logged in to the service on April 1st, they were greeted with a news flash: "Government source reveals signs of life on Jupiter." This headline was backed up by statements from a planetary biologist and an assertion by Ted Leonsis, AOL's president, that his company possessed documents that proved the government was hiding the existence of life on the massive planet. The story generated over 1300 messages on AOL, and hundreds of people called the Jet Propulsion Laboratory in Pasadena, California trying to obtain more details about the discovery.



Apollo Bacteria Cause Lunar Erosion (2005)

Nature.com reported that images of the Moon taken by the Floating Optical Orbital Lens (F.O.O.L.) revealed that bacteria left behind by the Apollo lunar mission was causing the moon to disintegrate. "Images of the lunar surface reveal deep cracks and holes that are slowly but surely releasing gas and dust into space. 'This is serious,' says Brad Kawalkowicz, an astrogeologist from the Sprodj Atomic Research Centre in Belgium, who has analysed the pictures. 'There really is less Moon up there than there used to be.' If the process continues, he adds, the Moon could eventually crumble away to nothing."





2017 Calendar of Events

- April 7 – Regular meeting at the Spectator Building. Note that this is the FIRST Friday of the month
- April 22 – Scope Clinic/ Open House at the Spectator Building
- April 29 – Outreach at Bayfront Park... Astronomy Day
- May 12 – Regular meeting at the Spectator Building
- May 27 – Outreach at McQuesten Park
- June 9 – Regular meeting at the Spectator Building
- June 24 – Outreach at Lakeland Park ... mostly Solar observing
- July 29 – Outreach at McQuesten Park ... mostly Solar observing
- August 12 – Club Picnic and public Perseid Event at Binbrook Park
- August 21 – Outreach at McQuesten park for Solar Eclipse... for those not going south for the event.
- September 8 – Regular meeting at the Spectator Building
- September 30 – Outreach at Bayfront Park... Astronomy Day
- October 13 – Annual General Meeting at the Spectator Building
- October 21 – Outreach at Grimsby Niagara Gateway Tourism Centre
- November 10 – Regular meeting at the Spectator Building
- November 18 – Scope Clinic/ Open House at the Spectator Building
- December 8 – Regular meeting at the Spectator Building



William J. McCallion Planetarium

McMASTER UNIVERSITY, HAMILTON, ONTARIO

- Public shows every Wednesday (7:00pm)
- Public transit available directly to McMaster campus
- Tickets \$7 per person; private group bookings \$150
- Different shows every week
- Upcoming shows include:
 - **Apr 5: Introductory Astronomy for Kids — Galaxies**
 - **Apr 12: Distant Worlds in our Solar System**
 - **Apr 19: Star Wars: The Science Awakens**
 - **Apr 26: Gravity in Space: From Orbits to Gravitational Waves**
- For more details, visit
www.physics.mcmaster.ca/planetarium

UPCOMING EVENTS

April 7, 2017 - 7:30 pm — *HAA Meeting* at the Hamilton Spectator Auditorium. Our featured speaker will be **Dr. Pauline Barmby** of Western University. ***NOTE: This is the first Friday of the month.***

April 22, 2017 - 1 pm - 4 pm — *Spring Telescope Clinic & Open House* at the Hamilton Spectator Auditorium. Many types of telescopes will be on display, and experts will be on hand to answer questions. You can also bring your own scope & get tips and pointers on its use.

April 29, 2017 - 7:30 pm - 11:00 pm — *Astronomy Day Public Stargazing Night* at Bayfront Park, Hamilton, ON.

May 12, 2017 - 7:30 pm — *HAA Meeting* at the Hamilton Spectator Auditorium.

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Check out the H.A.A. Website
www.amateurastronomy.org

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Observing site for the HAA provided with the generous support of the

Binbrook Conservation Area

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.

<http://www.npca.ca/conservation-areas/binbrook/>
905-692-3228

