

Newsletter for the Wiltshire,  
Swindon, Beckington  
Astronomical Societies  
and Salisbury Plain  
Observing Group

## We're Going on an Aurora Hunt

Wiltshire Society Page	2
Swindon Stargazers	3
Beckington AS and Herschel Society	4
NASA Space Place Springtime Planet Party	5
Space X arrive at the ISS with mock crew Lots of 'shorts' including Curiosity Rover crash on Mars and A look at Opportunity now it has been shut down.	6-12
What's Up March 2019	13
Constellation of the Month Monoceros	14-16
Space Station Timings	17
IMAGES, VIEWING SESSIONS and OUTREACH	18

Firstly, may I apologise personally for missing Chris Starr's talk on the Moon the evening. The opportunity to go to Iceland (no, not for a prawn ring) close to the equinox with no Moon was too good to miss.

Then our chairman Keith contacted last week and his wife Sandy has been in hospital with very bad leg problems and she comes out to home on the afternoon of the meeting. I think you will all share my wishes for her speedy recovery!

Then the treasure has a pre booked engagement which means Debbie Crokker has stepped in to help us this evening, and Peter is standing in to introduce the speaker.

We had a very well attended school outreach at Westbury Leigh, but cloud meant we had to do everything in the hall, We had 5 volunteers to help at the display tables too (I am well aware it was an early session, and no hope for a lot of members to come down to Westbury in time.

Good luck tonight, and one of my favourite topics too.

Clear Skies Andy

*One of the many pictures I took on recent trip to Iceland. Tech details: Canon 60Da camera attached to Canon 10-22 mm zoom lens set at 10 mm, shutter speed of 2.5 seconds, f 5.6 and ISO 4000 . Peter Chappell.*

*Here is to hoping I get clear enough skies and good Aurora conditions combining while I am over in Northern Iceland. Andy At home the first big aurora of the season have reach Mid Wales., you may get to see it before I do!*



## Wiltshire Society Page

### Wiltshire Astronomical Society

Web site: [www.wasnet.org.uk](http://www.wasnet.org.uk)

Meetings 2018/2019 Season.

**NEW VENUE the Pavilion, Rusty Lane, Seend**

**Meet 7.30 for 8.00pm start**

Date	Speaker	Title
2019		
5 March	Chris Starr:	A Most beautiful Moon – A History of Lunar Exploration.
2 April	Martin Griffiths:	'Universal Death' or How the Universe is trying to kill us.
7 May	Mark Radice:	Observing the Solar System.
4 Jun	Jon Gale:	Observing the Herschel 400.



Chris Starr

Chris Starr is based in Wells and runs Starscape, an independent consultancy in Space Science Education and Public Outreach - lecturing, teaching and organising astronomy-related events.

He has recently set up the Wells & Mendip Astronomers group.

Previously, Chris was Head of Space Science at Aiglon College in Switzerland, where he built a small observatory, taught Astronomy and led student astronomy trips to the USA.

Chris has also spoken at educational conferences in Europe, written for magazines and the Internet.

He ran a public outreach programme with Villars Tourist Office in Switzerland for a number of years and designed their exhibition 'From Earth to the Universe' for the International Year of Astronomy in 2009.

**Membership Meeting nights £1.00 for members £3 for visitors**

### Wiltshire AS Contacts

Keith Bruton Chair, [keisana@tiscali.co.uk](mailto:keisana@tiscali.co.uk)

Vice chair: Andy Burns and newsletter editor.

Email [anglesburns@hotmail.com](mailto:anglesburns@hotmail.com)

Bob Johnston (Treasurer) Debbie Croker (vice Treasurer)

Philip Proven (Hall coordinator) Dave Buckle (Teas)

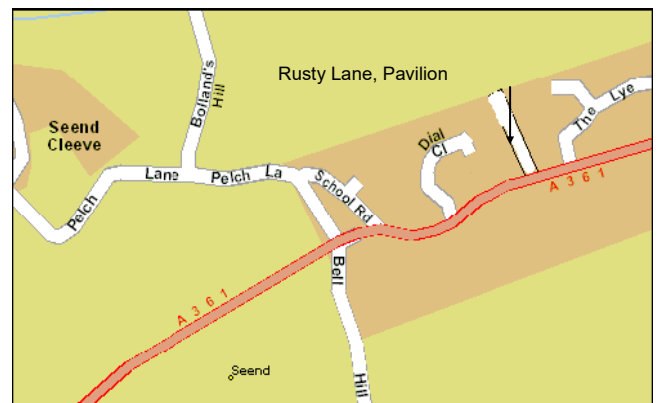
Peter Chappell (Speaker secretary)

Nick Howes (Technical Guru)

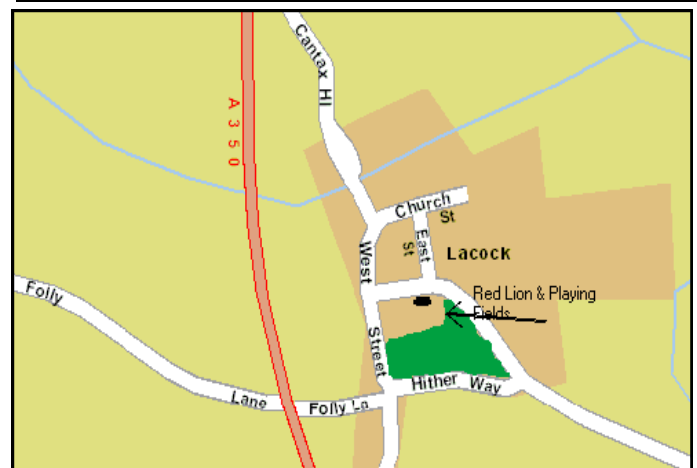
Observing Sessions coordinators: Jon Gale, Tony Vale

Web coordinator: Sam Franklin

Contact via the web site details.



## Observing Sessions



The Wiltshire Astronomical Society's observing sessions are open, and we welcome visitors from other societies as well as members of the public to join us.

We will help you set up equipment (as often as you need this help), and let you test anything we have to help you in your choice of future astronomy purchases.

Please treat the lights and return to full working order before leaving. With enough care shown we may get the National Trust to do something with them!

PLEASE see our proposed changes to the observing sessions, contacting and other details. Back Page

Note this year we have moved away from the '4th Friday of the month' routine to get away from nights when the Moon is too bright to view other objects, so may be 1st Friday of month...



# Swindon Stargazers

## Swindon's own astronomy group

The club meets once a month at Liddington Hall, Church Road, Liddington, Swindon, SN4 0HB at 7.30pm. See programme below.

### Ad-hoc viewing sessions

Regular stargazing evenings are being organised near Swindon. To join these events please visit our website for further information.

Lately we have been stargazing at Blakehill Farm Nature Reserve near Cricklade, a very good spot with no distractions from car headlights.

We often meet regularly at a lay-by just outside the village of Uffcott, near Wroughton. Directions are also shown on the website link below.

When we use East Kennett, we meet at the public car park just below The Red Lion pub at Avebury; we usually hang on for 10 minutes and then move on to our viewing spot at East Kennett. Information about our evenings and viewing spots can be found here:

<http://www.swindonstargazers.com/noticeboard/noticeboard06.ht>

If you think you might be interested email the organiser Robin Wilkey (see website). With this you will then be emailed regarding the event, whether it is going ahead or whether it will be cancelled because of cloud etc.

We are a small keen group and I would ask you to note that you DO NOT have to own a telescope to take part, just turn up and have a great evening looking through other people's scopes. We are out there to share an interest and the hobby. There's nothing better than practical astronomy in the great cold British winter! And hot drinks are often available, you can also bring your own.

Enjoy astronomy at it's best!

Members of the Wiltshire Astronomical Society always welcome!

## Meetings at Liddington Village Hall, Church Road, Liddington, SN4 0HB – 7.30pm onwards

The hall has easy access from Junction 15 of the M4, a map and directions can be found on our website at:

<http://www.swindonstargazers.com/clubdiary/directions01.ht>

### Meeting Dates for 2019

#### Friday 15 March 2019

Programme: AGM plus Viv Williams: Astro Imaging - the Basics

#### Friday 12 April 2019

Programme: Dr. Sarah Bosman: Dark Matter the most distant Objects

#### Friday 17 May 2019

Programme: Mark Woodland FRAS: Exoplanets and the Charterhouse Exoplanet Project

#### Friday 21 June 2019

Programme: TBA

### Website:

<http://www.swindonstargazers.co>

Chairman: Peter Struve

Tel No: 01793 481547

Email: [peter.struve@sky.com](mailto:peter.struve@sky.com)

Address: 3 Monkton Close, Park South, Swindon, SN3 2EU

Secretary: Dr Bob Gatten (PhD)

Tel Number: 07913 335475

Email: [bob.gatten@ntlworld.co.uk](mailto:bob.gatten@ntlworld.co.uk)

Address: 17, Euclid Street,

Swindon, SN1 2JW

## BECKINGTON ASTRONOMICAL SOCIETY

Society Details & Speakers programme can be found on our Website [www.beckingtonas.org](http://www.beckingtonas.org)

General enquiries about the Society can be emailed to [chairman@beckingtonas.org](mailto:chairman@beckingtonas.org).

### **Our Committee for 2016/2017 is**

Chairman: Steve Hill (email [chairman@beckingtonas.org](mailto:chairman@beckingtonas.org))

Treasurer: John Ball

Secretary: Sandy Whitton

Ordinary Member: Mike Witt

People can find out more about us at [www.beckingtonas.org](http://www.beckingtonas.org)

Meetings take place in Beckington Baptist Church Hall in Beckington Village near Frome.

See the location page for details of how to find us on our website.....

Post Code for Sat Nav is BA11 6TB.

Our start time is 7.30pm.

<b>15<sup>th</sup> February</b>	<i>Journey to the Edge of the Solar System</i>	Chris Starr
<b>15<sup>th</sup> March</b>	<i>How Old Is It?</i>	Stephen Tonkin
<b>26<sup>th</sup> April</b>	<i>Observing and Sketching the Deep Sky</i>	Mark Radice
<b>17<sup>th</sup> May</b>	<i>The Herschel 400</i>	Jonathan Gale
<b>21<sup>st</sup> June</b>	Annual General Meeting <i>Member Talks</i>	



## Springtime Planet Party

David Prosper

March brings longer days for Northern Hemisphere observers, especially by the time of the equinox. Early risers are treated to the majority of the bright planets dancing in the morning skies, with the Moon passing between them at the beginning and end of the month.

beginning and end of the month.

The **vernal equinox** occurs on **March 20**, marking the official beginning of spring for the Northern Hemisphere. Our Sun shines equally on the Northern and Southern Hemispheres during the moment of equinox, which is why the March and September equinoxes are the only times of the year when the Earth's north and south poles are simultaneously lit by sunlight. Exacting astronomers will note that the length of day and night on the equinox are not *precisely* equal; the date when they are closest to equal depends on your latitude, and may occur a few days earlier or later than the equinox itself. One complicating factor is that the Sun isn't a point light source, but a disc. Its edge is refracted by our atmosphere as it rises and sets, which adds several minutes of light to every day. The Sun doesn't neatly wink on and off at sunrise and sunset like a light bulb, and so there isn't a perfect split of day and night on the equinox - but it's very close!

Ruddy **Mars** still shines in the west after sunset. Mars scoots across the early evening skies from Aries towards Taurus and meets the sparkling Pleiades star cluster by month's end.

March opens with the morning planets of **Jupiter**, **Saturn**, and **Venus** spread out over the southeastern horizon before sunrise. A crescent **Moon** comes very close to Saturn on the 1<sup>st</sup> and occults the ringed planet during the daytime. Lucky observers may be able to spot **Mercury** by the end of the month. March 31 opens with a beautiful set of planets and a crescent Moon strung diagonally across the early morning sky. Start with bright Jupiter, almost due south shortly before dawn. Then slide down and east towards Saturn, prominent but not nearly as bright as Jupiter. Continue east to the Moon, and then towards the beacon that is Venus, its gleam piercing through the early morning light. End with a challenge: can you find elusive Mercury above the eastern horizon? Binoculars may be needed to spot the closest planet to the Sun as it will be low and obscured by dawn's encroaching glow. What a way to close out March!

Discover all of NASA's current and future missions at [nasa.gov](http://nasa.gov)



*Caption: Earth from orbit on the March equinox, as viewed by EUMETSAT. Notice how the terminator – the line between day and night - touches both the north and south poles. Additional information can be found at <http://bit.ly/earthequinox> Image credit: NASA/Robert Simmon*



*Caption: The morning planets on March 31. Image created with assistance from [Stellarium](http://Stellarium).*

## SPACE NEWS FOR MARCH

Our Facebook page carries a lot of these news items throughout the month.

### Curiosity Crashed, but it's Working Fine Again. NASA Won't Have to Send Astronauts to Turn it off and Back on Again.



In 2012, NASA's Curiosity rover landed in the Gale Crater on Mars and began exploring for clues about the planet's past and subsequent evolution. Since 2014, it has been investigating Mount Sharp (aka. Aeolis Mons) – the central peak within Mars' Gale Crater – in the hopes of learning more about Mars' warm, watery past (and maybe find signs of past life!)

On February 15th of this year (Sol 2320), Curiosity gave mission controllers a bit of a scare when it suffered a technical glitch and automatically entered safe mode. Luckily, as of Thursday, Feb. 28th, Curiosity's science team reported that after getting the rover back online and running a series of checks, the rover is in good shape and ready to resume normal science operations.

### The Record for the Most Distant Object in the Solar System has been Shattered. Introducing FarFarOut at 140 Astronomical Units



Remember Far Out, the distant planet at the far reaches of the Solar System, that was discovered in De-

ember, 2018? Well, it has been kicked unceremoniously off its pedestal as the most distant object after a short, two-month reign. In its place is the very newly-discovered FarFarOut (FFO.) And if it weren't for a heavy snowfall, things might have turned out differently.

### Virgin Galactic Sends Three People to the Edge of Space. Flights with Paying Customers Around the Corner Now



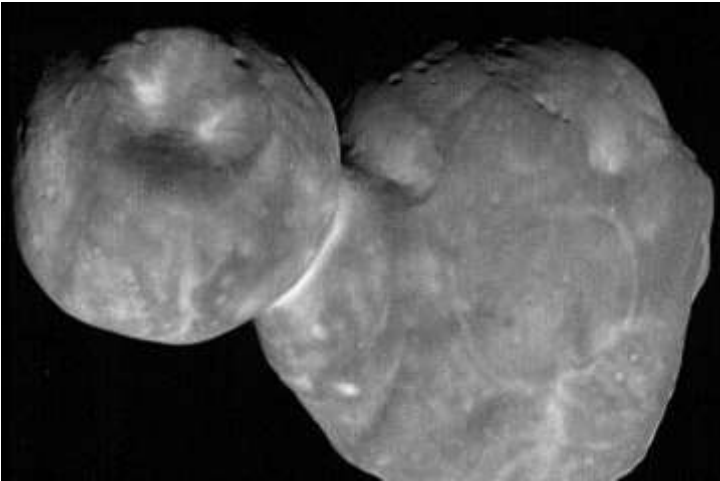
Virgin Galactic has reached another milestone in their flight test program. The VSS Unity spacecraft carried a third crew member on board, in its fifth rocket-powered test flight. It was the second time that the spacecraft reached space.

### Massive Volcanic Eruptions 66 Million Years Ago Happened Almost Exactly When the Dinosaurs Died Off



Everyone knows an asteroid strike wiped out the dinosaurs, right? Lots of evidence shows that the Chicxulub impact event had terrible consequences for the dinosaurs. But the picture is a little more complicated than that. Extreme volcanic activity may have contributed to the extinction.

### The Latest Images of Ultima Thule are in, and they are the Sharpest Yet!



On December 31st, 2018, the New Horizons probe conducted the first flyby in history of a Kuiper Belt Object (KBO). Roughly half an hour later, the mission controllers were treated to the first clear images of Ultima Thule (aka. 2014 MU69). Over the course of the next two months, the first high-resolution images of the object were released, as well as some rather interesting findings regarding the KBOs shape.

Just recently, NASA released more new images of Ultima Thule, and they are the clearest and most detailed to date! The images were taken as part of what the mission team described as a “stretch goal”, an ambitious objective to take pictures of Ultima Thule mere minutes before the spacecraft made its closest approach. And as you can no doubt tell from the pictures NASA provided, mission accomplished!

### **Meet WFIRST, The Space Telescope with the Power of 100 Hubbles**



WFIRST ain't your grandma's space telescope. Despite having the same size mirror as the surprisingly reliable Hubble Space Telescope, clocking in at 2.4 meters across, this puppy will pack a punch with a gigantic 300 megapixel camera, enabling it to snap a single image with an area a hundred times greater than the Hubble. With that fantastic camera and the addition of one of the most sensitive coronagraphs ever made – letting it block out distant starlight on a star-by-star basis – this next-generation telescope will uncover some of the deepest mysteries of the cosmos.

Oh, and also find about a million exoplanets.

Shout Out to Japan! Their Hayabusa2 Spacecraft has Collected its First Samples from Asteroid Ryugu



Japan's Hayabusa2 spacecraft has completed an important part of its mission to asteroid Ryugu. The spacecraft descended to the surface of the asteroid to collect two samples with its sampling horn. We don't know for sure if samples were successfully collected, but all indications are that the sampling mission went well.

### **Messier 78 – the NGC 2068 Reflection Nebula**



*Welcome back to Messier Monday! Today, we continue in our tribute to our dear friend, Tammy Plotner, by looking at the bright reflection nebula known as Messier 78!*

During the 18th century, famed French astronomer Charles Messier noticed the presence of several “nebulous objects” while surveying the night sky. Originally mistaking these objects for comets, he began to catalog them so that others would not make the same mistake. Today, the resulting list (known as the Messier Catalog) includes over 100 objects and is one of the most influential catalogs of Deep Space Objects.

### **We Hate Long Goodbyes, But Opportunity has Earned One**

NASA's Opportunity rover has reached the end of its life. Initially designed to last 90 days, and to travel only 1000 meters (1100 yards), the rover spent almost 15 years exploring the surface of Mars. During that time, it travelled more than 45 kilometers (28

miles.)

The last signal from Opportunity was on June 10th, 2018, when a severe global dust storm enveloped Mars. Since then, NASA has spent eight months trying to establish communications with the rover, to no avail. On Tuesday February 12th, 2019 NASA made one final attempt to revive Opportunity, but were unsuccessful.

Almost everybody is aware of how successful the mission was. But it's still a good time to remind ourselves of what the mission meant to our understanding of Mars. Along with its twin, Spirit, it answered fundamental questions about Mars that scientists debated for a long time.

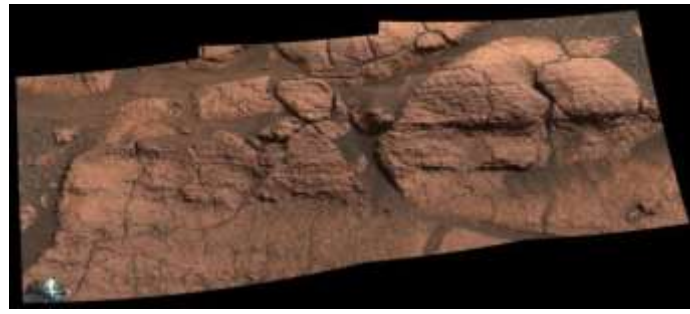
### **Mars Was Once Wet**

Before Spirit and Opportunity were sent to Mars, the Mars Global Surveyor spotted what looked like sedimentary rocks from orbit, in the year 2000. At that time, Dr. Michael Malin, the Principal Investigator for the Mars Orbiter Camera on the MGS said, "On Earth, sedimentary rocks preserve the surface history of our planet, and within that history, the fossil record of life. It is reasonable to look for evidence of past life on Mars in these remarkably similar sedimentary layers."

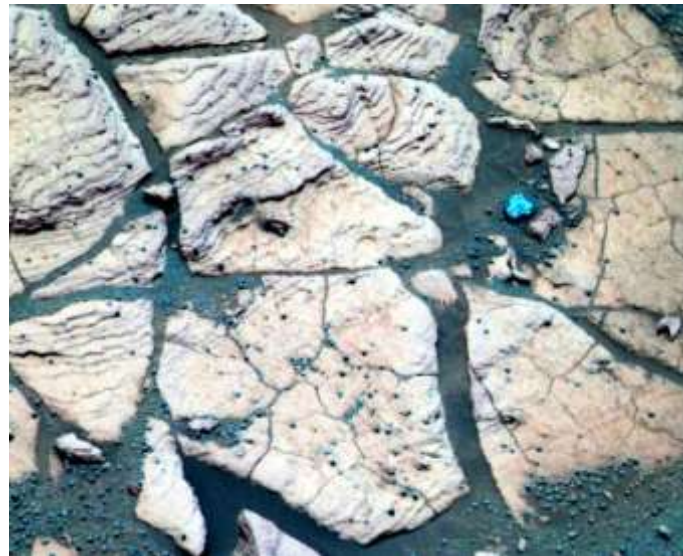


*A Mars Global Surveyor image of what appeared to be sedimentary rocks. Image Credit: NASA/JPL/MGS*

While it didn't find any actual fossils, (wouldn't that have been crazy!) Opportunity did provide evidence that Mars was once a much wetter and warmer world. This was the central question behind the dual-rover mission. Opportunity identified sedimentary rocks which were formed in ancient ephemeral playas, which basically means beaches. Opportunity landed in Meridiani Planum, where sedimentary rocks and hematite had been spotted. Hematite is a mineral that on Earth forms in hot springs or pools of water. The hematite is embedded in the sedimentary rocks, which also form in the presence of water.



*An Opportunity image of the rock called "El Capitan" in Meridiani Planum. The fine layers in the rock hint at aqueous sedimentation. Image Credit: NASA/JPL-Caltech/Cornell*



*A false-color image taken by Opportunity. The blue spheres are called "blueberries" and are made of the mineral hematite, which forms in the presence of water. The layered appearance of the rocks shows their sedimentary nature. Image Credit: NASA/JPL-Caltech/Cornell*

Later in its mission, Opportunity discovered the mineral jarosite. Jarosite only forms in the presence of water, so it provided the smoking gun for water on Mars. Jarosite forms in extremely acidic water, but here on Earth microbes can survive in it. Mission accomplished.





*A microscopic close up of the hematite “blueberries” taken by Opportunity’s microscopic imager on Sol 84. The area shown is only 3 centimeters across. Image Credit:*

*NASA/JPL-Caltech/Cornell/USGS  
Martian Eye Candy*

The rover was active on the Martian surface for 15 years, and gave us a massive cache of photos to peruse. NASA has an [online catalog](#) of over 228,000 images from Opportunity, including many panoramas.

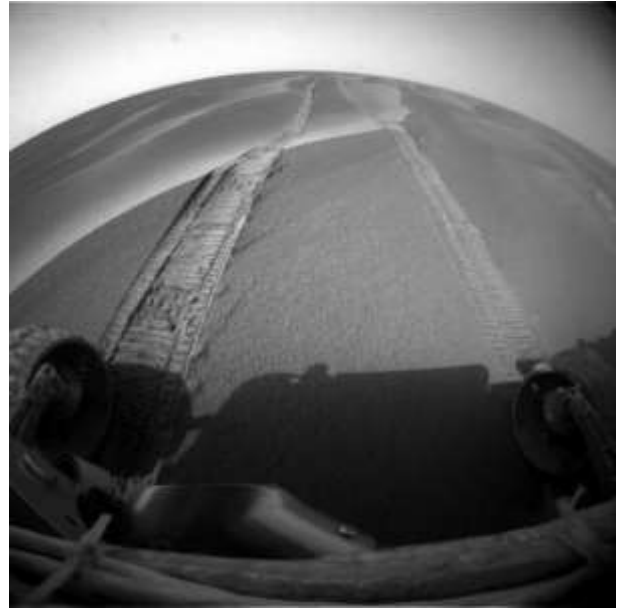


*A true-color of Victoria Crater, one of the places visited by Opportunity. Craters were prime targets because they are natural excavations into the geology of Mars. Image Credit:*

*NASA/JPL-Caltech/Cornell*

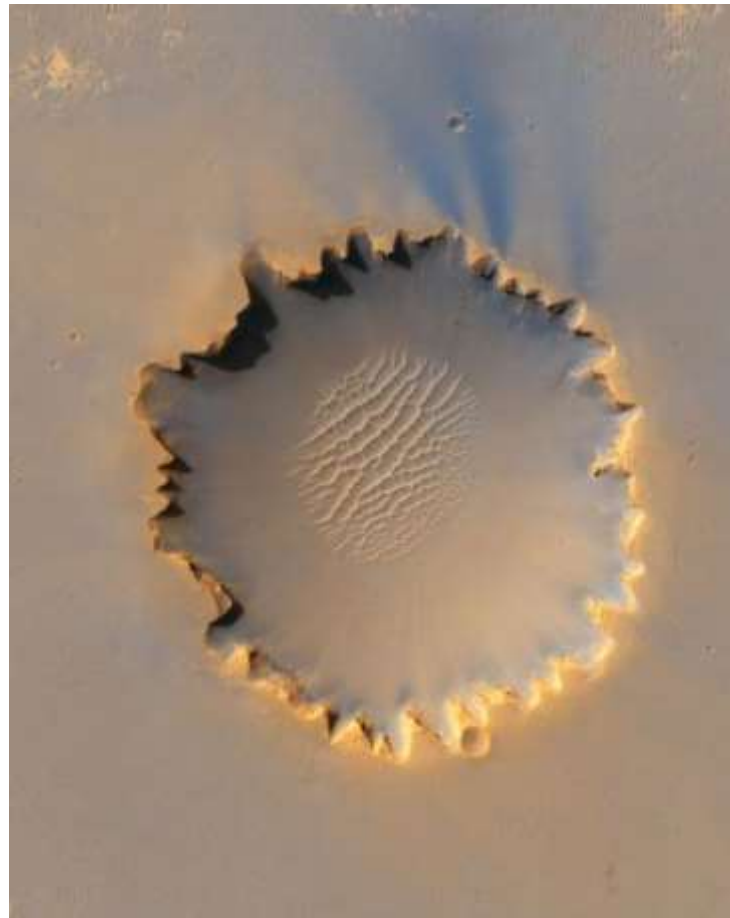
People have done some amazing things with trove of images given to us by Opportunity. Over at [360 Cities](#), you can find the work of [Andrew Bodrov](#). Bodrov took images from the Opportunity rover to create a 360 degree panorama of Victoria Crater on Mars.

Not everything went smoothly for Opportunity. At one point in 2005 the rover got stuck in soft sand. All six of the wheels were stuck, and it took five weeks of hard work and thinking and planning to get the rover out. At the time, Jeffrey Biesiadecki, a JPL rover mobility engineer, said “After a nerve-wracking month of hard work, the rover team is both elated and relieved to finally see our wheels sitting on top of the sand instead of half buried in it.”



*Opportunity’s view after escaping the sand trap. Image Credit: NASA/JPL/Cornell*

Opportunity had some helping hands during its time on Mars. When it approached Victoria crater, the crater rim was steep and unpassable in most spots. Thankfully, the Mars Reconnaissance Orbiter (MRO) was able to help. The HiRISE camera on the MRO identified a smooth enough area for the rover to enter the crater.



*A HiRISE camera image of Victoria Crater from the MRO. Opportunity is at roughly the 10 o'clock position in this image, a spot that HiRISE identified as smooth enough for the rover to enter the crater. Image Credit: NASA/JPL-Caltech/University of Arizona/Cornell/Ohio*

### State University

Opportunity was like a sight-seeing tourist on Mars. We got to go along for the ride when the rover discovered a meteorite on the Martian surface. Dubbed "Heat Shield Rock," the basketball-sized meteorite is made mostly of iron and nickel.



An image of "Heat Shield Rock," the meteorite discovered by Opportunity. Image Credit: By NASA/JPL/Cornell – <http://photojournal.jpl.nasa.gov/catalog/PIA07269> (TIFF converted into 100% quality JPEG), Public Domain,

Spirit, Opportunity's twin, succumbed to the Martian environment in 2010, when it got stuck in soft soil and couldn't get out. In 2011 NASA announced that the mission was over. Now that Opportunity has reached the end, we can definitely call their mission one of the most successful ever.

It's up to MSL Curiosity to carry the flag now, and it's still going strong.

The legacy of Spirit and Opportunity will last a long time. The rovers answered the big question about Mars, and they also laid the groundwork for human mission to Mars. Future missions are already being developed.

The Mars 2020 rover is based on MSL Curiosity, and will launch in 2020. It will continue investigating Mars as the next step in NASA's Mars Exploration Program.

The 2020 rover will land in Jezero Crater, a lake that was once about the same size as Lake Tahoe. The rover's instruments will be able to examine the rocks for evidence of ancient life.

Sometime after 2020, humans will land on Mars. Maybe we'll even establish a scientific outpost or colony there. We'll soon have the technological means to do so. When that happens, we can look back on the twin rovers, Spirit and Opportunity, and all the people behind them, and acknowledge all they contributed to the human endeavour.

"It is because of trailblazing missions such as Opportunity that there will come a day when our brave astronauts walk on the surface of Mars," said NASA

Administrator Jim Bridenstine. "And when that day arrives, some portion of that first footprint will be owned by the men and women of Opportunity, and a little rover that defied the odds and did so much in the name of exploration."

### SpaceX launches first Crew Dragon ferry ship

March 2, 2019 William Harwood

---

If you would like to see more articles like this please support our coverage of the space program by becoming a Spaceflight Now Member. If everyone who enjoys our website helps fund it, we can expand and improve our coverage further.

---

### STORY WRITTEN FOR CBS NEWS



SpaceX's Falcon 9 rocket fires away from pad 39A at NASA's Kennedy Space Center with the first space-bound Crew Dragon capsule. Credit: Walter Scriptunas II / Spaceflight Now

Opening a new era in American spaceflight, a Falcon 9 rocket streaked into space early Saturday, boosting the company's first Crew Dragon spacecraft into orbit on an uncrewed test flight, the first launch of a commercially developed capsule intended to carry astronauts to and from the International Space Station.

Lighting up the deep overnight sky for miles around, the rocket's nine first stage engines ignited and throttled up to full thrust at 2:49 a.m. EST (GMT-5), generating 1.7 million pounds of thrust and quickly thundering skyward from launch complex 39A at the Kennedy Space Center.

Trailing a long jet of brilliant exhaust, the 215-foot-tall rocket smoothly accelerated as it shot away to the northeast, climbing directly into the plane of the International Space Station's orbit. The lab complex passed over Florida 26 minutes before liftoff and was sailing 258 miles above Iraq at the moment of launch. Looking on 3.2 miles from the launch pad in the

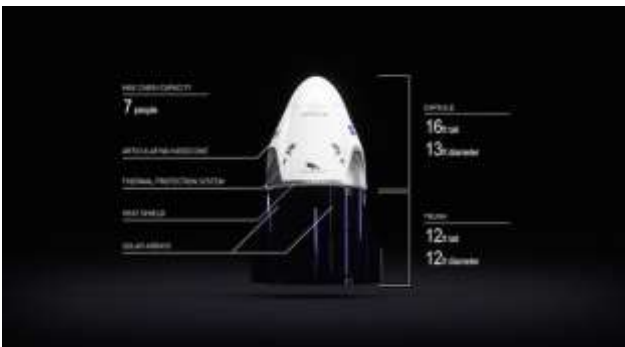
SpaceX launch control room were astronauts Douglas Hurley and Robert Behnken, who plan to be aboard the next Crew Dragon when it takes off on the program's second test flight in the mid-summer timeframe. That will be the first launch of American astronauts aboard a U.S. rocket since the shuttle program ended in 2011.

"I can't begin to explain to you how exciting it is for a test pilot to be on a first flight of a vehicle," Hurley, a shuttle veteran and former Marine Corps F/A-18 test pilot, told reporters before launch. "We'll be ready when SpaceX and NASA are ready for us to fly it."

That will depend on how the uncrewed Crew Dragon does this week during the Commercial Crew Program's initial launch, a flight intended to thoroughly test the spacecraft's myriad systems before trusting it to carry astronauts. Along with enduring the rigors of launch, the capsule must autonomously rendezvous and dock with the space station early Sunday and then return to Earth Friday with a hypersonic plunge back into the atmosphere and splashdown in the Atlantic Ocean east of Cape Canaveral.

"We're going to test its navigation capabilities, we're going to test avionics, telemetry, we're going to test the reaction control system, its ability to dock, its ability to re-enter," said NASA Administrator Jim Bridenstine. "We're going to make assessments based on this about how it might need to be tweaked or changed."

"Eventually, we're going to do a launch abort test as well. And then depending on how all of these tests go, we want to launch American astronauts on American rockets from American soil for the first time since the retirement of the space shuttle (in 2011)."



*A diagram of the Crew Dragon spacecraft. Credit: SpaceX* While many hurdles remain before that goal is achieved, Elon Musk, founder and chief designer at SpaceX, said he was relieved the mission got off to such a trouble-free start, with all of the capsule's major systems operating normally after the climb to orbit.

"I'd like to express a very strong note of appreciation to the SpaceX team," he said at a post-launch news conference.

"It's been 17 years to get to this point, from 2002 to now, an incredible amount of hard work and sacrifice from a lot of people to have gotten to this point."

"To be frank, I'm a little emotionally exhausted. That was super stressful, but it worked, so far. We have to dock with the station, we have to come back, but so far, it has worked. We've passed some of the riskiest items."

In a post-launch tweet, Bridenstine said the flight marked "a new chapter in American excellence, getting us closer to once again flying American astronauts on American rockets from American soil. Congratulations to the @SpaceX and @NASA teams for this major milestone in our nation's history."

The mission got off to a spectacular start, thrilling thousands of tourists and area residents expected to gather along Florida's "Space Coast."

The first stage engines powered the Falcon 9 out of the

thick lower atmosphere, shutting down about two-and-a-half minutes after liftoff. The stage then fell away and headed for landing on an off-shore dronship while the single engine powering the Falcon 9's second stage continued the Crew Dragon's climb to orbit.

The second stage engine shut down about nine minutes after launch, about a minute before the first stage settled to a pinpoint landing on the "Of Course I Still Love You" dronship, chalking up SpaceX's 35th successful booster recovery.



*NASA astronaut Doug Hurley, backdropped by astronauts Bob Behnken, Mike Hopkins and Victor Glover (left to right), speaks to reporters Friday ahead of the Crew Dragon spacecraft's first orbital test flight. Credit: NASA/Joel Kowsky*

A few moments later, the Crew Dragon capsule was released from the second stage, kicking off an automated 27-hour rendezvous with the space station. If all goes well, the stubby capsule, carrying about 400 pounds of supplies and an instrumented astronaut test dummy nicknamed Ripley, after the heroine of the sci-fi thriller "Alien," will catch up with the lab complex early Sunday, approaching from behind and below before looping up to a point directly ahead of the station. ISS commander Oleg Kononenko, flight engineer Anne McClain and Canadian astronaut David Saint-Jacques will be standing by inside the outpost, closely monitoring the Crew Dragon's trajectory and velocity to make sure it is performing as expected. They also plan to send commands to verify a station crew can abort an approach if necessary.

Once all of that is complete, the spacecraft will move in for a docking at the station's forward port around 6 a.m. as the two vehicles pass over the Pacific Ocean northwest of Samoa at nearly five miles per second. Hatches will be opened about two hours later.

The ship will remain attached to the station until next Friday when it will undock, fire its braking rockets and head for a splashdown in the Atlantic Ocean 230 miles east of Cape Canaveral. Recovery crews will be stationed nearby to haul the capsule back to shore for extensive post-flight inspections.

A successful test flight, along with a critical in-flight test of the Falcon 9/Crew Dragon launch abort system in April, will help pave the way toward the first piloted test flight in the mid-July timeframe, ending an eight-year hiatus in NASA's human space launch capability.

"This is an invaluable exercise for us to learn in the space environment how these systems will be working, and then making sure that these systems are ready to go for when we're going to put our crews on," Kathy Lueders, manager of NASA's Commercial Crew Program, told reporters Thursday. "We instrumented the crap out of this vehicle."

The Commercial Crew Program is the end result of a

series of NASA-funded industry competitions in the wake of the shuttle's retirement to develop a new American spacecraft to carry astronauts to and from low-Earth orbit.

NASA has awarded Boeing multiple contracts totaling \$4.82 billion to develop a commercial crew ship now known as the CST-100 Starliner, a capsule that will launch from the Cape Canaveral Air Force Station atop a United Launch Alliance Atlas 5 rocket.

SpaceX also won a series of contracts totaling some \$3.1 billion to date to develop a piloted version of the company's Dragon cargo ship. The company holds a separate cargo contract valued at \$3.04 billion for 20 space station resupply flights and another contract for an unspecified amount for at least six additional flights through 2024.

The NASA commercial crew contracts required both companies to provide funding of their own.

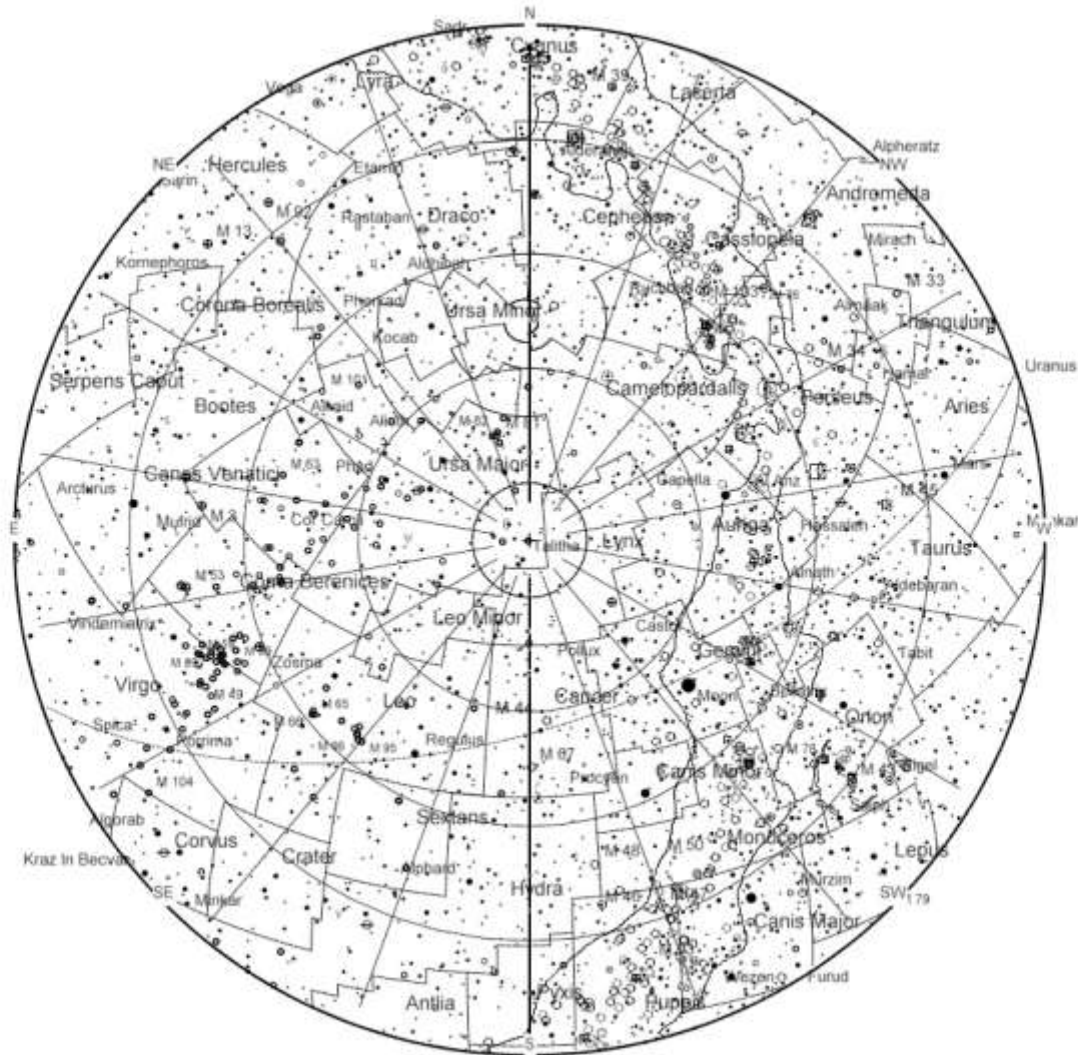
The Crew Dragon and CST-100 Starliner both will carry supplies and four astronauts at a time to the space station and both will approach the lab from directly ahead or above, docking at recently modified ports at the front end of the complex. The Starliner will return to a touchdown in the western United States while the Crew Dragon splashes down in the Atlantic Ocean east of Cape Canaveral.

Boeing plans to launch its CST-100 Starliner on an uncrewed test flight in the April-May timeframe. Assuming the uncrewed flights go well, along with remaining tests of each company's launch abort system, SpaceX plans to launch Behnken and Hurley aboard another Crew Dragon in the mid-summer timeframe. That mission is known as Demo 2.

Boeing's first piloted flight, carrying a crew of three, is expected this fall. If no major problems develop, operational crew rotation flights could begin before the end of the year, ending NASA's sole reliance on Russian Soyuz spacecraft for rides to and from the station.

But NASA is hedging its bets. The final two U.S.-contracted seats on a Russian Soyuz spacecraft will be used in July to launch NASA astronaut Drew Morgan and Italian astronaut Luca Parmitano. NASA managers are exploring an option to buy two more Soyuz seats, one for use this fall and another next spring.

That would ensure American-sponsored astronauts in orbit aboard the station through most of next year even if the commercial crew program runs into major problems or delays in the test program.

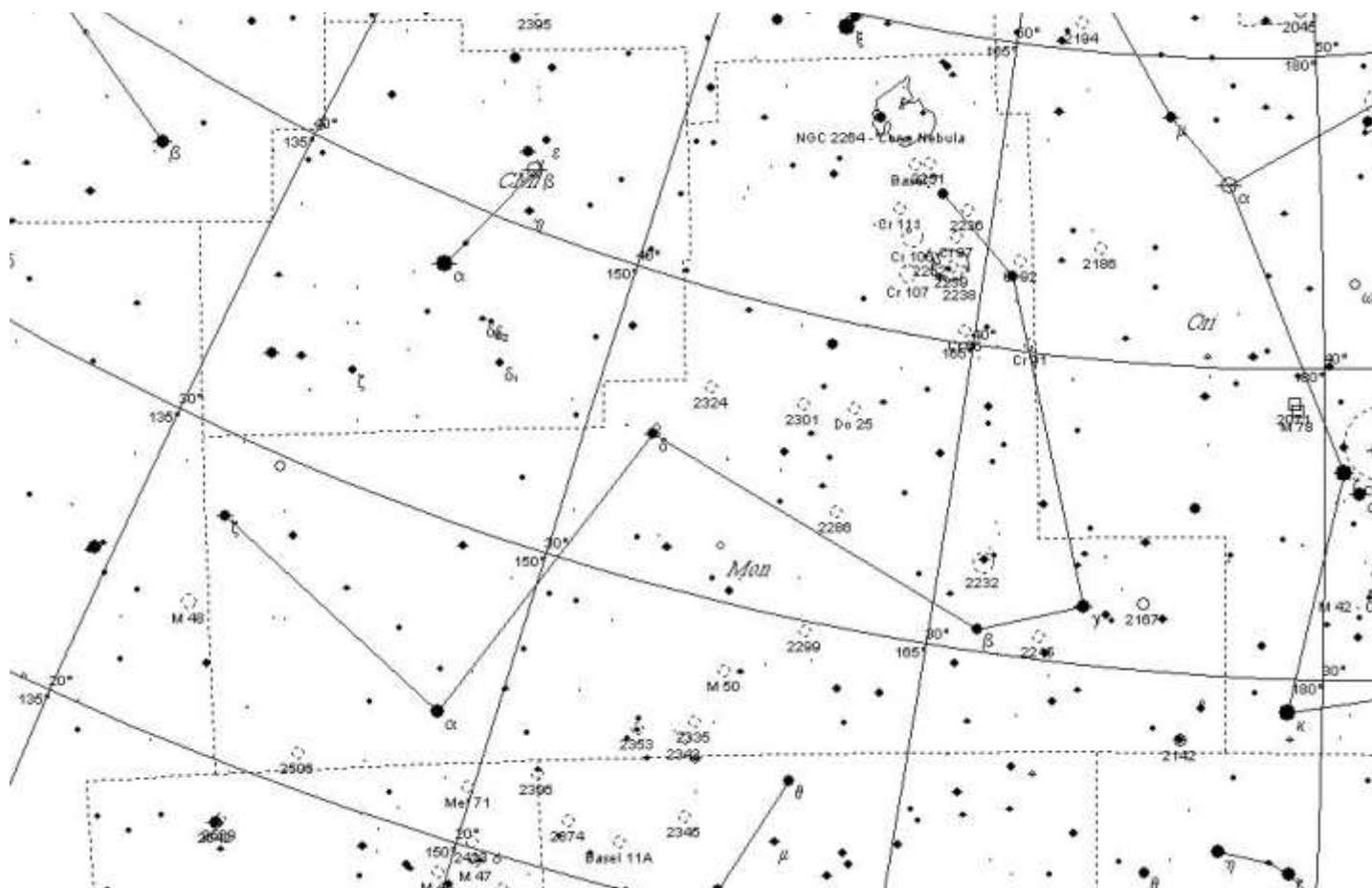


**March 6 - New Moon.** The Moon will be located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 16:04 UTC. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

**March 20 - March Equinox.** The March equinox occurs at 21:58 UTC. The Sun will shine directly on the equator and there will be nearly equal amounts of day and night throughout the world. This is also the first day of spring (vernal equinox) in the Northern Hemisphere and the first day of fall (autumnal equinox) in the Southern Hemisphere.

**March 21 - Full Moon, Supermoon.** The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This phase occurs at 01:43 UTC. This full moon was known by early Native American tribes as the Full Worm Moon because this was the time of year when the ground would begin to soften and the earthworms would reappear. This moon has also been known as the Full Crow Moon, the Full Crust Moon, the Full Sap Moon, and the Lenten Moon. This is also the last of three supermoons for 2019. The Moon will be at its closest approach to the Earth and may look slightly larger and brighter than usual.

## CONSTELLATIONS OF THE MONTH: Monoceros



Flanked by Orion and Canis Minor, with Gemini above and Canis Major below, the faint constellation Monoceros ("the Unicorn") is often overlooked.

While the constellation may have been in existence prior to the seventeenth century, its first historical reference appears in Jakob Bartsch's star chart of 1624, under the name "Unicornu". It is believed that Bartsch (who incidentally was Johannes Kepler's son-in-law) relied on earlier works, but such works have never been identified.

It takes a lot of imagination to fashion a unicorn out of this group of stars. In fact, there are several variations. While our figure puts the horn in front, from gamma Monocerotis through epsilon and up to S Monocerotis, another popular form has the horn instead coming from delta Monocerotis through 18 Mon and over to epsilon.

But it isn't the stars which hold most of our interest here. Instead, Monoceros has several celebrated deep sky objects as well as the most massive binary system yet discovered.

The stars of Monoceros are as dim as the constellation's history: only a few fourth-magnitude stars that are difficult to notice except on very clear nights. *Alpha Monocerotis* is only a 3.93 visual magnitude, slightly brighter than *gamma Monocerotis*: 3.98.

The only Bayer star of interest is *beta Monocerotis*, which is a splendid triple. See below for a detailed description of this system.

### Double stars in Monoceros:

*Beta Monocerotis* is a wonderful triple star system, especially for smaller telescopes. William Herschel, who discovered it in 1781, thought it was one of the best he'd ever seen.

The three stars form an elegant triangle that doesn't change much, if at all, over time. Thus the system may be considered "fixed". The visual magnitudes and separations are as follows: AB (4.7, 5.2; 132 degrees, 7.3"), AC: (6.1, 124 degrees, 10").

*Epsilon Monocerotis* is a fixed binary: 4.5, 6.5; 27 degrees, 13".

*15 Monocerotis*, also known as *S Monocerotis*, is another multiple system consisting of six stars. However most of them are extremely faint:

AB: 4.8, 7.6; 213 degrees, 2.8". Component C: 9.9, 13 degrees, 17"; D: 9.7, 308 degrees, 41", E: 10, 139 degrees, 74", and F: 7.8, 222 degrees, 56".

### Variable stars in Monoceros:

*R Monocerotis* is an irregular variable, and the nucleus of *Hubble's Variable Nebula* (see below). It is an RW Aurigae type variable, changing from visual magnitude 10 to 12.

*S Monocerotis* is also irregular, the central star in NGC 2264. This star is a bright 4.5 visual magnitude, dipping down at times to about 5.0.

### Deep Sky Objects in Monoceros:

NGC 2237, a large diffuse nebula ("Rosette Nebula") which engulfs the open star cluster NGC 2244 (see below). This nebula actually carries four separate NGC numbers (2237, 2238, 2239, and 2246) although it usually goes under the name of NGC 2237.

It takes a large telescope to distinguish the ring shape. Usually all one sees is a ghostly bit of fluff around the star cluster.



This nebula has been extensively studied, for it seems to be extraordinarily massive (over 10,000 Suns). Dark matter is woven in and out of the surrounding gases. It is surmised that eventually the gases will coalesce, producing either a new star or perhaps even a whole new system of sun and planets, similar to our own.

*NGC 2244*, the open cluster at the centre of the Rosette Nebula, may actually be stars formed out of the Rosette Nebula. However, the central star, 12 Mon (magnitude 6), probably does not belong to the group.

*NGC 2264* is a large and bright cluster with associated nebula (The Cone Nebula, so called because of its shape). The brightest star here is the variable S Monocerotis, which is found near the top of the cluster.

Like other clusters in this constellation, *NGC 2264* is surrounded by gaseous matter not revealed in small scopes. The spectacular dark Cone Nebula is found at the southern edge of this cluster. However, much like the Horsehead Nebula, it appears best in long-exposure photographs.



M50 (NGC 2323) is surprisingly the only Messier object in this constellation.

This is a cluster of about a hundred bright stars, rather tightly grouped, ideal for small telescopes. It can even be seen by the naked eye on a good night. There is a red star near its centre. The cluster is considered to be about 2500 light years away.

To find M50 draw a line between Sirius and Procyon; you'll find the cluster about a third of the way up from Sirius.

Another way to find M50 is to locate the roughly-shaped square formed by alpha, delta, and beta Monocerotis, along with Sirius. Right in the middle of that square lies M50.



### **Then there is Plaskett's Star:**

This giant double star system is recognised as the most massive pair yet discovered.

John Stanley Plaskett began his career at the Dominion Observatory in Ottawa. As he became aware of its limitations, he lobbied the Canadian government to support the development of a new astronomy facility.

In 1913 the federal government provided funding for the construction of a 183 cm (72 inch) reflecting telescope, to be built near Victoria, BC. The Dominion Astrophysical Observatory officially opened in 1918 and was, for a time, the largest telescope in the world. Plaskett served as DAO's first director from 1917 to 1935.

It was here that Plaskett set about studying binary stars and in 1922 this work resulted in his discovering the very massive binary star which now bears his name.

The system is comprised of two giant O-type stars, each of which orbits a common centre of gravity every 14.4 days. While Plaskett arrived at a mass of 90 Suns for each star, it is now probable that the total mass of the two does not exceed 100 Suns. Even so, this pair still stands as the most massive double star system yet discovered.

Plaskett's Star is probably a member of the NGC 2244 cluster (see above).

### **Hubble's Variable Nebula (NGC 2261) and the mystery star R Monocerotis**

The nebula has a curious shape, somewhat like a comet's tail. At the "head" of the comet is where the variable R Monocerotis will be found ... perhaps.

This reflection nebula has a usual visual magnitude of about 10, but this fluctuates sporadically. It was originally thought that as R Monocerotis's visual magnitude changed, so did the visual magnitude of the nebula. But this proved to be false; the nebula's variations do not seem to be associated with the star's variability.

However, Valerie Illingworth (*Facts On File Dictionary of Astronomy*) states that the variability of the nebula comes from what is called a bipolar flow of emissions originating from R Monocerotis. This ejection of gas in two opposite directions is typical in very young stars.

Other observers question the existence of R Monocerotis, considering the area nothing more than an extremely dense gaseous area. Tirion's *SkyAtlas 2000.0* doesn't show the star, and major star catalogues don't list the star. Burnham calls it "a bright nebulous condensation with perceptible apparent size."

Observations at Kitt Peak and Mauna Kea have concluded that R Monocerotis is a protoplanetary system. That is, that planets may presently be forming in a highly condensed region: another "solar system" being born.

While the nebula is easily seen in small scopes, it is a little tricky to find. *Burnham's Celestial Handbook* has a finder's guide (p. 1201). Or you may try this: once you locate epsilon Monocerotis star-hop up to 13 Monocerotis. Farther up, to the northeast, is S Monocerotis. Between these two, just about half way, the great nebulosity surrounding S Monocerotis begins. At the extreme southern edge of this nebulosity is the distinguishing form of Hubble's Variable Nebula: the comet-like shape is unmistakable.



# ISS PASSES For March/Early April 2019

From Heavens Above website maintained by Chris Peat

Date	Bright ness (mag)	Start			Highest point			End		
		Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
<a href="#">03 Mar</a>	-0.4	03:37:46	10°	E	03:37:46	10°	E	03:37:46	10°	E
<a href="#">03 Mar</a>	-3.6	05:10:30	39°	SW	05:11:30	64°	SSE	05:14:46	10°	E
<a href="#">04 Mar</a>	-2.4	04:21:31	35°	ESE	04:21:31	35°	ESE	04:23:47	10°	E
<a href="#">04 Mar</a>	-3.8	05:54:15	13°	W	05:57:05	86°	N	06:00:23	10°	E
<a href="#">05 Mar</a>	-0.5	03:32:29	12°	E	03:32:29	12°	E	03:32:44	10°	E
<a href="#">05 Mar</a>	-3.9	05:05:13	46°	WSW	05:06:06	87°	S	05:09:24	10°	E
<a href="#">06 Mar</a>	-2.5	04:16:10	40°	E	04:16:10	40°	E	04:18:25	10°	E
<a href="#">06 Mar</a>	-3.8	05:48:53	14°	W	05:51:42	87°	N	05:55:01	10°	E
<a href="#">07 Mar</a>	-0.5	03:27:05	12°	E	03:27:05	12°	E	03:27:25	10°	E
<a href="#">07 Mar</a>	-3.9	04:59:49	46°	W	05:00:42	85°	N	05:04:00	10°	E
<a href="#">08 Mar</a>	-2.5	04:10:44	40°	E	04:10:44	40°	E	04:12:59	10°	E
<a href="#">08 Mar</a>	-3.8	05:43:28	14°	W	05:46:15	76°	SSW	05:49:33	10°	ESE
<a href="#">09 Mar</a>	-0.5	03:21:39	12°	E	03:21:39	12°	E	03:21:57	10°	E
<a href="#">09 Mar</a>	-3.9	04:54:23	47°	W	04:55:14	88°	SSW	04:58:32	10°	E
<a href="#">10 Mar</a>	-2.4	04:05:19	38°	E	04:05:19	38°	E	04:07:31	10°	E
<a href="#">10 Mar</a>	-3.5	05:38:03	14°	W	05:40:42	50°	SSW	05:43:54	10°	SE
<a href="#">11 Mar</a>	-0.4	03:16:18	11°	E	03:16:18	11°	E	03:16:26	10°	E
<a href="#">11 Mar</a>	-3.9	04:49:02	49°	WSW	04:49:42	67°	SSW	04:52:58	10°	ESE
<a href="#">12 Mar</a>	-2.2	04:00:04	32°	ESE	04:00:04	32°	ESE	04:01:58	10°	ESE
<a href="#">12 Mar</a>	-2.8	05:32:47	15°	W	05:35:00	30°	SSW	05:37:55	10°	SSE
<a href="#">13 Mar</a>	-3.4	04:43:54	42°	SSW	04:44:02	42°	SSW	04:47:11	10°	SE
<a href="#">14 Mar</a>	-1.6	03:55:06	20°	SE	03:55:06	20°	SE	03:56:17	10°	ESE
<a href="#">14 Mar</a>	-2.0	05:27:50	14°	WSW	05:29:07	17°	SW	05:31:19	10°	S
<a href="#">15 Mar</a>	-2.2	04:39:11	21°	S	04:39:11	21°	S	04:40:59	10°	SSE
<a href="#">22 Mar</a>	-2.3	20:10:09	10°	SSW	20:12:02	23°	S	20:12:02	23°	S
<a href="#">23 Mar</a>	-2.2	19:19:35	10°	S	19:22:01	19°	SE	19:23:33	14°	ESE
<a href="#">23 Mar</a>	-1.9	20:54:52	10°	WSW	20:56:18	23°	WSW	20:56:18	23°	WSW
<a href="#">24 Mar</a>	-3.5	20:03:48	10°	SW	20:07:00	47°	SSE	20:07:37	41°	ESE
<a href="#">24 Mar</a>	-0.7	21:40:09	10°	W	21:40:22	11°	W	21:40:22	11°	W
<a href="#">25 Mar</a>	-2.9	19:12:51	10°	SW	19:15:52	33°	SSE	19:18:46	11°	E
<a href="#">25 Mar</a>	-3.2	20:48:55	10°	W	20:51:30	52°	WSW	20:51:30	52°	WSW
<a href="#">26 Mar</a>	-3.9	19:57:43	10°	WSW	20:01:00	72°	SSE	20:02:32	29°	E
<a href="#">26 Mar</a>	-1.2	21:34:16	10°	W	21:35:16	18°	W	21:35:16	18°	W
<a href="#">27 Mar</a>	-3.6	19:06:34	10°	WSW	19:09:48	55°	SSE	19:13:03	10°	E
<a href="#">27 Mar</a>	-3.8	20:43:00	10°	W	20:46:11	81°	NW	20:46:11	81°	NW
<a href="#">28 Mar</a>	-3.9	19:51:44	10°	W	19:55:02	89°	N	19:57:02	22°	E
<a href="#">28 Mar</a>	-1.6	21:28:18	10°	W	21:29:46	24°	W	21:29:46	24°	W
<a href="#">29 Mar</a>	-4.0	20:37:01	10°	W	20:40:21	89°	SSW	20:40:33	77°	ESE
<a href="#">30 Mar</a>	-3.8	19:45:44	10°	W	19:49:03	85°	N	19:51:19	19°	E
<a href="#">30 Mar</a>	-1.9	21:22:19	10°	W	21:24:02	27°	W	21:24:02	27°	W
<a href="#">31 Mar</a>	-3.8	21:31:00	10°	W	21:34:17	69°	SSW	21:34:46	57°	SE
<a href="#">01 Apr</a>	-3.8	20:39:41	10°	W	20:43:00	84°	S	20:45:30	16°	ESE
<a href="#">01 Apr</a>	-1.9	22:16:22	10°	W	22:18:13	24°	WSW	22:18:13	24°	WSW
<a href="#">02 Apr</a>	-3.2	21:24:57	10°	W	21:28:07	44°	SSW	21:28:57	35°	SSE
<a href="#">03 Apr</a>	-3.5	20:33:35	10°	W	20:36:51	61°	SSW	20:39:41	13°	ESE
<a href="#">03 Apr</a>	-1.5	22:10:39	10°	W	22:12:24	17°	SW	22:12:24	17°	SW
<a href="#">04 Apr</a>	-2.2	21:18:58	10°	W	21:21:47	26°	SSW	21:23:10	19°	S
<a href="#">05 Apr</a>	-2.7	20:27:28	10°	W	20:30:35	37°	SSW	20:33:39	10°	SE
<a href="#">06 Apr</a>	-1.3	21:13:24	10°	WSW	21:15:18	15°	SW	21:17:12	10°	S

**END IMAGES, OBSERVING AND OUTREACH**



The Aurora seen from Wiltshire on 27th February 2014. Who knows we may get lucky again this year, they have already been seen the Brecon Beacons last week.

Nikon D800, 14-28mm wide angle, 6second exposure, auto stretched in Photoshop to pull out the greens. Taken from a layby on the A420 towards Ford.

Andy Burns

<b>Wiltshire Astronomical Society</b>	<b>Observing Sessions 2018 – 2019</b>	
<b>Date</b>	<b>Moon Phase (%)</b>	<b>Moonrise</b>
<b>2019</b>		
22 <sup>nd</sup> February	Waning Gibbous (84%)	9.31 pm
29 <sup>th</sup> March	Waning Crescent (32%)	After midnight
26 <sup>th</sup> April	Waning Gibbous (58%)	After midnight
24 <sup>th</sup> May	Waning gibbous (75%)	After midnight

**OUTREACH**

- To be arranged Great Wishford School, nr Wilton. Viewing evening
- Kings Lodge Year 1/2s Moon talk and viewing from 7pm To be re arranged due to heating problem
- July 4th-5th Nibley Music Festival