Star Gazer News

Solar Eclipse Special Edition
August 21, 2017

Contents

Background Image above is a screen snap from a video made using a Canon 6D in movie mode and a 400 mm telephoto lens. By John H.

BAS Eclipse Chasers Successful!

Kneeling L to R: John Hlynialuk, (Wiarton Echo), Joan Skelton, Krista Bell-Dawson, Cheryl Dawson, Susan MacLachlan, Lorraine Rodgers, Doug Turner. Second row kneeling: Garnet Tettenborn, Matt Hood, Dr. John VanDorp, Gena VanDorp. Standing L to R: Chris Hlynialuk, Eric Ingard, Desna Ingard, Phil Wallace (partially hidden), Tony Wallace, Rob Vollett, Dave Skelton, Mike Tettenborn, Phil Visser. Standing R side: Julian Delf, Frank Williams, Greg Rodgers, Robert Atkinson, Brett Tatton. Missing Liz Certain

A sizeable group of enthusiastic eclipse chasers converged from several directions on Grand Island Nebraska on the weekend prior to the solar eclipse set for Monday Aug 21. No one went home Aug 22 disappointed! It was spectacular!

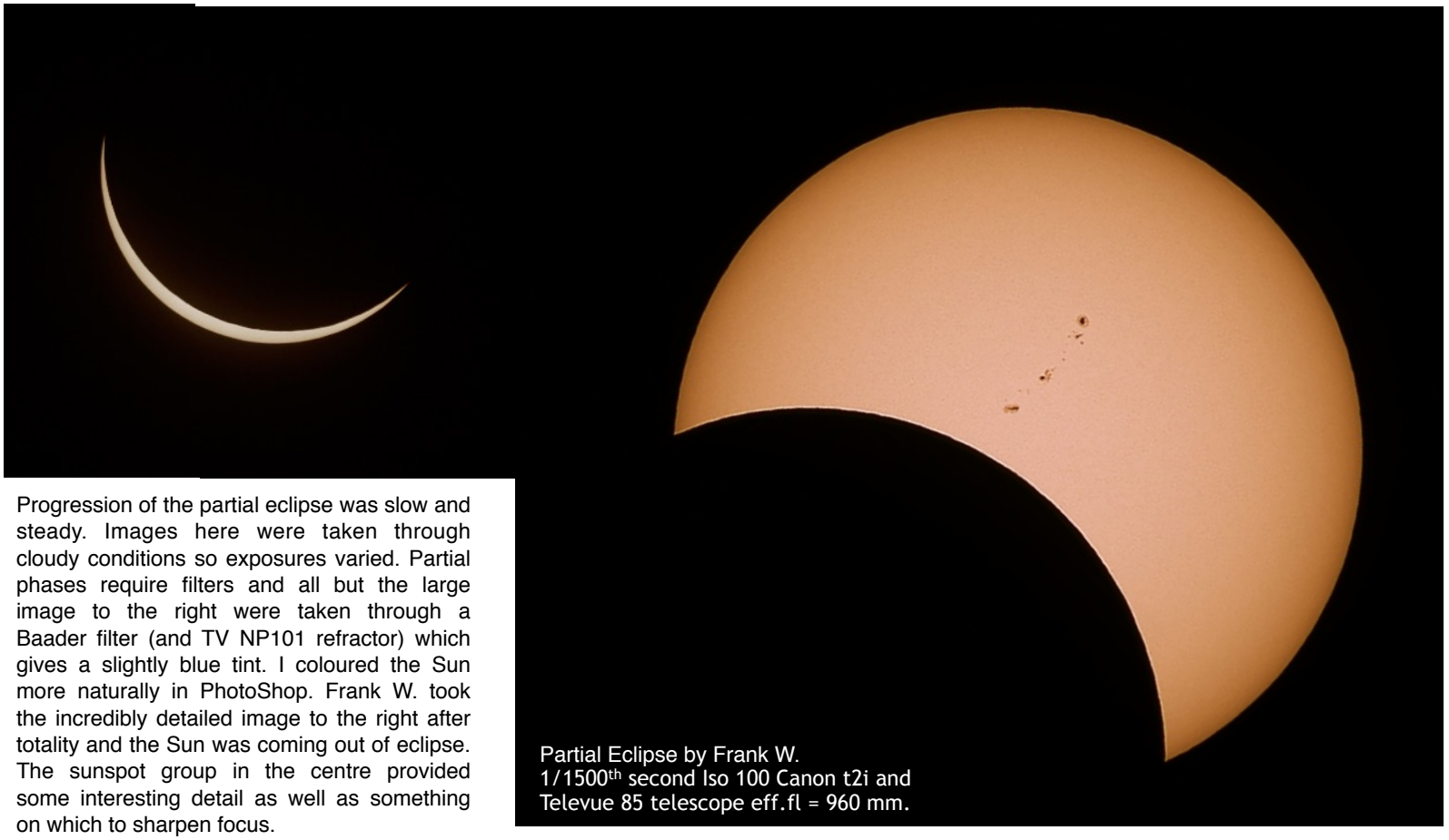
After downpours overnight Saturday/Sunday and clouds early Monday morning which produced a nice solar halo (pg. 2), cirrus cloud moved in and out to interfere with the partial phases. But at totality, the corona was easily visible to almost its full extent. The diamond rings were thrilling and the sight of the dark moon edge outlined by three groups of prominences was mind-blowing. Once again, the naked eye view encompassed the entire phenomena while our imagers worked hard at recording the different phases of the event. The range of brightness of corona and prominences is so great that cameras cannot record it all in one image. The eye does a much better job of visualizing the whole scene. Still, BAS imagers did a fantastic job of recording all aspects of this grand spectacle.

I am dedicating this issue to showing off our BAS photographers' marvellous images. I take my hat off to them because they sacrificed precious seconds of totality manipulating cameras and tweaking focus on their lenses and telescopes. Thanks to their efforts we have many pages of images that we can all enjoy as we recall the special experience that we all shared Monday Aug 21. Thanks to Frank, Julian, Chris, Eric, Lorraine, Robert and Mike, we have a permanent record of this special event. (OK, I took a few pictures too. -ed)

A solar halo ordinarily is a nice sight, but it is an indicator of less than clear blue sky. But in the words of Gary Caldwell “the weather will be what it will be.” Clouds were present throughout the morning but we only missed the faint outer reaches of the corona due to thin haze. No one noticed clouds during the few minutes of totality, we had other sights to see.

At 10:14 CDT when the image at right was taken, a halo was visible. No one looked for a halo during totality, and there was probably not enough sunlight to form one anyway. Image right was taken 2h 44min before totality. Julian’s video to be played at the Sep 6 meeting shows a halo forming and fading all day.

Canon 6D, 24 mm foc. len., 1/500 s, f/14, ISO 100. Image shot 10:14 am Nebraska time.

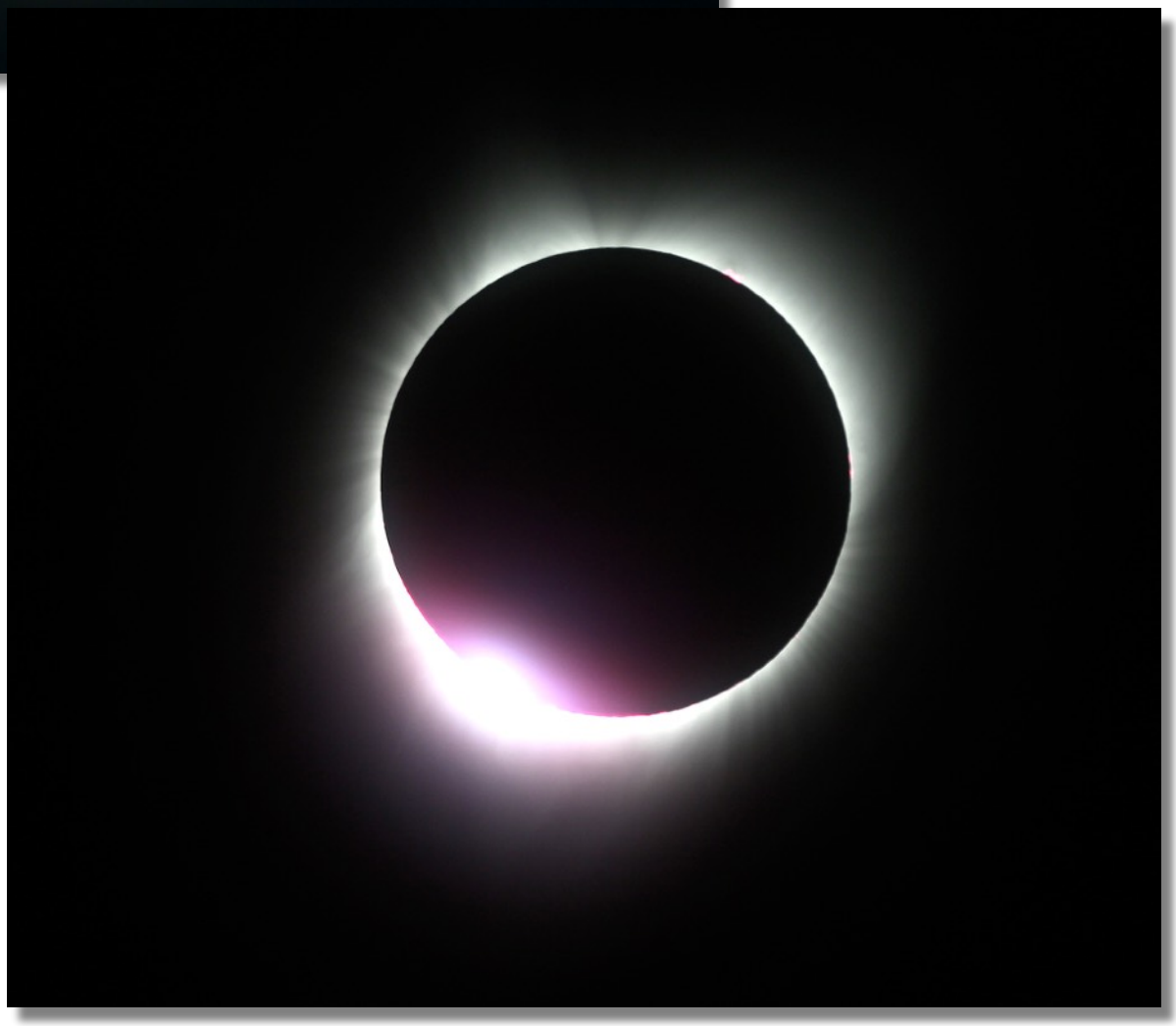


Progression of the partial eclipse was slow and steady. Images here were taken through cloudy conditions so exposures varied. Partial phases require filters and all but the large image to the right were taken through a Baader filter (and TV NP101 refractor) which gives a slightly blue tint. I coloured the Sun more naturally in PhotoShop. Frank W. took the incredibly detailed image to the right after totality and the Sun was coming out of eclipse. The sunspot group in the centre provided some interesting detail as well as something on which to sharpen focus.

Partial Eclipse by Frank W.
1/1500th second Iso 100 Canon t2i and
Televue 85 telescope eff.fl = 960 mm.

Frank Williams succeeded in getting both diamond rings even though these features are very fleeting. Perhaps my memory of previous views of diamond rings is faulty but I do not recall them being so short. Luck was with us, however, and the two images here (Frank's at left, mine below) captured the beautiful effect of the last glint of sunlight passing through a gap in the Moon's profile.

Exposure details: Canon t2i at prime focus of Televue 85 mm scope giving 960 mm eff. foc. len. with this camera. Exposure = 1/1000 sec. at ISO100.



The purple colour of the diamond is an artifact of the levels adjustment I made to the image to bring out some of the faint inner corona that starts to become visible just after the diamond disappears.

Barely visible are the three main areas of prominences that showed up so well at mid and late totality (11, 1 and 3 o'clock. The large one at 1 o'clock was much more spectacular later on but the nice feature at about 3 o'clock showed up well too.

Exposure details:
Canon 60Da at prime focus of TV NP101 (4-inch) refractor, effective focal length 864 mm, f/5.6, exp=1/250s, ISO 100. John H. image cropped, enhanced levels PS.

Julian Delf imaged the Sun's corona at the middle of totality and also captured the star Regulus in lower corner. He did a bit of processing to bring out details in the outer corona so Regulus stands out better too but the inner corona got washed out as a result.

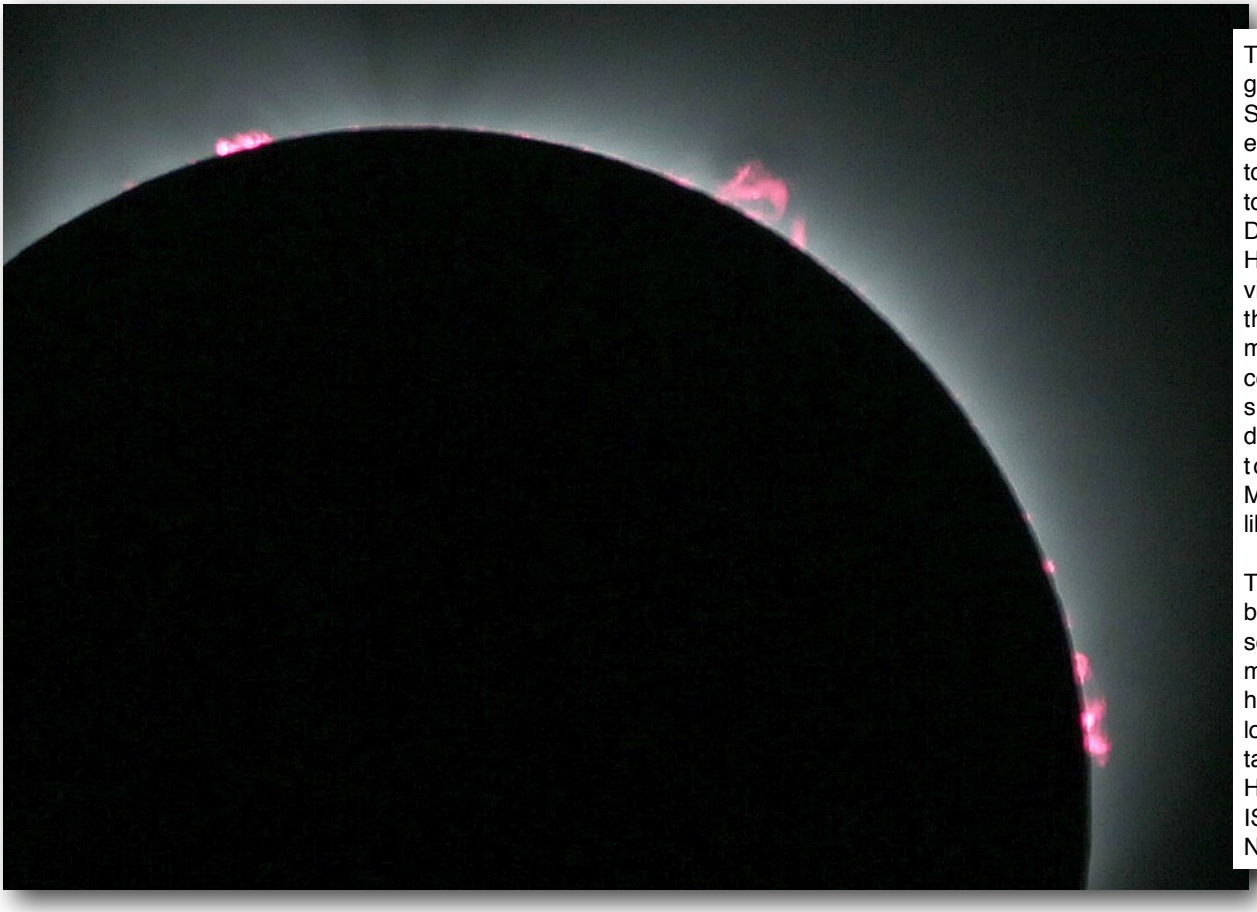
Image right was taken with a Sony SLT-A77V camera and 70-200 mm telephoto lens with 2X converter and crop sensor giving an effective focal length of a 600 mm lens. Exposure was 1/5 s, ISO 200

An almost boring partial phase gave way to a much-too-short first diamond ring and then a comparatively long period of 2min 34s of corona viewing! Finally the main event!

We had some concerns about cloud cover since corona visibility depends on sky transparency and the cirrus clouds were moving much too slowly pre-totality for our liking. Cirrus clouds were still present at totality and we probably missed the faint outer tendrils of corona (only inner and middle corona is visible in image right). Still there was a nice view of prominences and inner corona during all of totality.

The view of red prominences right against the inky black edge of the Moon was amazing. Three main areas of reddish prominences appeared and these became more obvious as totality progressed. By the second diamond ring, they were all connected by the chromosphere. More on these features is on the next page.

Right: Corona Mid-totality
Image by John H. Canon 60Da 1/40 s ISO 100 prime focus TV NP101 giving 864 mm effective focal length with the APS-C sensor.



Three nice prominence groups were visible on the Sun's limb and became even more "prominent" at totality. These were not a total surprise since Dr. Van Dorp had his 80 mm Lunt H-alpha scope and we viewed them twice, both on the day before and the morning of the eclipse. The centre one reminded me somewhat of one seen during the Feb 26, 1979 total eclipse in Gimli Manitoba. That one looked like a seahorse.

The image left and the one below were taken 12 seconds apart. Note how much of the chromosphere has become visible in the lower image. Both images taken during totality by John H. Canon 60Da 1/4000 s ISO 100 prime focus TV NP101, 864 mm eff. fl.

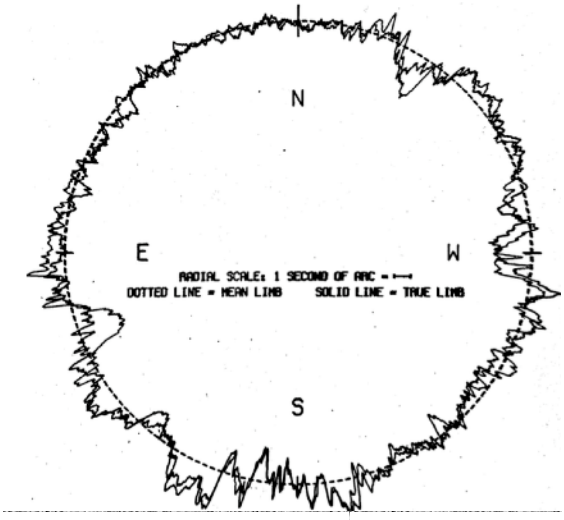
Chromosphere [info from Wikipedia]
The chromosphere (literally, "sphere of color") is the second of the three main layers in the Sun's atmosphere [photosphere below, corona above -ed] and is roughly 3,000 to 5,000 km deep. The chromosphere's rosy red color is only apparent during eclipses. It sits just above the photosphere and below the solar transition region. The layer of the chromosphere atop the photosphere is homogeneous. A forest of hairy appearing spicules rise from the homogeneous layer some of which extend 10,000 km into the corona above.

The density of the chromosphere is only 1/10000th times that of the photosphere, the layer beneath, and 1/100 000 000th that of the atmosphere of Earth at sea level. The Sun's light makes the chromosphere normally invisible but it can be seen only during a total eclipse, where its reddish color is revealed. The color hues are anywhere between pink and red.

The density of the chromosphere decreases with distance from the Sun and so does the temperature. The inner boundary is about 6,000 K and it drops to a minimum of approximately 3,800 K before increasing to about 35,000 K at the outer boundary at the transition layer of the corona. Chromospheres have been observed also in stars other than the Sun.

The phenomena called Bailey's Beads is an effect produced by sunlight streaming through lower relief like valleys around the lunar profile. The limb diagram from IOTA below shows the predicted profile for the Moon on eclipse day. Two sets of data are actually superimposed but they agree with each other and predict beads to form at the 1 o'clock position as well as at the 3, 6, 7 and 8 o'clock positions. Since the orientation of the images received from our photographers is not generally known, a specific feature like that in the image at right could be any one of those expected.

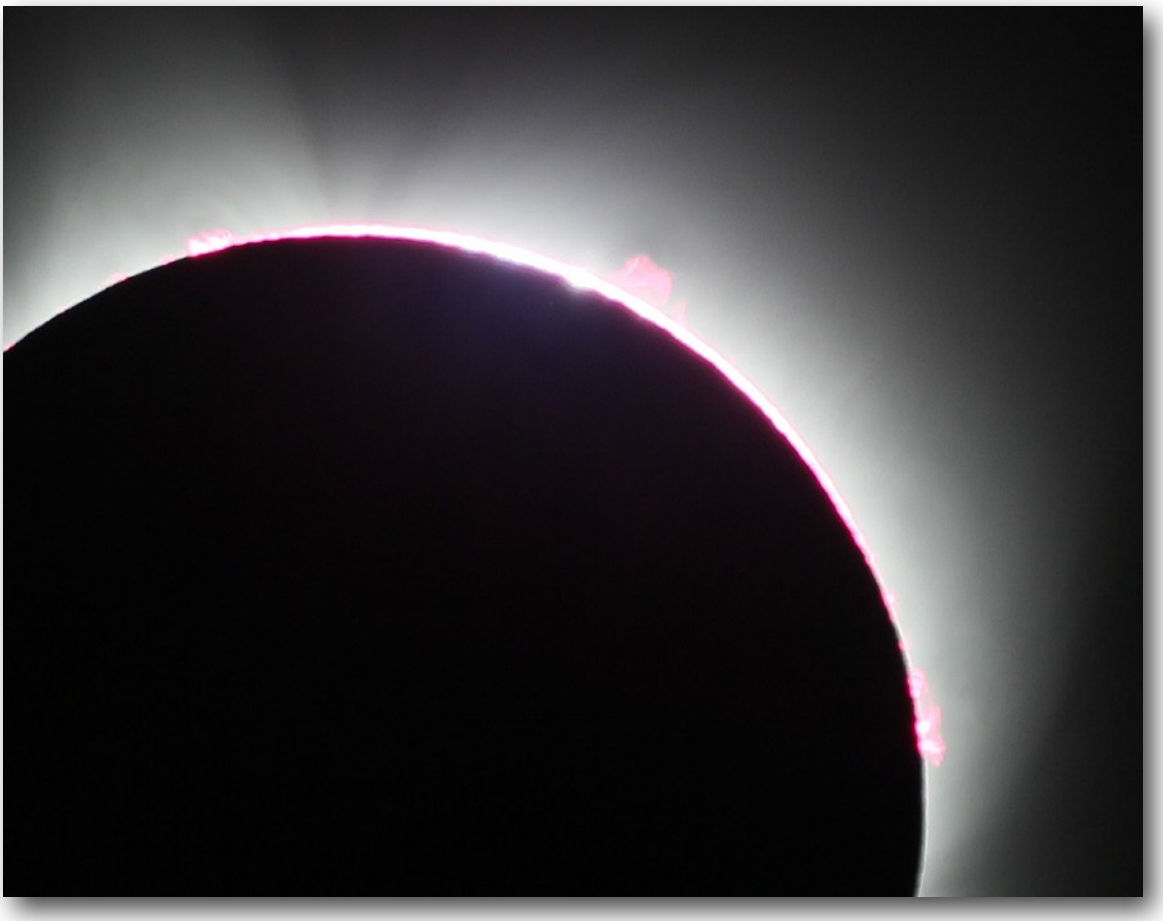
Bailey's Beads were not noticed visually at this eclipse, but Chris H. got one in the image right. [Good work, son! -ed]



A Bailey Bead shows up in this image taken by Chris H. with a Canon 50D at the prime focus of a classic C-8. Focal length is 1500 mm (0.6 Field Reducer) shutter speed was 1/1000 s, ISO 200. It could have been the one predicted for the 1 o'clock position in the diagram at left but each telescope-camera combination was unique and north was not always up in the images. This image was taken at the start of the second diamond ring and signalled the end of totality.

Image right was taken at the end of totality and start of the second diamond ring. It would have been taken just a second before the one taken by Chris above. Oddly, there is no hint of a bead forming in this shot as the photosphere can be seen over the same large arc of chromosphere seen in the lower image on page 6 and there is no hint of beading up. The irregularity in the outline is due to lunar landscape features but no deep valley like in the diagram above is evident from the light shining past.

Image right by John H. with a Canon 60Da at the prime focus of a TV NP101 refractor. Effective focal length is 864 mm shutter speed was 1/400 s, ISO 200. Original image was enlarged and cropped.



Frank W. (and Julian D.) both caught the second diamond ring at the end of totality in spectacular fashion as indicated by the image left (Frank's) and below (Julian's).

Image left exposure details: Canon t2i at prime focus of Televue 85 mm scope giving 960 mm eff. foc. len. Exposure = 1/1000 sec. at ISO100.

Image below: Julian D. caught the same diamond with his 400 mm telephoto.

Julian and Frank's images must have been very close to simultaneous since apart from a colour difference, there are no differences in features visible. Both show the prominence at 1 o'clock and the larger group of prominences at 4 o'clock. The spikes in the image left are produced by internal features of the optics used to capture the image. Generally, refractors (Frank used a Televue 80mm refractor) do not produce diffraction spikes while telephoto lenses often do. Reflectors with secondary vanes always do.

Image Right: Exposure details:
Sony SLT-A77V camera, with 400 mm telephoto, effective focal length = 600mm, f/8, exp=1/1000s, ISO 200. Image has been cropped and enlarged.

Seeing planets in the sky during the daytime is not such a big deal since many of us have seen Venus and some of the other bright planets on occasion with the Sun still above the horizon. Aligned GOTO telescopes have made this relatively easy. It was no surprise that Venus was seen through the clouds during totality.
In the image left (a screen-snap from time-lapse images Julian Delf made into a video), Venus is visible above the tree at right. But even more interesting is that he caught the shadow advancing across the sky as totality started and ended. The sky is lighter in the lower left corner and the shadow line crosses from centre bottom of image to the centre left edge (marked by arrows). The video shows this on about 5 frames at the start and end of totality. Nice work Julian!

We also saw Jupiter in the eastern sky well before totality started in a clear blue break in the cirrus cloud. It was so obvious and one of the group got a pair of binos on it and confirmed that it had a disk. He described it to be just like the view of Jupiter's disk as seen on other occasions. It was surprisingly easy to see in a convenient break in the clouds well before totality even though the sky was still pretty bright.

The two planets were all most of us expected to see and during such a short totality, there was no time to spare doing a thorough search. Mars was 8.25° from the Sun and magnitude 1.8 while Regulus at magnitude 1.4 was only 1.3° away and just outside of the corona.
No one was expecting to see Regulus which was the closest bright star to the Sun but it did show up on an image or two taken by Mike Tettenborn and Julian Delf. Another nice surprise.

The exposure Mike made for corona shows traces of the red chromosphere around the edge of the Moon right where we saw the group of prominences!

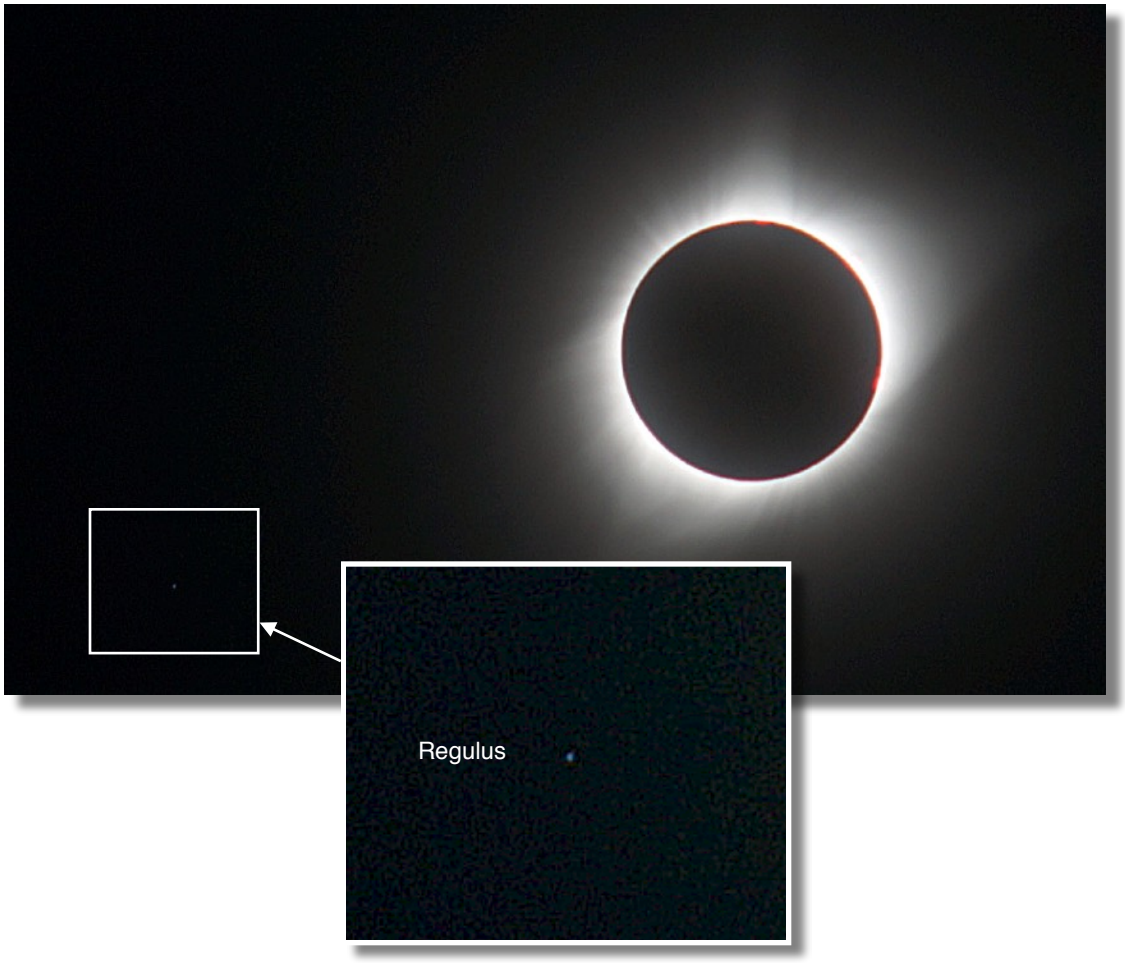


Image right by Mike T. using a 135mm lens on a Sony mirrorless NEX5 camera, 200mm effective focal length at ~f/7, ISO 100, 1/20 second shutter speed.