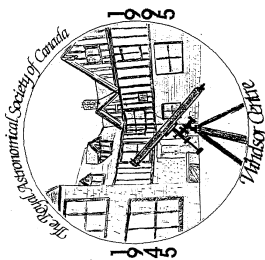




# AURORA

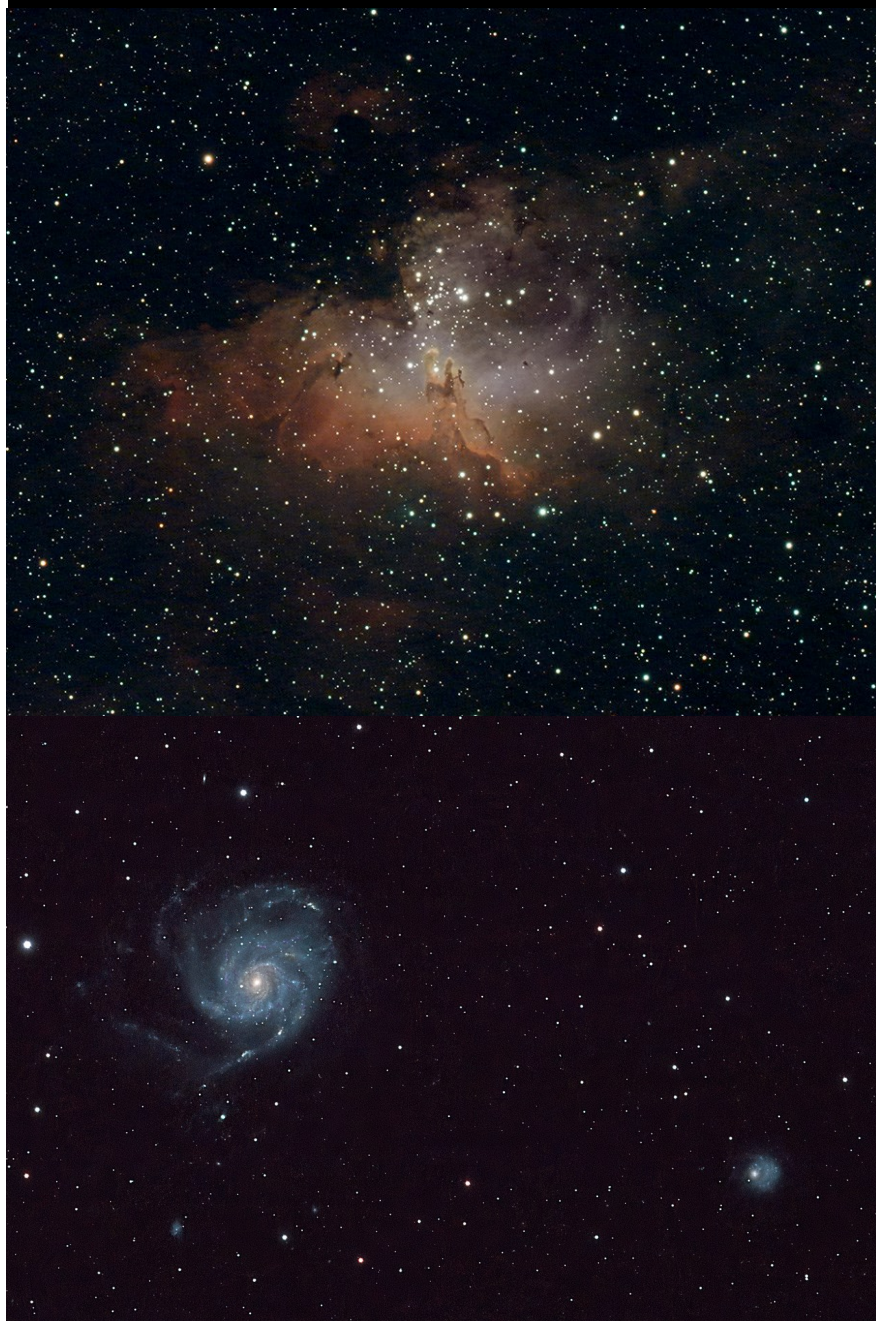


March/April 2020

The Royal Astronomical Society of Canada - Windsor Centre

Volume 45, No. 6

## Astrophotos by Randy Drumm



Randy only recently jumped into astrophotography and he has done it with both feet! It has been amazing to watch his quick progression in this aspect of our hobby. In the last issue of Aurora we featured his Orion and Horsehead Nebula shots and here we present M16 - The Eagle Nebula and M101 the Pinwheel Galaxy. For M16 Randy captured the data over 3 nights and for M51 Randy selected 32 of his best 3 minute subs and stacked and processed them for this image.

Randy uses a Skywatcher Esprit 100mm APO, EQ6 R Mount and Canon 77d DSLR with CLS filter and field flattener guided with PHD2 and is in the process of learning Pix-Insight for image processing.

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## Calendar of Events

### *Our next meeting...*

September?, hopefully this Fall  
at  
[Ojibway Park Nature Centre](#)  
5200 Matchette Road

### *Main Speaker...*

To Be Determined

### *Topic...*

To Be Announced

### *Activities...*

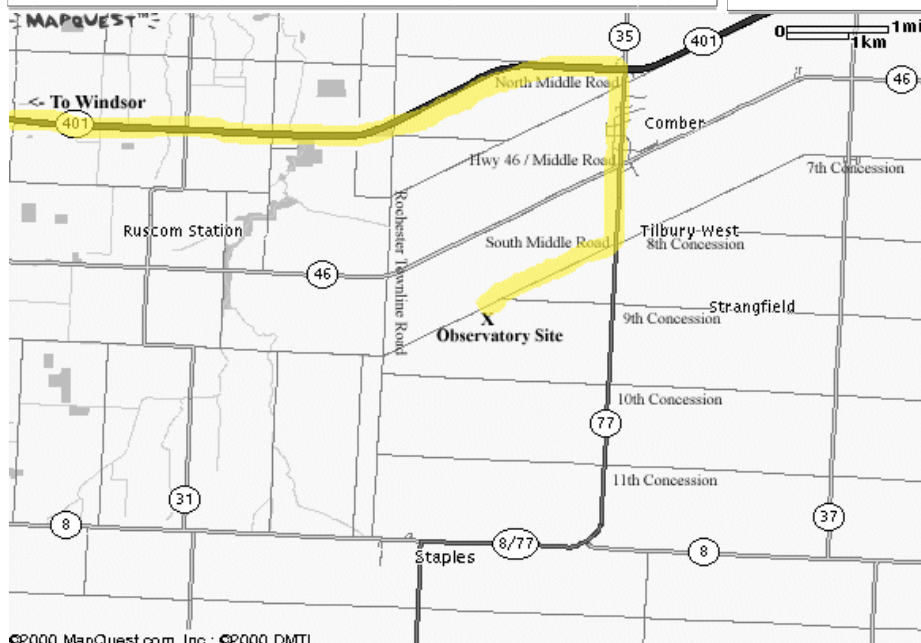
**Moon and Venus:** Venus is 0.7 degrees South of the crescent moon on the morning of **Friday, June 19th**. There is an occultation in Atlantic Canada and this should make a nice photo opportunity for us.

**Summer Solstice:** On **Saturday, June 20th at 5:43 p.m. EDT** the Sun reaches its' maximum Northern declination in the sky and marks the beginning of Summer for the Northern hemisphere.

**Moon and Planets:** The Moon slides past **Jupiter, Saturn and Mars** on **July 5, 6, and 11th** respectively.

**Oppositions:** **Jupiter** is at opposition on **Tuesday, July 14th** and then **Saturn** is at opposition on **Monday, July 20th**.

**Perseid Meteor Shower:** Peaks on **Wednesday, August 12th**. Best views will be from the late evening until a fat crescent moon rises just after 1:00 a.m. on the morning of the 13th.



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### Hallam Observatory Site

**Directions:** The map at left shows the Comber area and it includes the major highways (401, 77, 8 and 46) that are in the area of the observatory.

The most direct route from Windsor is "highlighted" on the map which is to take Highway 401 East to Highway 77 South to South Middle Road. Turn right onto South Middle Road and go about 1 kilometer and just after the point where Concession 9 joins it (it is hard to see this intersection) you will find the observatory site on the South side (left) of the road. 3989 South Middle Road.

If you hit the Rochester Townline Road (you come to a stop sign) you have gone too far.

## Submissions

Aurora is published monthly except for July, August and December. The September, October, January, March and May issues are full newsletters (usually 6 pages) with a number of member submitted articles. The November, February, April and June issues are short flyers (2 pages).

Submitted articles can be of any length from a paragraph to multiple pages. I can scan pictures and/or diagrams (both prints and film) to support your article and the originals will be returned to you.

Submission deadline is the 1st of the month.

Editor: Steve Mastellotto Email: [mmastellotto@cogeco.ca](mailto:mmastellotto@cogeco.ca)

## Membership

The Windsor Centre of The Royal Astronomical Society of Canada meets on the 3rd Tuesday of every month (except July and August) at the Ojibway Park Nature Centre. In addition to regular meetings the centre hosts a number of observing nights, a picnic and a December social. Members receive a copy of the Observer's Handbook, a subscription to SkyNews magazine and access to the Centre's library and telescopes. Optionally the RASC Journal is available in print form—online version free.

Annual Membership Fees: Please see the RASC website at [www.rasc.ca](http://www.rasc.ca) for current rates.

Contact Greg Mockler ([greg.mockler@live.com](mailto:greg.mockler@live.com)) or visit our website at: <http://www.rascwindsor.com> for more information.

## Dr. James Peebles Lecture to RASC - Windsor Centre by Sandra van Gaalen



We were very fortunate to have had this opportunity and thanks to Dr. Chitra Rangan for her time in organizing a special guest speaker for our 75<sup>th</sup> Anniversary celebration this year. On Friday May 1<sup>st</sup> at 3:30 p.m. Dr. James Peebles winner of the 2019 Noble Prize in Physics held a seminar via Zoom for RASC - Windsor Centre members. Those members who had the chance to participate will agree in saying he provided a great talk of which I have watched at least three times since the original discussion. A very special thanks to Dr. Peebles for taking the time to hold this seminar. Here is a brief summary of the talk.

Dr. James Peebles was an undergrad at University of Manitoba where it was suggested he go to Princeton to study. At Princeton he was welcomed by two students from the University of Manitoba, Bob Pollock who he knew previously and remained friends with and Bob Moore who he did not know previously. Bob Pollock started the program on gravity physics and suggested that Dr. Peebles consider studying cosmology. This is where he spent most of his career and has been giving lectures on cosmology for over half a century. Many things have changed during this time.

The Milky Way galaxy has rifts of darkness, not absence but the presence of dust and gases. These regions are where the stars form in groups. The larger ones emit ionizing radiation, mostly hydrogen. You can see the dust lanes in the arms. The yellowish light across the center is the light of ten million stars like the Sun. There are thousands of millions of planets in the Milky Way galaxy which will never be seen by humans.



(not the original photo from Dr. Peebles lecture)

There are many neighboring galaxies such as ellipticals with a disc shape and many like the Milky Way. The distribution of the galaxies is clumpy, although there are similarities where one area resembles another on a large scale. This is seen in extreme cases by observing radio galax-

ies, bright radio sources which is very violent which can be seen for great distances.

The first evidence the Universe is Expanding was influenced by many great minds. Percival Lowell was from a very wealthy family and he had the good fortune to hire excellent astronomers who used his observatory to study. He was honoured for building an outstanding observatory. He hired Melvin Slipher who built instruments that allowed him to show that the light from distance galaxies shifted towards the red and the brightness of stars in the sky gives an estimate of distance.

Edwin Hubble had just the right instincts for the time. He was greatly assisted by the observations of Milt Humason, who had the right technology to help develop Hubble's Law.

**On the Theoretical Side:** Herman Weyl was driven out of Germany. He was the first to decide that maybe the Universe was expanding. He was a mathematician who didn't have a theory, he had a scheme. Alexander Friedmann was a Russian with a new theory, not the solutions. He generalized Einstein's Relativity Theory for an expanding Universe, but he didn't know about the astronomical evidence. George Lemaitre was Belgium. He put together a theory in 1927 which he independently discovered and observations confirmed the expanding Universe.

Following WWII an advancement in technology and science marked the second golden age in science. The first was in 1930 at the time when George Lemaitre understood Albert Einstein's Theory of General Relativity. In 1964 the astronomers thought the abundance of Helium was very much greater than originally anticipated to have been produced in the stars. After 1964 experiments were conducted to look for thermal radiation.

The Soviet Union's, Zeldovich moved away and worked under difficult conditions. All his journals were censored and he couldn't publish his work at the same time that others were being published and therefore his work was late entering circulation. He formed the opinion that abundance of Helium is much lower in older stars. This meant the "Big Bang" theory had to be wrong. Dark Matter, Fred Zwicky a brilliant astronomer/physicist recognized that the galaxies were all moving too rapidly to be gravitationally bound by the observed stars in the galaxies. There had to be 'missing mass', or 'dark matter'.

Albert Einstein's Cosmological Constant has a property that pushes matter away. Einstein theorized that the cosmological constant was going to make a stable static Universe. The cosmological constant  $\lambda$  causes the Universe to swell up. Later he received a letter from Lemaitre stating he really should reconsider the cosmological constant. Einstein agreed.

Plasma interacts strongly with radiation and free electrons act like a fluid at high pressures. The fluid oscillates and creates ripples. As it expands and cools, it decouples and the plasma recombines, (can no longer hold its ionic state) to baryonic matter which grows. In the early 1980s they knew thermal radiation was very smoothly distributed. Galaxies are distributed in a clumpy way so how does this happen without disturbing the radiation?

In 1982 Dr. Peebles introduced nonbaryonic dark matter. Dark matter is dark because it didn't interact with radiation, it could slip through the radiation plasma and start to build the concentration of matter without disturbing the radiation very much. Dark matter is dark because it doesn't interact or react with ordinary matter, baryonic matter or radiation.

If there is an anomaly, the theory will be adjusted. It would be exciting to see a real anomaly where the adjustment would have to be made that would make the theory much better.

The theory has two hypothetical notions.

1. Nonbaryonic dark matter introduced in 1982
2. Einstein's cosmological constant (we don't understand  $\lambda$ )

Upon completion of his discussion, Dr. Peebles kindly answered several questions from the RASC members.

## At The Eyepiece: A Diversion by Mike Ethier

One of the most inspiring sights available to amateur astronomers is the planet Saturn, especially when the rings are opened to their widest angle. Along with most views of this strange world comes the smaller pinprick of light known as Titan, Saturn's largest moon, and second largest moon in the solar system. It is half as big again as Earth's moon. Titan is often referred to as a planetary moon, and has proven itself to have one of the most interesting surfaces in the solar system, mainly thanks to the Cassini mission, which began mapping Titan in 2004.

Five years before this, in 1999, Hal Clement's novel Half-Life was published. Hal Clement (real name Harry Clement Stubbs, 1922-2003) was a hard science fiction writer who really focused on the science angle, and the methods used to gain answers to puzzling questions. The novel details an expedition from Earth to study the atmosphere and surface of Titan, searching for biochemical clues as to why humans are rapidly going extinct. The expedition consists of 23 scientists, men and women, and all of them quite ill, and we follow their means and methods used to search for answers. While an amateur telescope won't reveal too much about the surface of Titan, Clement's novel will, and the book will likely increase your interest greatly in this alien world. Of course in 1999 we knew far less about Titan than we do now, but this only makes the novel even more fascinating, as Clement uses every little known scrap of contemporary information about the moon in his book. Reading Clement is almost like reading transcripts

from an actual space expedition to Titan, and I'm certain many club members, especially those with sturdy science backgrounds, would find his work fascinating. Clement earned a degree in astronomy from Harvard, and went on to earn an M. Ed from Boston, and later an M. S. in chemistry from Simmons.

Not only is he a well educated man, but he is also a master writer, earning the Grand Master title from the Science Fiction Writers of America in 1999, the same year Half-Life was published (the author would have been 77). And if this was the only great book he had written, he would still deserve the title. However, though Half-Life contains no aliens, many of his books do. The way humans and aliens interact in his stories, searching for answers to scientific puzzles, is equally fascinating. Some of his best early writing concerns the planet Mesklin, with its eccentric orbit and even more eccentric inhabitants. Even Clement's fictional planets have strong basis in science fact, and the way he explores them and attempts to solve their mysteries seems to invite readers along for the ride. Here are a few more titles by Clement that I highly recommend, though it is by no means his entire list. Many of these titles are available on Kindle, and will likely be read by the purchaser more than once.

- Mission of Gravity (serialized beginning in 1950)
- Iceworld (1951)
- Cycle of Fire (1957)
- Close to Critical (1958)
- Still River (1987)
- Half-Life (1999)

### Messier of the Month: M 5, in Serpens Caput



*Messier 5 by Brian Thomas. Hallam, Celestron 14 f/11, 16 x 2 min. subs, ISO 400, darks, flats & dark flats calibration*

NGC 5904 is one of the finest globular clusters in the sky, and it is quite suitable for smaller apertures. My first view was July 19<sup>th</sup>, 1985, when I saw it from Lake Penage, west of Sudbury. I was using my 8" Edmund scope, for which I had made stops of 4" and 6". Even at 4" of aperture I was able to resolve some stars, though not in the central region. At 72x about 10 stars were winking in and out. Moving up to 6" of aperture, the center now becomes intensely bright. 56X gave good resolution, but again only in the outer haze. At 112x the center was hinting at breaking up, and star patterns began emerging around it. At full aperture, resolution was good even at 36x. At 112x stars begin to finally flicker in the central area. The core is literally blazing now, and streams and spirals of stars surround it. The core showed irregularity at 169x, and at 254x fainter stars to the core can be glimpsed. A very small "inner" inner core can now be seen.

Jump to May 20<sup>th</sup>, 2020, from a dark site in Kent County, using a 12" scope. While Messier 5 is a rewarding object for a 6" and 8" mirror, in a 12" scope it can be a bit overwhelming. At 60x the cluster is very large, and there is already good resolution from the core outwards to the limiting edges. At 100x the brilliant core is breaking up, with even more stars seen closer to it. Brighter stars seem to circle the core. At 136x and 187x (the best viewing range, in my opinion) uncountable resolving stars seem to resemble a face-on spiral galaxy that is resolving along its winding arms. Other viewers have also commented on this effect.

At 272x the core appears to thrust upward towards the viewer, giving the impression of viewing a snow-covered volcanic cone from directly above. This is a truly wondrous object for amateur telescopes! Optimum viewing time is 10:00 p.m. July 3<sup>rd</sup>, though it is still high enough several weeks before and after to make a journey there worthwhile.

Messier 5: Size 23'; Visual mag. 5.7; Brightest star mag. 12.2

## President's Message

As this is written, in any other year we would have been drawing near to the time of our June membership meeting on the third Tuesday of the month; which would have in turn segued into our normal summer recess. But as we are all well aware, 2020 has proved itself to be anything but normal. Despite this unprecedented turn of events, I hope that you, your friends and loved ones continue to stay well and that there have been some opportunities in these past months to do some observing and enjoy the goings-on in the night sky.

How ironic that the COVID-19 pandemic brought about what was certainly one of the most exciting and memorable talks ever given to the RASC Windsor Centre. Dr. Chitra Rangan, of the Physics Department at the University of Windsor and a member of our group, was concerned about how many events that had been scheduled for this, our 75<sup>th</sup> Anniversary year, needed to be cancelled because of the virus. So, in late April, she reached out to Canadian-American astronomer and astro-physicist, Dr. James Peebles, of Princeton University in New Jersey; who in 2019 was awarded one-half the Nobel Prize in Physics for theoretical discoveries in physical cosmology, and invited him to speak to our Centre in this special anniversary year.

To her surprise and delight, Dr. Peebles immediately and graciously accepted her invitation and on May 1<sup>st</sup>, he gave an approximately one-hour presentation to the Windsor Centre via a Zoom webinar. His talk was a sweeping and intimate history of the advances in cosmology that have transpired over the last half-century and was laced throughout with anecdotal stories of many of those he has personally known, who have played key roles in the advancement of our knowledge of the Universe.

Thanks so much to all of you who were able to join this very special webinar on such short notice. I want to once again remind you that Chitra recorded the webinar and it is still available through a private upload she made to YouTube so that Windsor Centre members who could not attend that day can still have the opportunity to see the talk. It can be found at <https://youtu.be/aKn0X7f-Zgw>. The RASC Windsor Centre also wants to thank those on the staff of the University of Windsor's Physics Department who lent their technical assistance in making the webinar possible.

The weather this spring has provided quite a few excellent opportunities for viewing the night sky. I am sure that many eyes have been on the planet, Venus, that ended a particularly favourable apparition in the evening sky when it reached inferior conjunction on June 3<sup>rd</sup>. It made a fine passage through the stars of the Pleiades cluster, in Taurus, over the evening of April 2-4. And during the final days of May, Mercury joined the evening twilight scene, along with a crescent moon that also provided a fine photo opportunity on the night of May 24<sup>th</sup> (see photo below).

The predawn sky is currently adorned by the outer planets; with Mars, Jupiter and Saturn low in the south and east during those wee hours of the morning. Looking towards the approaching summer, Jupiter reaches opposition on July 14<sup>th</sup>, Saturn just a few days later on the 20<sup>th</sup>; while Mars will delight with a very favourable opposition later in the year, on October 13<sup>th</sup>. Even now, all three worlds are well worth watching either with the unaided eye, or telescopically.



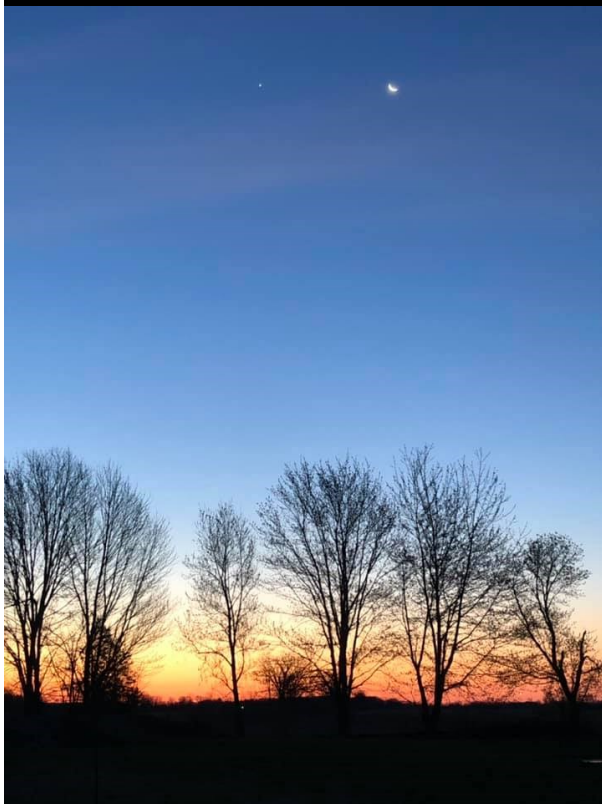
The last of the winter stars have slipped away in the west, sped onwards by the lengthening hours of daylight at this time of year. The sight of Orion and Canis Major descending over Hallam Observatory, near Comber, on April 19<sup>th</sup> is particularly memorable for me as it was an exceptionally clear evening. Speaking of the observatory, after 19 years the roof of the warm room is in acute need of new shingling and a local company has been engaged to do the job which should be completed by the end of June. There are also plans afoot to re-paint the dome's exterior and also to do further re-finishing of the observatory deck over the course of the summer. Volunteers, as always, will be appreciated!

In closing, I just want to once again wish all of you well and continued health in your families as we all continue doing our part in these most challenging times.

Randy Groundwater  
President

*Mercury is seen midway between Venus (just above the power line, lower right) and the waxing crescent moon on the evening of May 24, 2020 at Hallam Observatory. Photo by Randy Groundwater*

## Member Astrophotos



**Top Left:** Moon and Venus on April 26th by Mike Mastronardi. **Top Right:** Moon and ISS pass from Hallam on May 30th by Juliana Grigorescu. **Middle Left:** Pete Barbaro captured this shot of Venus (it is not the moon) by shooting a 60 second video and selecting the best 900 of 7600 frames and stacking them along with a bit of noise reduction and sharpening (no colour adjustment) using his C8 @ f/10 with an ASI224 video camera with IR blocking filter. **Middle Right:** Steve Mastellotto captured Messier 11 using 12 x 10 minute subs and RGB filters for a total of 6 hours exposure. All processing done in PixInsight. **Bottom Left:** Nancy Ng captured an incoming storm front from Hallam on June 11th. **Bottom Right:** Brian Thomas captured the moonrise on May 7th using his Canon 5D, 480mm f/6, 1/2 second exposure at ISO 1600.