

# Star Gazer News

*Astronomy News for Bluewater Stargazers  
Special Issue: May 2016*

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## Transit of Mercury: Success!

Although a Mercury transit is not as spectacular an event as a transit of Venus, it comes pretty close for those who have not seen Venus do the deed. You have a better chance of seeing Mercury transit the Sun because "ToM's" happen more often. Its orbit is closer to the Sun and therefore Mercury passes between us and Sol every 88 days. Theoretically, there should be a Mercury transit every 3 months or so, but just like with lunar eclipses, the angle of the tilt is important. Most of the time Mercury is above or below the Sun.

Taking that into consideration reduces the events to about one good transit every decade or so on average. In the 20th century there were 14 Mercury transits and in the 21st, we can expect another 14,

*This Special Edition is a report in words and images of the May 9, 2016 Transit of Mercury as seen by many observers in the Bruce/Grey counties area and even farther afield. Reports came in from the Bluewater area as well as from London ON and even Alberta and Minnesota. Images in this souvenir edition were kindly provided by BAS members at the ES Fox Observatory as well as "roaming astronomers" from farther away. Thank you to all who sent in reports and images to make this souvenir of the 2016 Mercury Transit possible.*

3 of which have happened already. After the next transit on Nov 11, 2019, we get an unusually long break until Nov 13, 2032. Both of these are in the poor weather month of November and we could easily be clouded out. After another November transit 7 years later in 2039, we finally get a May transit in 2049! About the only consolation with these widely spaced opportunities is that the next **Venus** transit does not happen until Dec 11, 2117! But then, only 8 years later on Dec 8, we get a second Venus transit! For the 2117 transit, I will be celebrating my 170th birthday. I have told my family not do anything special, but I do expect a nice cake.



**Image left:** Steve Irvine observed and recorded the transit from Big Bay on Georgian Bay. This image was made through his H-alpha solar telescope.

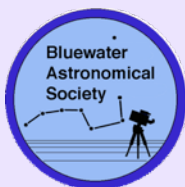
Steve writes:

*Here is one of my photos taken yesterday of the Mercury transit. I had my scope and mount out on our front lawn tracking it from start to finish, and it was great to check it frequently to follow the progress. I was clouded out ten years ago during the previous Mercury transit, so this one was really appreciated.*

*Canon 6D connected via eyepiece projection (Hyperion 5mm modular eyepiece) to a Coronado SolarMax II 60 scope tracking on an HEQ5 mount. ISO 2000, 1/320 sec. exp., 9:36 a.m. EDT, Georgian Bluffs, ON.*

Steve

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**BAS Members View Transit at ES Fox**

Clear skies and gentle cool breezes made the Transit of Mercury a very special occasion for BAS stargazers Monday May 9. The sky over this area and much of Ontario was clear for some or all of the 7.5 hour long event. The viewers at the Fox Observatory set up 5 telescopes including an H-alpha solar scope to view and record the happenings. Students on program at the BOEC had personally-narrated views of an event that many have never seen before. Those of us that saw the Venus Transit in 2012 remarked on how minuscule the silhouette of Mercury was in comparison. Also remarkable was how slowly Mercury moved across the face of the Sun. The images here were kindly provided by several of our BAS photographers who recorded the event through H-alpha scopes as well as conventionally-filtered instruments from 3-inch refractors to our 10-inch Bishop scope in the observatory.

**Mallincam Views of Mercury**

The club's H-alpha scope was employed to produce the image at lower right -a metre-across view of the Sun. We had it working for the first while but then decided that the poor resolution (Mallincam to LCD projector to screen) was not worth the effort since Mercury was just too tiny to see well. We returned to visual H-alpha viewing and views with the other white light filtered telescopes we had set up. The Lunt setup is shown below with yours truly looking through the drop wall at the screen inside to focus the image. A helper was controlling the Mallincam software on the other side of the wall.



Above: Mallincam view through the LCD projector shows Mercury just after ingress -the faint dot centre left of disk. The sunspot group near the centre was much larger than Mercury.

## Editor's Report

Finally! A BAS scheduled event that was not cancelled by weather. The weather was nothing short of spectacular on Monday May 9 and we got to see the entire transit of Mercury. Skies were crystal clear the whole previous night and even the fog that came in around the Fox Observatory had disappeared by the time the Sun had cleared the trees to the east. Observers there for first contact were Zoe K., Lorraine R., Brett T., Frank W., Julian D., and me. One of us (guess who) actually arrived at 10 pm the night before to try to catch an auroral display but not much happened. See image below. Later in the day Mike T. and Eric I. also came by. We were visited a number of times throughout the day by elementary students on program at the BOEC. All were thrilled by the view. "That's the Sun?!" or "That little black dot is Mercury? That is sooooo cool!" were typical comments.

First contact was really difficult to pin down accurately since the low Sun ( $10^\circ$ ) was affected by atmospheric seeing. We could only spot the disk of Mercury after it was partly or mostly clear of the limb. The tiny nibble which was the planet partly crossing the Sun was swamped by the turbulence caused by the atmosphere. Even though we had three minutes for the limb crossing, none of us could estimate contact times well enough -although we did agree that the events seemed to be running a bit late.

The Sun was much higher at transit end so the view was much steadier as we watched the planet exit across the Sun's limb. The event times we were using were accurate only to the nearest minute and again, we generally agreed that what we saw was a bit later than the predictions.

During the long interval while Mercury was crossing the Sun, we went back to periodically viewing it through the H-alpha scope as well as the regular white-light filtered telescopes. We had set up the 10-inch Bishop scope, the 8-inch Coleman SCT (the original donation that started the BCAS) as well as a refractor or two and a Celestron 5-inch reflector. Some of us were taking images, both of the transit (through the scopes) and of the goings-on around the observatory as people came by. It was a wonderful public event and the smiles on the faces

Earth's magnetosphere had experienced an event on the previous night that generated some beautiful aurora which were imaged by Steve I. at Big Bay. That image ended up on the front page of the Warton Echo for May 17.

In the hope that it would repeat again during the evening of May 8 and morning of May 9, I set up my camera at the observatory. Unfortunately, the best that was seen was this faint display just before midnight. This image has been stretched to reveal the colours, and to the eye, only a faint yellowish glow was detected along the horizon. Canon 60Da, 20 s, ISO 3200, focal length 17 mm, f/3.5, time 11:36 pm May 8. The video of the "display" will be shown at the June 1 meeting. It is still interesting.

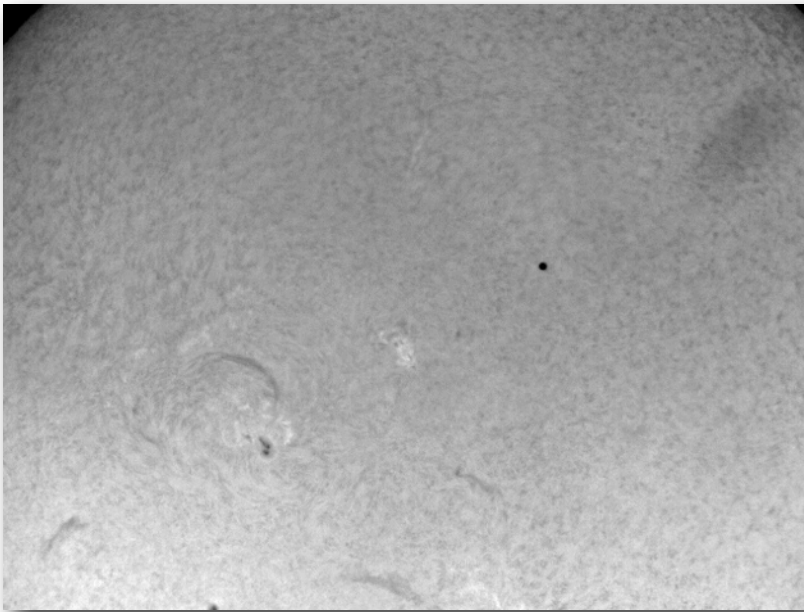


Photo by Julian Delf.

of kids that looked through the telescopes was very rewarding. The adult chaperones also enjoyed the view. This was a good example of how an astronomical event can be integrated into the program at the outdoor ed centre.

One of the useful features of the SkyWatcher software running on the mount at the Fox is that it can be set to track at the solar rate which keeps the Sun in the middle of the field of view of the eyepiece. And with a rich field adapter (x0.63) we could get the FOV to give a full solar image that would fit on the big screen nicely (see lower right pg. 2). Without the adapter, the solar image was larger and great for watching ingress and egress visually. It is a very versatile system and just requires a quick change to go from 2500 mm to a wider field of view at 1600 mm.



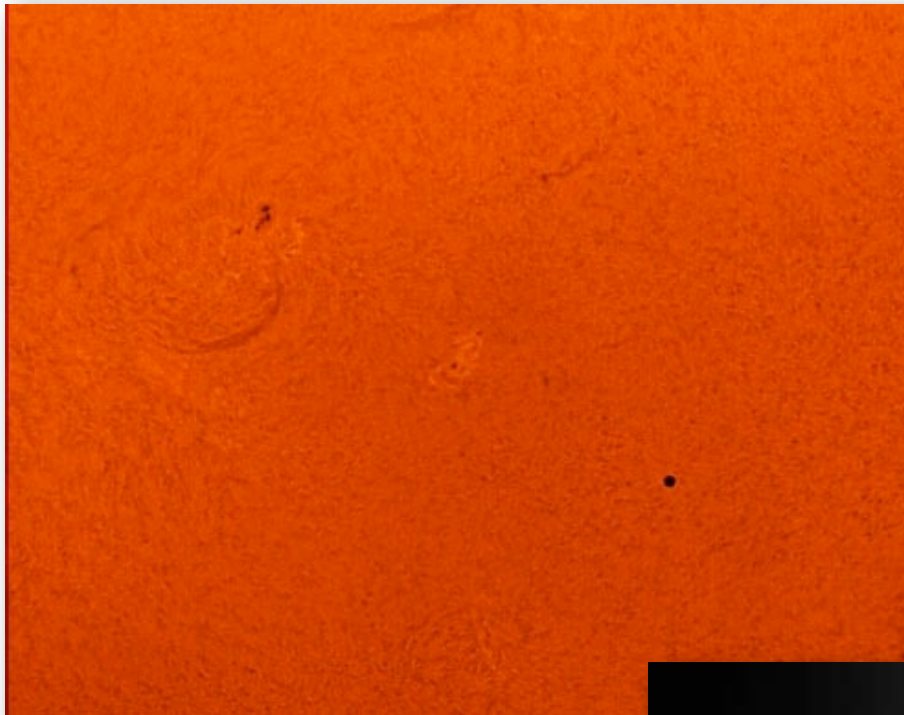


BAS member-at-large Robert A. had some good luck imaging, in spite of fighting cloudy skies in London, ON. His H-alpha scope was the larger brother to our Lunt and produced the images left and below. Direct imaging through the H-alpha scope was the way to go as Steve I. also got a very nice image with a similar setup at Big Bay. See Steve's image on pg 1.



Imaging train :  
Lunt 100mm SS Ha (picture above)  
ZWO ASI120M CMOS camera  
1280x960 resolution @ 1.08"/pixel

**Image Left:** Stacked w/Avistack, Processed w/wavelets Registax.Curves and colored w/CC14 to simulate what you would see visually in Ha. The image at top is the original B&W shot.



**Image Below:**

Single frame from 10000 frame AVI  
No processing  
(See the Newton rings?)  
19 arcseconds Mercury's gone in 3m 12s

**Robert sent this email with his images:**

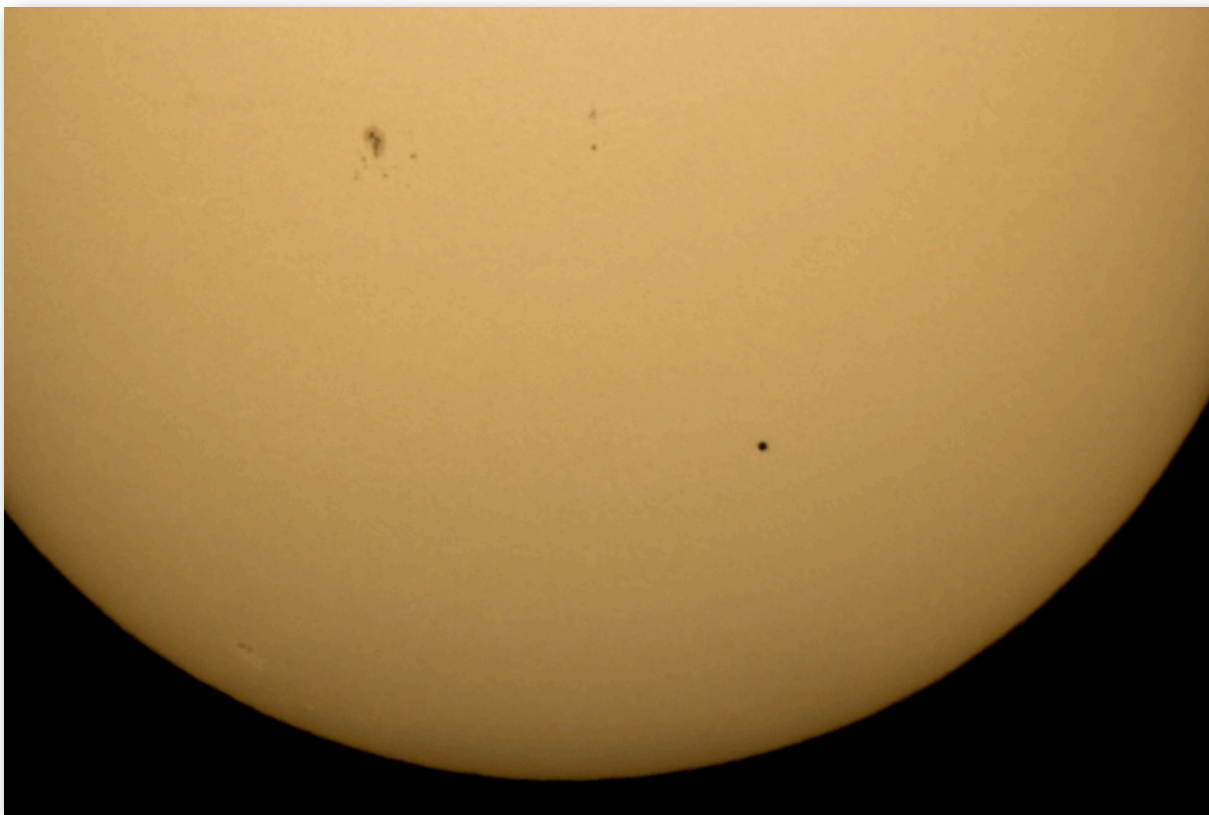
Started out visually observing the transit with Lunt zoom EP sun full disc. And the most striking thing (which everyone comments on) is how jet black and perfectly round Mercury was against the solar disc.

Imaging began around 10:30am under relatively clear good skies. Then high level clouds rolled in and had to adjust the exposure rate on the fly. Viewing was poor and Mercury was jumping around like a Fovian sand flea! Rest is history! Be back in Nov 2019.

Brrrrr.

Thanks. Robert





This image was shot at 9:02:45 AM after Mercury had been on the move for almost two hours. The ingress point is on the lowermost point on the solar disc at the bottom of the image. The original shot has had the colour corrected because it was inadvertently shot with the wrong colour balance making it come out blue. (See below) Imaged with a Canon 60D at prime focus of the 10-inch Bishop scope at 2500 mm focal length, f/10, a 1/1000 s exposure at 200 ISO.

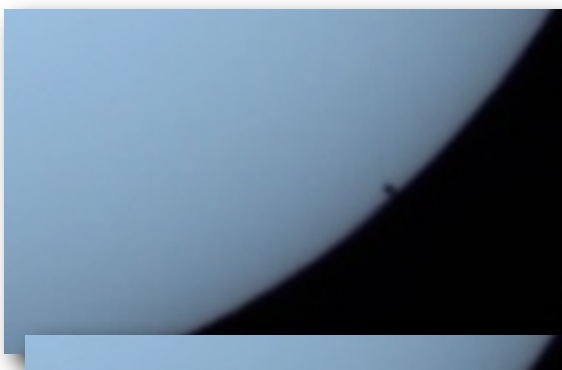
Photo by JH from Fox Observatory.

An interesting aspect of the day was that since we had such a long event, we were able to examine the Sun through the various instruments, compare the views and find features on the surface that might have escaped attention if there was less time.

There was an interesting white feature (a faculae) that we noticed at the edge of the Sun and right beside it a darker spot that seemed associated with it. The faculae is visible in the lower left of the image above, which was taken at 9:02 AM. The H-alpha view of the same feature revealed the facula as a plage (French for "beach"), a brighter and hotter area like many that are found surrounding or near

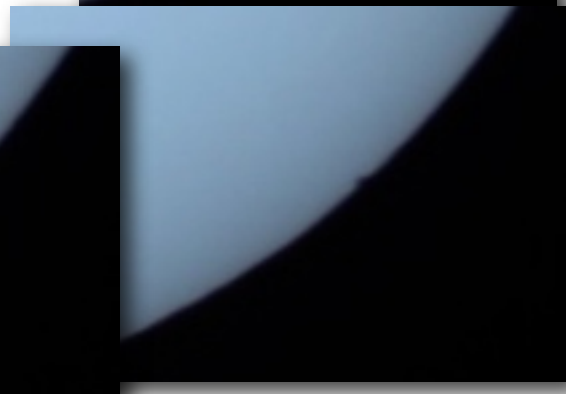
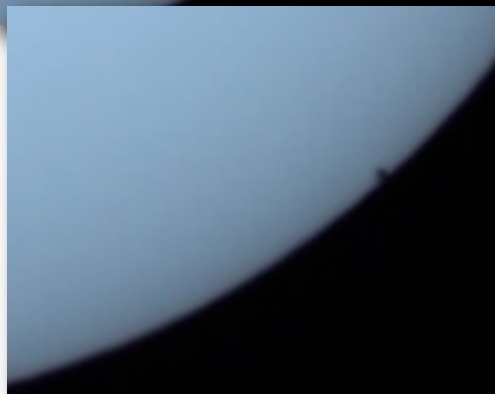
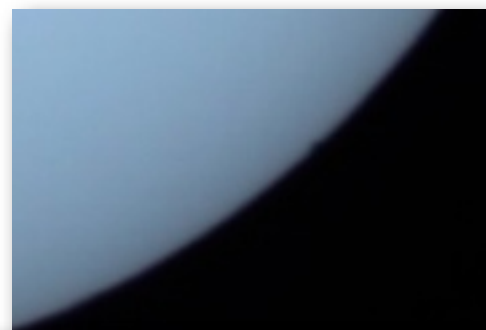
sunspots. It is a plage in H-alpha and a faculae in white light and they are not identical since faculae are generally lower down in the chromosphere. Faculae are actually not that difficult to see with a white light filter, especially near the limb of the Sun where the background is darker and faculae stand out better.

We also noticed the changes in the appearance of sunspots as well. An especially large group of four looking like a "comma" near the centre of the Sun were of particular interest. There was also one fainter group that looked like a large smiley face -at least to one of us anyway.



Images CCW from top right show the progress of Mercury as it approached and crossed the limb to end the transit. These are screen snaps from a Canon 60Da video shot through the Bishop 10-inch. Manual settings were used to get the correct exposure. White balance is off because it was left inadvertently for night shots and not daylight.

Images by John H.



**Joan and Dave Skelton: Owen Sound**

We viewed the event from the park across from Legacy Ridge- it was clear and a bit breezy but great viewing using Joan's Pronto. We stayed for about half an hour. Joan [also] viewed the end from our driveway using the Pronto again. Again it was very clear..... Took a few pics with a small camera held near the eyepiece.

Here are some of my more successful Mercury transit photos, done in the simplest format. Just held the iPhone at the eyepiece and clicked! [One of the few images of the last nibble of Mercury at the Sun! -ed]

I tried to take some ingress photos out at the park across from the Legacy golf course, but it was too windy for the telescope to stay steady. All of the attached were taken approaching or at egress from our driveway (and very little wind).

Equipment info:

- Telescope: Tele Vue Pronto (70 mm aperture)
- Eyepiece: 13 mm Orion Stratus
- Camera: iPhone 6

**Marian and Keith Ratcliffe: East of Durham**

I woke up at 5:30am Monday morning and the skies were clear as we set up the telescope to observe the transit. Sadly Keith had to go to work.

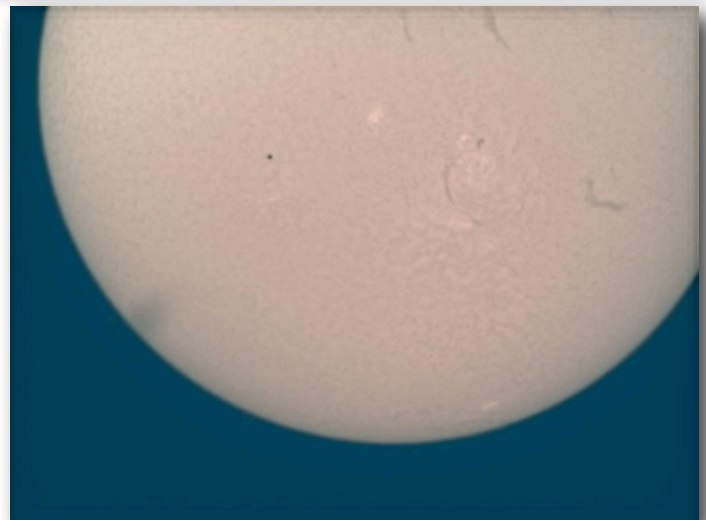
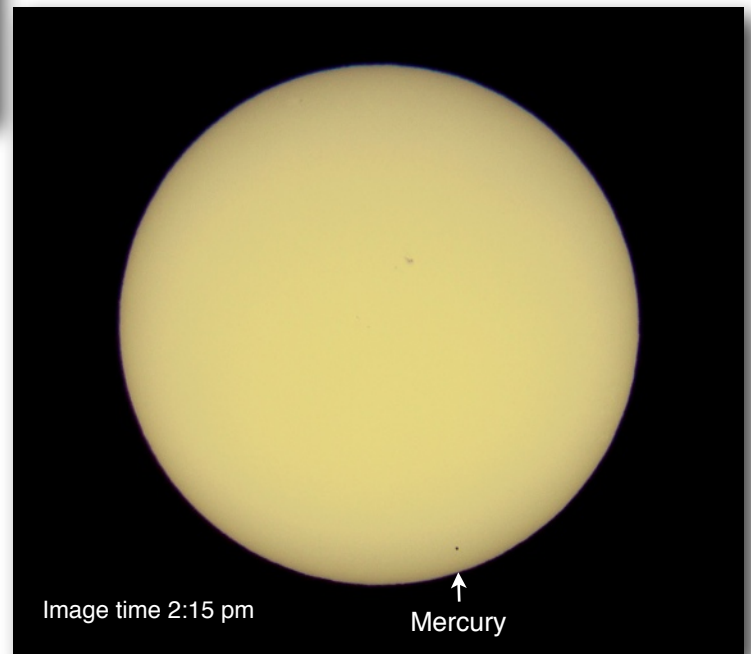
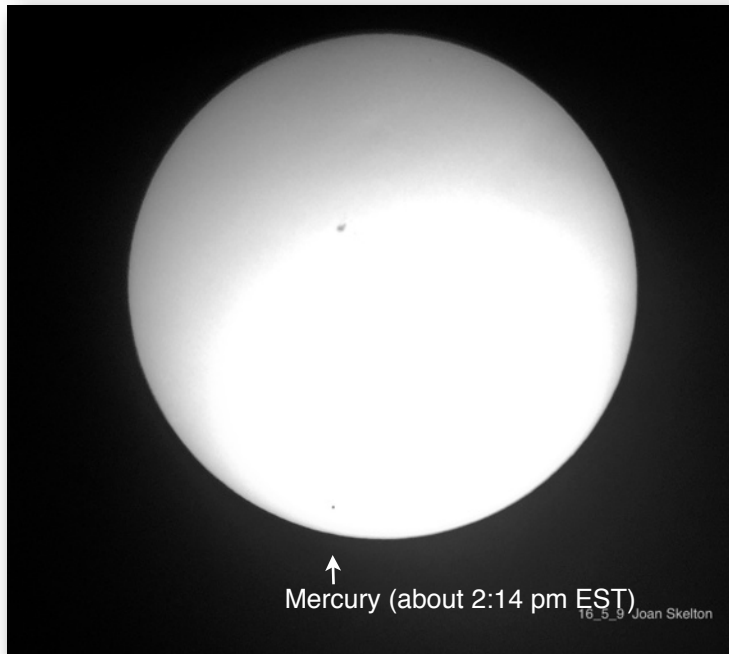
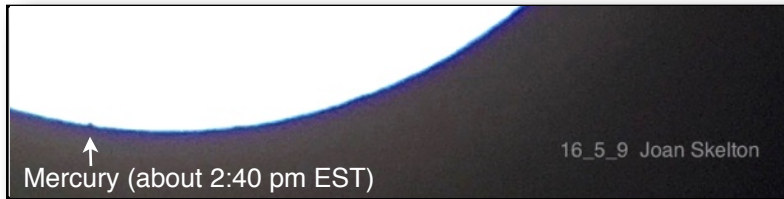
Just after 6am a mass of clouds rolled in and blocked the sun until after 8:30am so I missed the start of the transit. After that all was clear and beautiful and I was able to enjoy the remainder of the transit. I spent the day weeding the gardens and wandering over to the telescope to take a peek and some photos for Keith.

View in scope seemed larger, was much more clear and the disc of Mercury was more defined. Camera has wide angle lens on it so photo is not as good as actual view.

The attached photo was taken around 2:15pm and has not been edited, flipped or altered, just the way I saw it in the scope. Hope that's ok.

Image below taken through 8" (200mm) Newtonian reflector Baader solar film with DIY holder, cheap little Sony cybershot camera, hand-held to lens. [Image has been coloured to present a more natural colour. -ed]

Location: Munic. of West Grey (E.of Durham in former Glenelg twp.)  
Marian Ratcliffe



**Eric Ingard: Red Bay**

I have attached a photo of the transit and it was taken on a Lunt 60 using the neximage 5 and stacked in Registacks. Took me a while to find where neximage stored the image so I hope I am not late.

Image right is from the video which Eric took at 10:05 am.

## Donna-Marie Bonnett Hanover ON

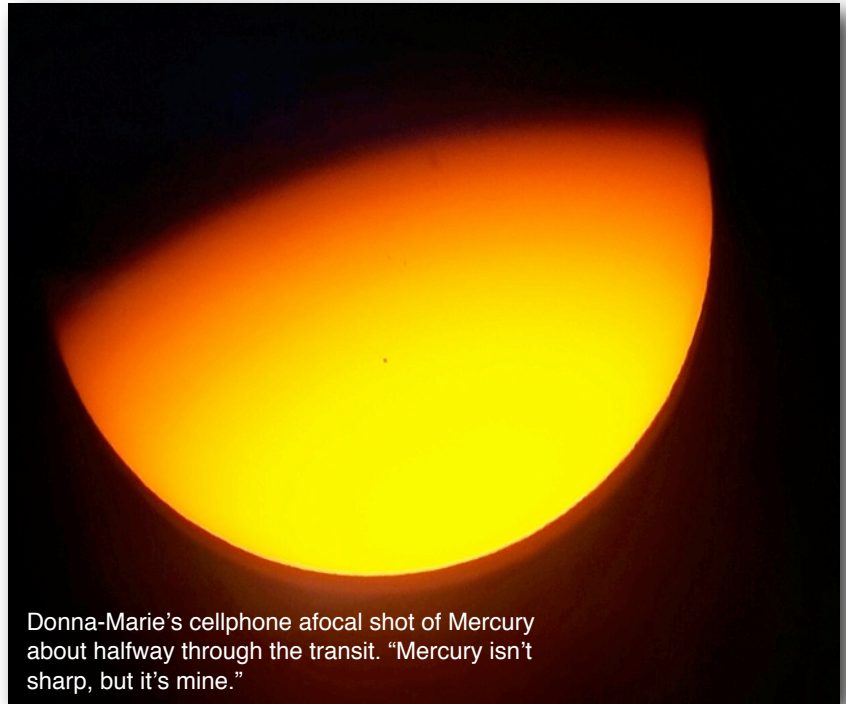
Hello John, I was with a friend that day and decided to keep it intimate. The day of the transit, we were using a 90mm scope & solar filter, with 13 mm Nagler.

At 7:12 am, for ingress, we started on Grey 40 near Blue Mountains. The viewing was good but we were in a cloud bowl. Our 2nd stop was Thornbury marina/park, where we attracted several curious picnickers who wanted to take a peak at Mercury. Nice!

On a whim, we then set up near the entrance to LCBO in Collingwood. There, we attracted several people who were very keen to view it through our solar filter scope. That was fun!

Our 2nd to last stop was up near the Scenic Caves Road. And to round out our transit day, we decided that our last viewing of Mercury's transit would be on a side road in Proton Station to watch its egress. Mercury became elliptical in appearance and then was gone. All in all, time well spent!

Thank you John, for asking for my input.  
Donna-Marie Bonnett

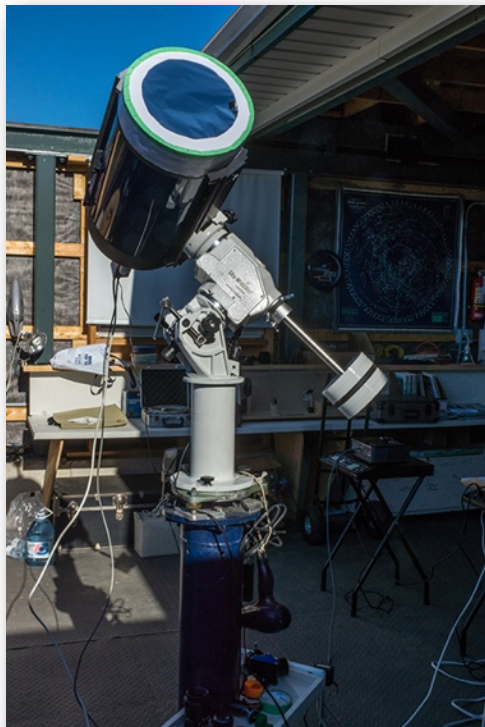


Donna-Marie's cellphone afocal shot of Mercury about halfway through the transit. "Mercury isn't sharp, but it's mine."

## All About Equipment

The variety of telescopes used is depicted here. The largest instrument at the Fox was the 10-inch SCT in the observatory. An almost full aperture Baader filter was fashioned for it -actual diameter was about 22 cm or 8.6 inches due to the limitations on the size of the material.

There is a common misconception that because the typical size of turbulent air cells in our atmosphere is 4 to 6 inches, apertures much bigger than that give no more detail. However, a S&T editor actually did the experiment with different apertures under different conditions, and bigger aperture always won out with more detail. So when buying or making a solar filter, get as large as you can afford.



Robert A. used a 100 mm Lunt (above) for his views and images -see pg 4. The BAS owns the little brother, the 60 mm H-alpha telescope right.



Second on the favourite views list (after the H-alpha scope) was Brett's Explore Scientific ED80 (3.2-inch) refractor pictured above. A Thousand Oaks full aperture glass filter was used to give a nice yellow solar image.



Lorraine was viewing through a Celestron NexStar 130 SLT reflector also using a home made solar filter. We are happy to say that they all worked perfectly.

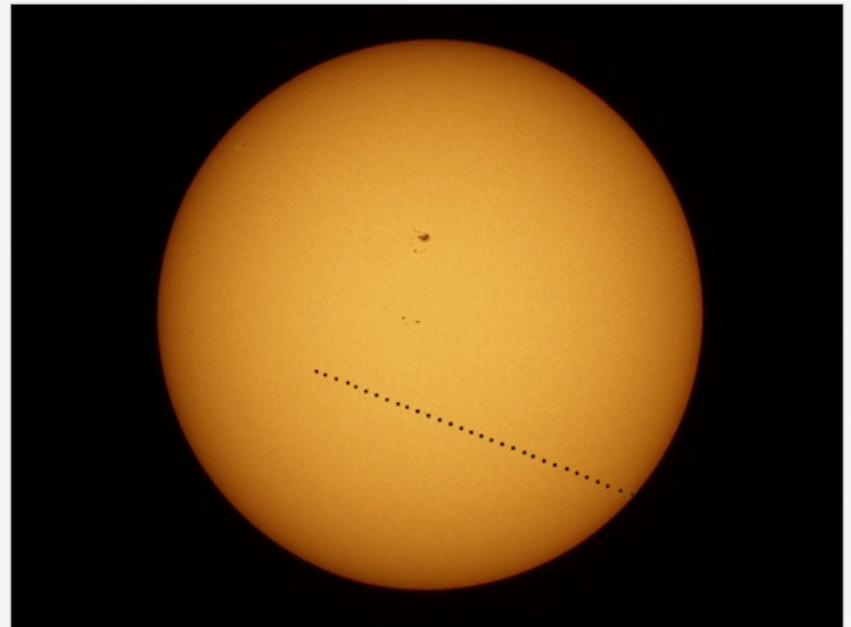


The Mercury transit was covered by many astronomy news magazines including our favourite SkyNews. Check out their image gallery here: <http://www.skynews.ca/transit-day-for-mercury/> for images by Canadian amateur astronomers including our very own Steve Irvine.

Some sample images follow:



This superbly detailed, full-disc H-alpha transit shot was captured by **Jean Guimond** from Quebec City, Quebec. He used a Lunt 80mm H-Alpha solar scope and a Point Grey Grasshopper monochrome video camera to acquire the 100 frames used in the final image. "The weather on transit day was quite uncertain — windy, overcast, and we even had some rain and snow. Fortunately we were lucky enough to catch a few breaks in the clouds and see part of the event," he notes.



**Bill Batchelor** made this fine composite photo of the transit with images captured using a modified Canon EOS T2i camera and a 120mm refractor telescope from his backyard in Coquitlam, British Columbia. "There were a few clouds at sunrise but they blew out quickly and we enjoyed mostly clear skies for the majority of the transit. What a wonderfully relaxing event," Bill says.



**Gordon Rife** of Schomberg, Ontario, assembled this set of detailed transit images. "I used a Celestron 70 mm fluorite refractor telescope and a Baader Solar screen filter. For the picture shown here, I combined the best 25% of 500 video frames captured with an Image Source camera equipped with a 802 nanometer IR filter to steady the seeing, which was poor," he reports.



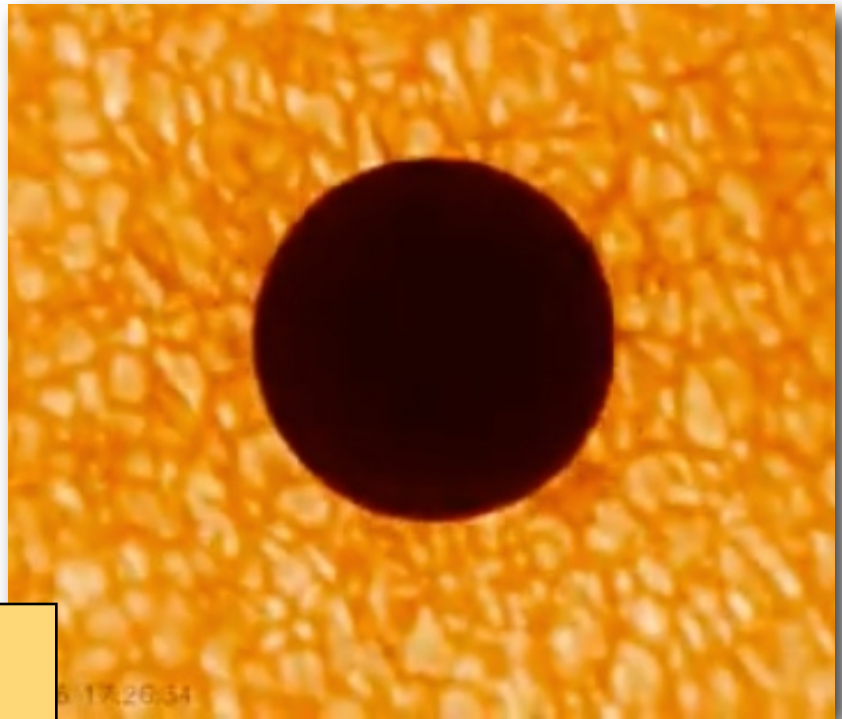
Mercury's ingress was photographed by **Barry Mark** of Stitsville, Ontario. This crop from a larger image was made with a Sky-Watcher 80mm Esprit refractor telescope and Canon EOS Rebel T4i DSLR camera.

## Big Bear Spots Mercury Crossing Sun

The **Big Bear Solar Observatory (BBSO)** is a solar observatory located on the north side of Big Bear Lake in the San Bernardino Mountains of southwestern San Bernardino County, California, approximately 120 km east of downtown Los Angeles. The telescopes and instruments at the observatory are designed and employed specifically for studying the activities and phenomena of our solar system's star, the Sun.

The observatory was built by the California Institute of Technology in 1969 under the direction of professor Harold Zirin. Management of the observatory was transferred to the New Jersey Institute of Technology (NJIT) in 1997. Funding comes from NASA, the National Science Foundation, the United States Air Force, and other agencies.

Image at right is the highest resolution image of Mercury's transit ever taken. Smallest features are about 50 km across.



### Big Bear Solar Observatory and NASA combined high resolution video

here: <https://www.youtube.com/watch?v=reHKV-ULUDs>

and here: <https://www.youtube.com/watch?v=MHhuyEzvx-U>



The **Big Bear Solar Observatory (BBSO)** operates three telescopes in two separate domes at the BBSO. The largest is a 1.6 m (63 inch) solar telescope, the largest such instrument now operating. The image right shows two smaller instruments, a 25 inch solar telescope (with movie cameras mounted) and a smaller 10-inch H-alpha telescope attached to the tube of the larger 25-inch (top).

Three Images from the video taken by the H-alpha telescope are shown here with Mercury before first contact (centre left), during mid-transit (lower right) and halfway through egress (lower right).

