ASTRONOMICAL SOCIETY OF SOUTHERN AFRICA

Durban ’nDaba

Monthly Newsletter of the Durban Centre - February 2022

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Member Submissions Disclaimer

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Chairman's Chatter

February 2022

Dear ASSA members.

With the James Webb Space Telescope now at its destination, we can only wait for it to begin taking images and sending them back home.

ASSA will celebrate 100 years this year. We are in the process of combining a history of the various centres' which will be available in a publication in the coming months.

For those that have been keeping an eye open on the weather, we have been given a single clear night in Durban in the last 2 weeks. Unfortunately, due to contracting Covid, I was not able to take advantage of this rare summer gift. I do hope that many of you had the chance to step outside and enjoy the view and image where possible.

We will be looking to host an astronomy course this year, which will include many future astronomers who have already been enquiring. Those interested, please contact me so that we can ascertain numbers.

ASSA Durban Centre, will look at starting a young astronomers group, which will be a first for ASSA nationally. This initiative, thanks to Corinne Gill, will bring together our young astronomers to discuss various aspects in astronomy and maybe take off on a national level.

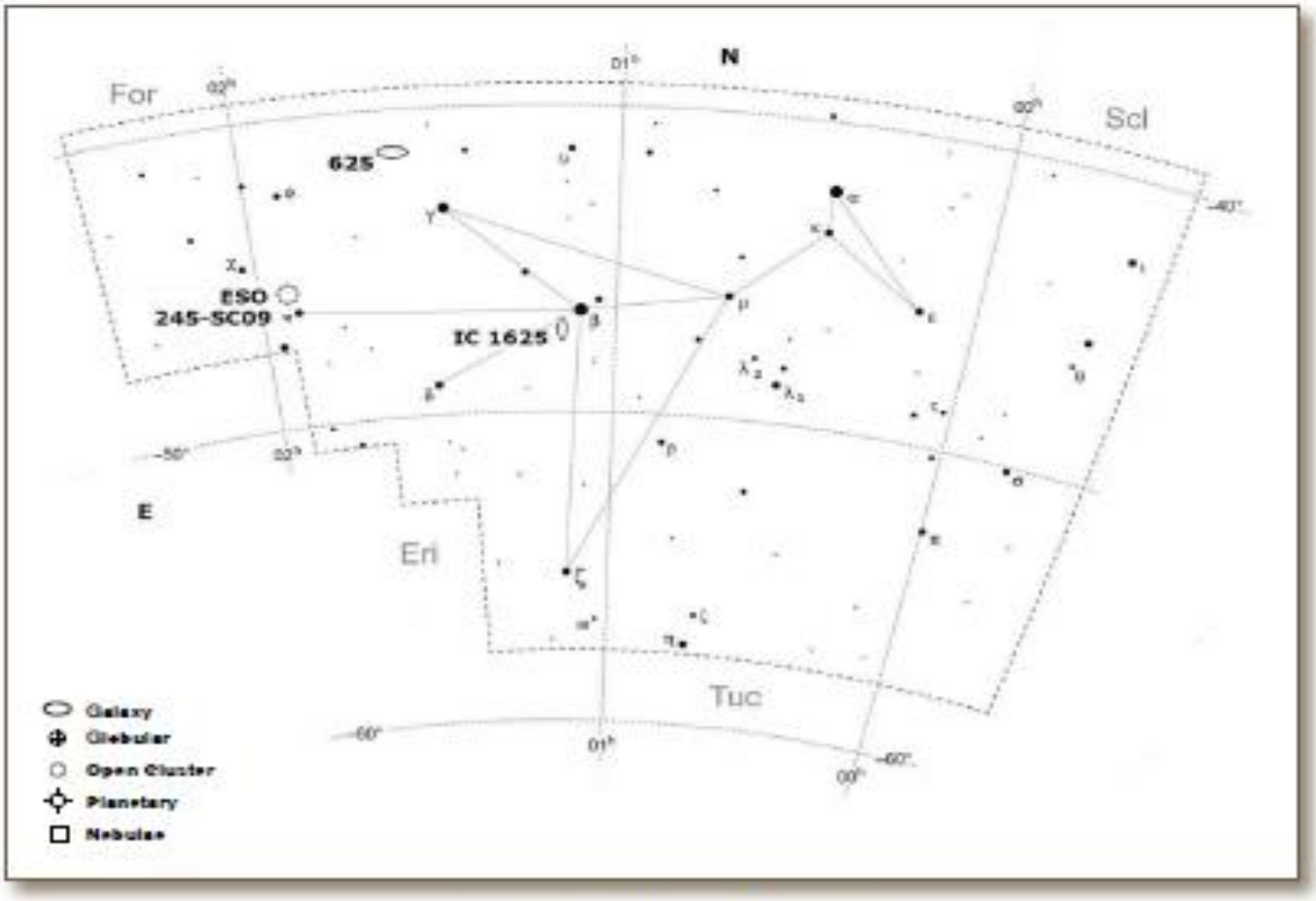
I look forward to seeing everyone on our next virtual meeting held on 09 February 2022.

As always, stay safe and wishing you all clear skies.

Amith Rajpal.

Astronomy Delights:
Phoenix - the Fire Bird

By Magda Streicher



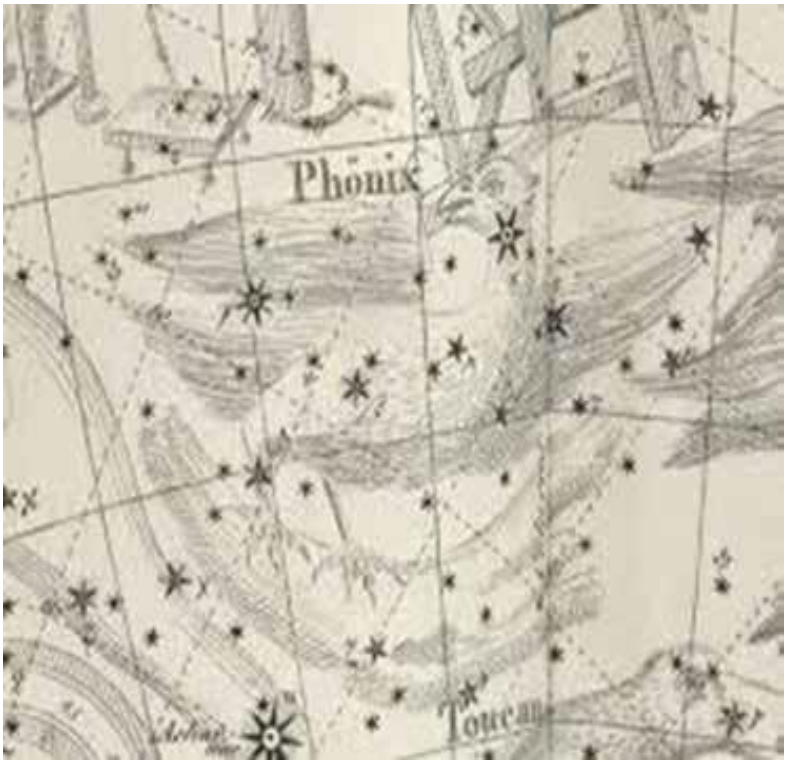
The constellation of Phoenix

A typical Horn Bill bird familiar in the South African bushveld

...Phoenix

The forefathers, seafarers and hunters of ancient times most probably developed names for the patterns and shapes outlined by the stars of the night sky. Many of them are associated with the legends of their cultures and their ways of life. Most of the constellations' names have Greek and Latin roots and some are very original. The Greek language refers to constellations as "signs", while Hipparchus, Ptolemy and the Arabians referred to them as "figures". It is generally accepted that various animals and birds played prominent roles in people's minds in ancient times as can be seen from images they have left us on wood and rocks.

Let us have a look at the starry bird constellations. Apus, also known as the bird of paradise, is without doubt one of the most appreciated feathered creatures. The ordinary turtle-dove received an honorary place in the star formation of the constellation Columba. Then there is Corvus the crow which literally lies equally astride the celestial equator. Grus the crane is surely one of the prettiest star constellations of the southern night sky. One of Bayer's twelve southern constellations is Pavo the peacock. Another starry bird which finds its place in the night sky is the constellation Tucana the toucan, also known as the beak bird. Flying to the northern hemisphere, we acquaint ourselves with the gracious constellation Cygnus the swan. Aquila the eagle is one of the best-known star-bird constellations projected against the northern night sky.



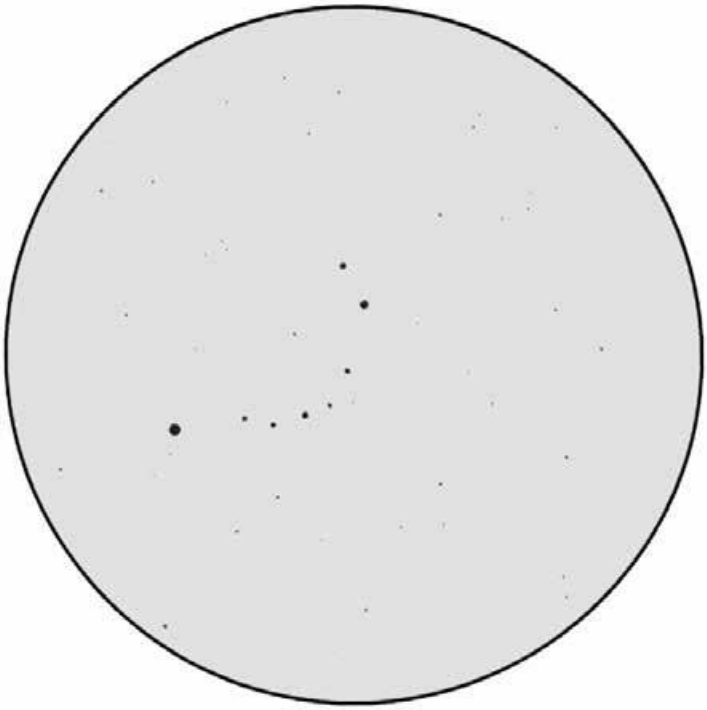
Ancient impression and map of the Phoenix constellation Photograph: The Skytonight

Phoenix is the winged bird shown on Egyptian coins as an emblem of immortality. Others saw the figure as a Griffin but in China it was known as the Fire Bird. The Arabian people knew it as a primitive boat and also called it the Young Ostrich. The constellation Phoenix is situated between Horologium and Grus, just south of the constellations Fornax and Sculptor.

The double star theta Phoenicis is situated in the westernmost part of the constellation. It is comprised of two white coloured components, with magnitudes 6.6 and 7.2, a 4" separation and position angle (PA) of 275˚. It was first documented by John Herschel in 1835.

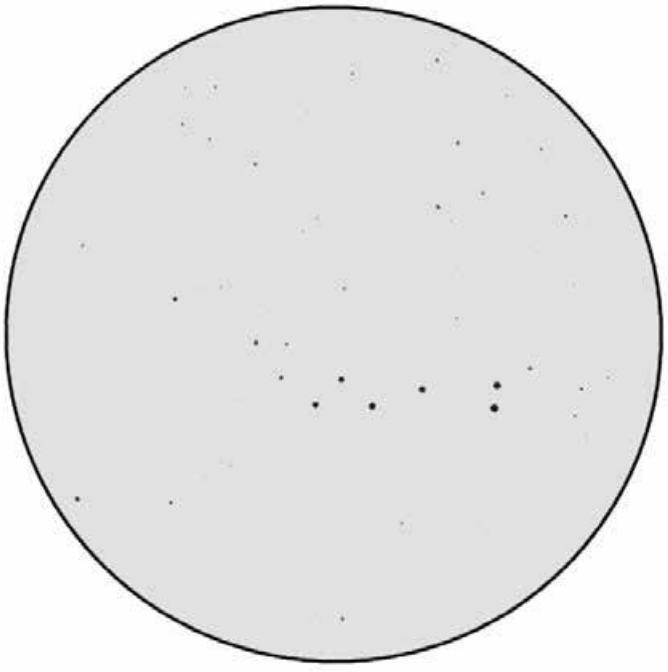
...Phoenix

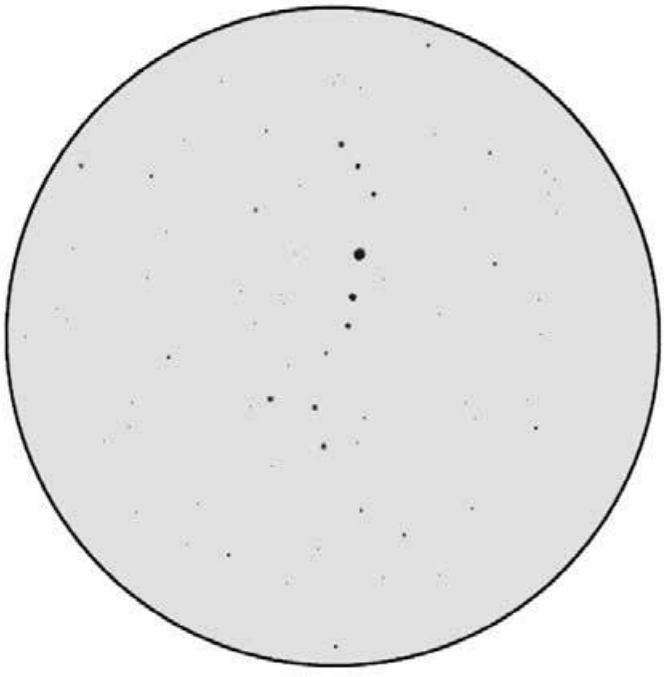
Further to the east and comfortably situated in the centre of the constellation is beta Phoenicis. This beautiful, bright yellow coloured double star is only 1.4” in separation, with a position angle (PA) of 346˚. The galaxy cluster Abell 2870 is on a radius of 55’ to the east. The brightest in this group of galaxies is IC 1625 with a magnitude of 12 and situated only 20’ south-east of beta Phoenicis. It is slightly oval in shape with a tiny nucleus surrounded by a hazy envelope. The north-eastern corner star of the constellation is illuminated by yellow coloured gamma Phoenicis, showing the way approximately 2.2 degrees northeast to the galaxy NGC 625. It displays a soft elongated east-west haze, which appears like an extended oval with a feather-like edge. Although it has a high surface brightness, a subtle brightening is evident towards the middle. With even higher magnification it seems that the western end of the galaxy is slightly thicker and blunt with a thinner, sharper eastern part. A quite prominent string of stars swings away from the galaxy in a southern direction.



I keep on searching amongst the stars to find asterisms, and share this one approximately 40’ southeast of pi Phoenicis. The stars in this formation represents in a way a pair of earphones, consisting of seven various magnitude stars in a half-moon shape noticeably outstanding against the field of view. The brightest star is HD 12003 situated towards the east. It can be found at RA: 01h56m.0 – DEC: -43°06’.3, with an overall magnitude of 11 and 13’ in size.

Below: Two more asterisms can be searched out in this feathery constellation at RA: 01h42m.5 – DEC: -42°12’.9. and RA: 23h42m.2 – DEC: -53°23’.7





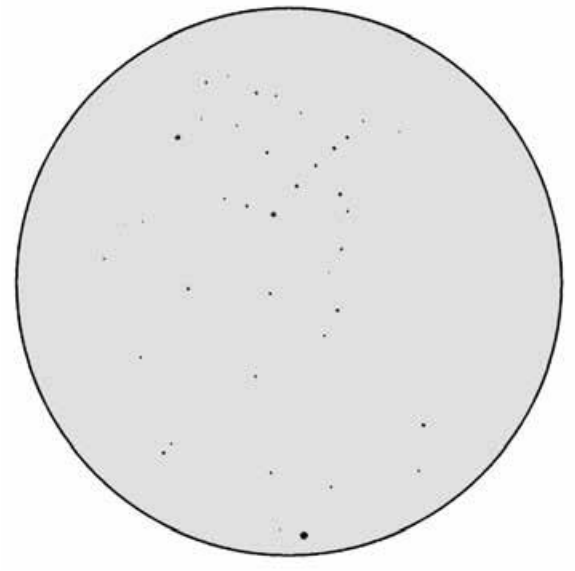
...Phoenix

To find a special kind of cluster in the constellation, you only have to shift your attention 18’ north of psi Phoenicis towards the eastern part of the constellation. **ESO 245-SC09** enriches its direct surroundings in an outstanding way. Unique to this cluster is the long, faint north-west to south-east string approximately 10’ in length. Fainter members spray out to the north-east. To me this cluster resembles a secretary bird with its long legs and outspread wings in flight.

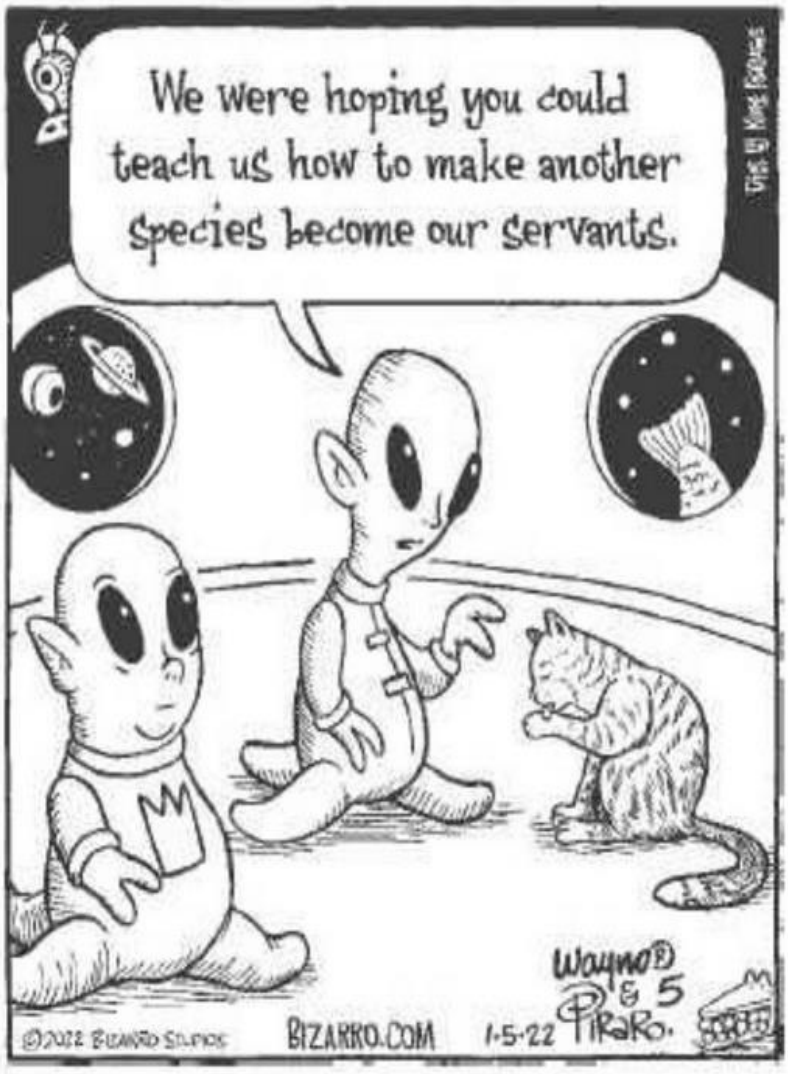
In the extreme south of the constellation is xi Phoenicis which is a double star with a magnitude 5.8 white coloured primary and a 10.2 shady yellow of 13.2” and position angle (PA) of 253°. If you are brave enough, search out two galaxies NGC 215 and NGC 212, just 5’ apart from one another situated 20’ north-west of xi Phoenicis.

Fly with me, and discover countless starry bird shapes that can be found amongst the many stars that drape our dark night skies.

OBJECT	TYPE	RA	DEC	MAG	SIZE
IC 1625	Galaxy	01h07m.7	-46°54’.5	12.3	1.6’×1.2’
NGC 625	Galaxy	01h35m.1	-41°26’.0	11.2	5.8’×2.1’
ESO 245-SC09	Open Cluster	01h53m.7	-45°57’.2	11.5	12’



ESO 245-SC09 – Open Cluster



At the Eyepiece

February 2022 by Ray Field

The Moon is New on the 1st, First Quarter on the 8th, Full on the 16th and Last Quarter on the 24th. The Moon is near Saturn on the 1st but too close to the Sun to be seen, near Jupiter on the 3rd but also too close to the Sun to be observed favourably and is near Uranus on the 7th, near Pollux in Gemini on the 14th, near Regulus on the 16th, near the close double Porrima or Gamma Virginis on the 19th, near Spica on the 21st, Antares on the 24th, it occults the star Theta Ophicuchi on the 25th (see the diagram on page 10 of ASSA Sky Guide 2022), is near the star Lambda Sagittarii (proper name Kaus Borealis) on the 26th, near Mars on the 27th and near Venus in the daytime at noon (see diagram on page 10 of the ASSA Sky Guide 2022).

Mercury is a morning object rising about 2 hours before the Sun. It is orange-reddish in colour and to the naked eye it looks like a bright “star”. It has polar ice caps, which vary in size according to seasons on Mars.

Jupiter is not suitably placed for observation as it is hidden in the solar glare this month. It reaches conjunction with the Sun on the 5th March. *(conjunction, in astronomy, an apparent meeting or passing of two or more celestial bodies).*

Saturn is also hidden in the solar glare this month. Later in the year it becomes a morning object.

Uranus is an early evening object this month and is lost in the solar later in the year. The moon is near Uranus on the 7th.

Neptune, not visible to the naked eye, also enters evening twilight this month.

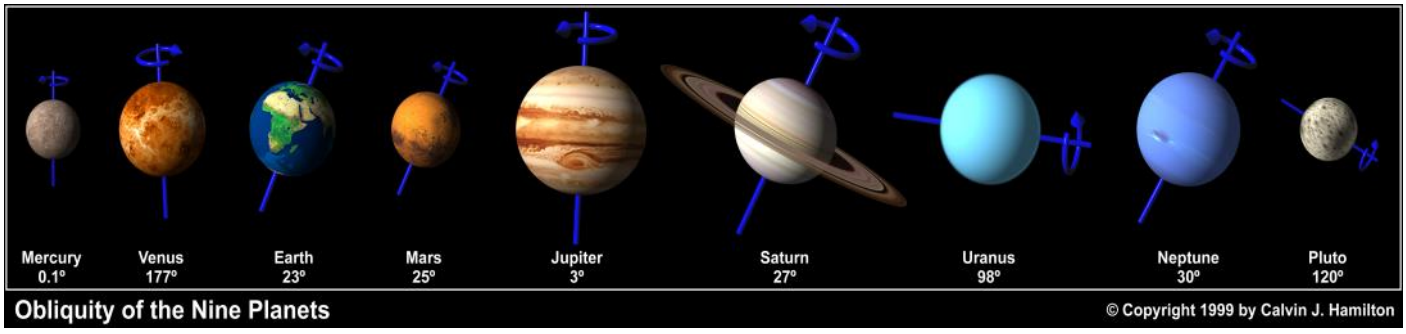
Meteor Showers: The Alpha Centaurids, active from 28th January to 7th February have a good prospect for observation this month. Their zenithal hourly rate (ZHR) is 5. The time to watch is from 22:00 to 03:30.

Comets: Comet c/2021 A1 (Leonard). It may reach naked eye brightness this month and the best place to look is low in the Southwest soon after sunset

Comet 104p/Kowal 2 was closest to the Sun on 11th January, but its magnitude is only expected to peak in the second half of the year, when it may be visible in binoculars.

The Starry Sky for Durban. In the evening sky, the Southern Cross is not as low as last month and can be seen rising over the South East with its pointers. Canopus, the second brightest star in the sky, is about 60° above the horizon due South. Achernar, a bright star, is equidistant and opposite the Southern Cross from the South Celestial Pole. The brightest star in the sky, Sirius, is almost overhead and follows Orion over the Northwest across the sky. The bright star Procyon lies between Canis Major containing Sirius and the two bright stars of Genini containing Pollux over the Northern horizon.

References: ASSA Sky Guide 2022, Nortons’ Star Atlas and Philips’ Planisphere 35° S.

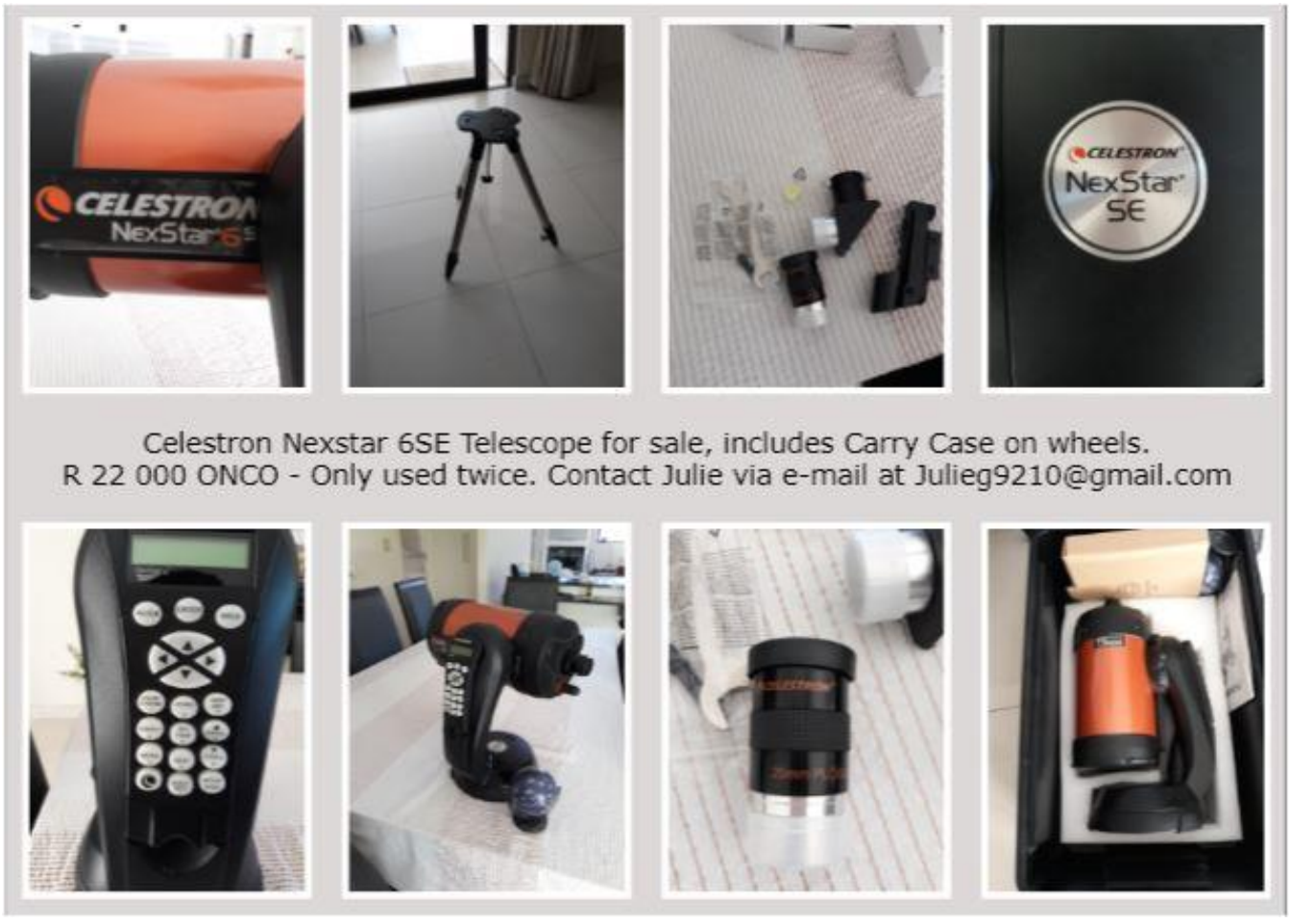


Solar Activity and Space Weather

Nat Gopalswamy, Pertti Mäkelä, Seiji Yashiro, Sachiko Akiyama, Hong Xie

After providing an overview of solar activity as measured by the sunspot number (SSN) and space weather events during solar cycles (SCs) 21-24, we focus on the weak solar activity in SC 24. The weak solar activity reduces the number of energetic eruptions from the Sun and hence the number of space weather events. The speeds of coronal mass ejections (CMEs), interplanetary (IP) shocks, and the background solar wind all declined in SC 24. One of the main heliospheric consequences of weak solar activity is the reduced total (magnetic + gas) pressure, magnetic field strength, and Alfvén speed. There are three groups of phenomena that decline to different degrees in SC 24 relative to the corresponding ones in SC 23: (i) those that decline more than SSN does, (ii) those that decline like SSN, and (iii) those that decline less than SSN does. The decrease in the number of severe space weather events such as high-energy solar energetic particle (SEP) events and intense geomagnetic storms is deeper than the decline in SSN. CMEs expand anomalously and hence their magnetic content is diluted resulting in weaker geomagnetic storms. The reduction in the number of intense geomagnetic storms caused by corotating interaction regions is also drastic. The diminished heliospheric magnetic field in SC 24 reduces the efficiency of particle acceleration, resulting in fewer high-energy SEP events. The numbers of IP type II radio bursts, IP socks, and high-intensity energetic storm particle events closely follow the number of fast and wide CMEs (and approximately SSN). The number of halo CMEs in SC 24 declines less than SSN does, mainly due to the weak heliospheric state. Phenomena such as IP CMEs and magnetic clouds related to frontside halos also do not decline significantly. The mild space weather is likely to continue in SC 25, whose strength has been predicted to be not too different from that of SC 24.

For Sale



A Quintuple Star in the Constellation Orion

By Brian Ventrudo

The complex of emission, reflection, and dark nebulae near the star Alnitak and Sigma Orionis. The Horsehead Nebula is at center. Sigma Orionis is the bright star to the left of the Horsehead. The pale white Flame Nebula, split in two by a dark lane of dust, is at bottom and just right of center. Image credit: Terry Hancock and GrandMesaObservatory.com

Perhaps the finest multiple star in the sky visible to both northern and southern observers, Sigma Orionis is a gravitationally-bound system of five stars, four of which are visible upon careful inspection with a small telescope. The brightest star of this group is one of the most luminous known, and it lights up the gas and dust around the famous Horsehead Nebula near Orion's Belt. The star will one day expire, like many stars in Orion, in a spectacular supernova explosion.

Sigma Orionis doesn't have an easy-to-remember name, but it's not hard to find. It's just south of Alnitak, the easternmost star in Orion's Belt. The total visual magnitude is 3.6, so it's visible even in light-polluted city skies.

What looks like one star to the naked eye is actually five stars labeled by astronomers as A to E. At an apparent magnitude of 4, A and B are the brightest and lie so close together they appear like a single star in even the largest telescope. But in a backyard scope at 100-150x, you'll easily resolve the C, D, and E components. Star C is the faintest, at magnitude 9, and about 11″ (arc-seconds) from the primary. D and E are brighter at 7th magnitude and are about 12″ and 42″ from the AB combination. You can see the whole bunch in a 4-inch or larger telescope at 100x.

...A Quintupple Star

The tightly-spaced A and B components are each tremendously massive and bright: more than 35,000 and 30,000 times brighter than our Sun, and with a total mass of almost 35 Suns. The A/B pair are only 90 astronomical units (AU) apart, a little more than twice the Sun-Pluto distance, and orbit each other every 170 years.

Component C of Sigma Orionis is some 3900 AU away from the A/B pair, and D and E are 4600 and 15,000 AU (about 1/4 light year) away from the main A/B components. Because of their tenuous gravitational association with their more massive siblings, the C, D, and E components of Sigma Orionis will eventually leave the orbit of A/B and travel the galaxy as lone stars.

The Sigma Orionis system is some 1,150 light-years away from the Sun.

The ultraviolet light from A/B excite surrounding gas and dust clouds. A and B will end their lives as spectacular supernova explosions, while the smaller C, D, and E components will end their lives as white dwarfs after briefly expelling their atmospheres as planetary nebulae.

Component E is a strange star, with a strong magnetic field and strange helium-rich patches in its atmosphere.

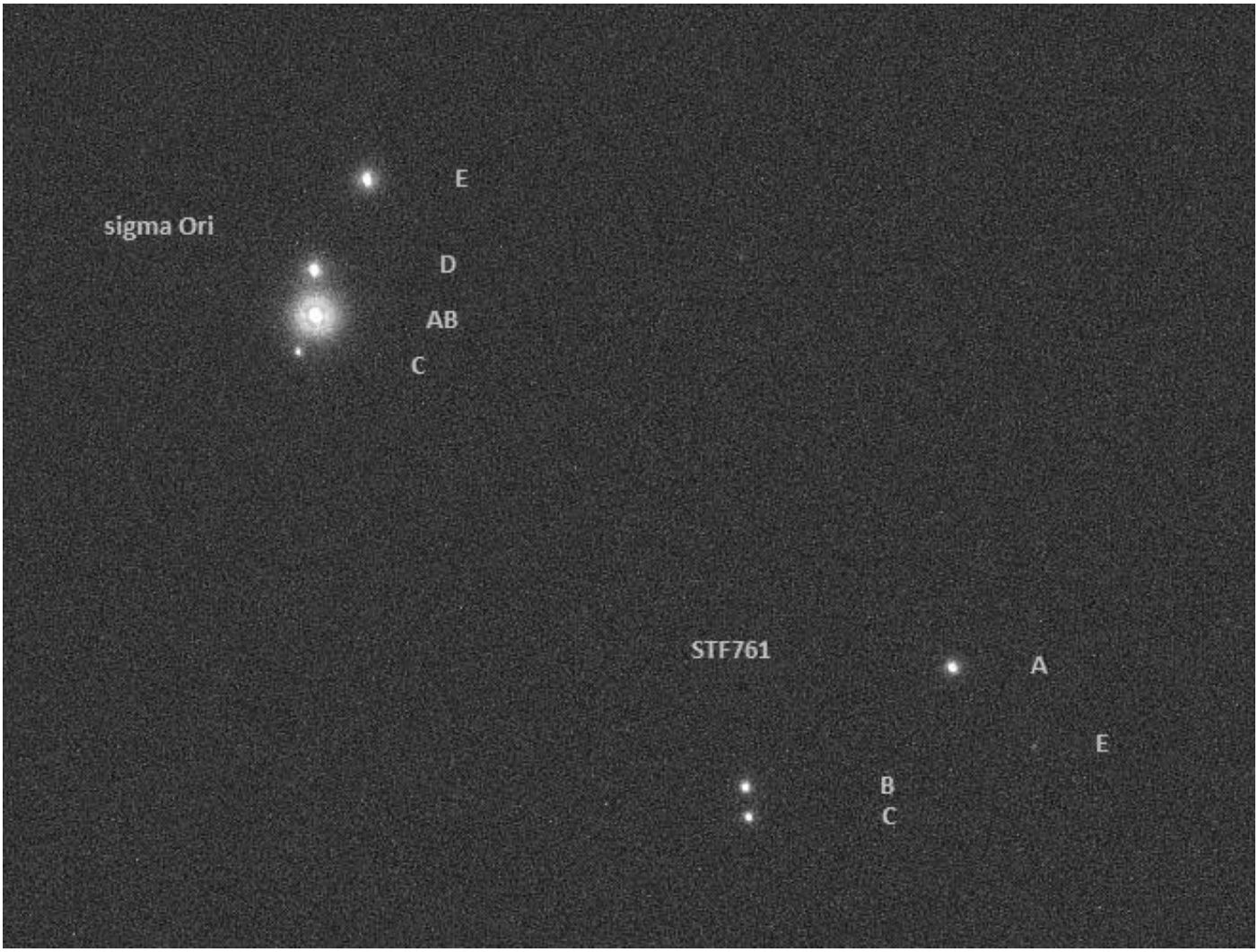
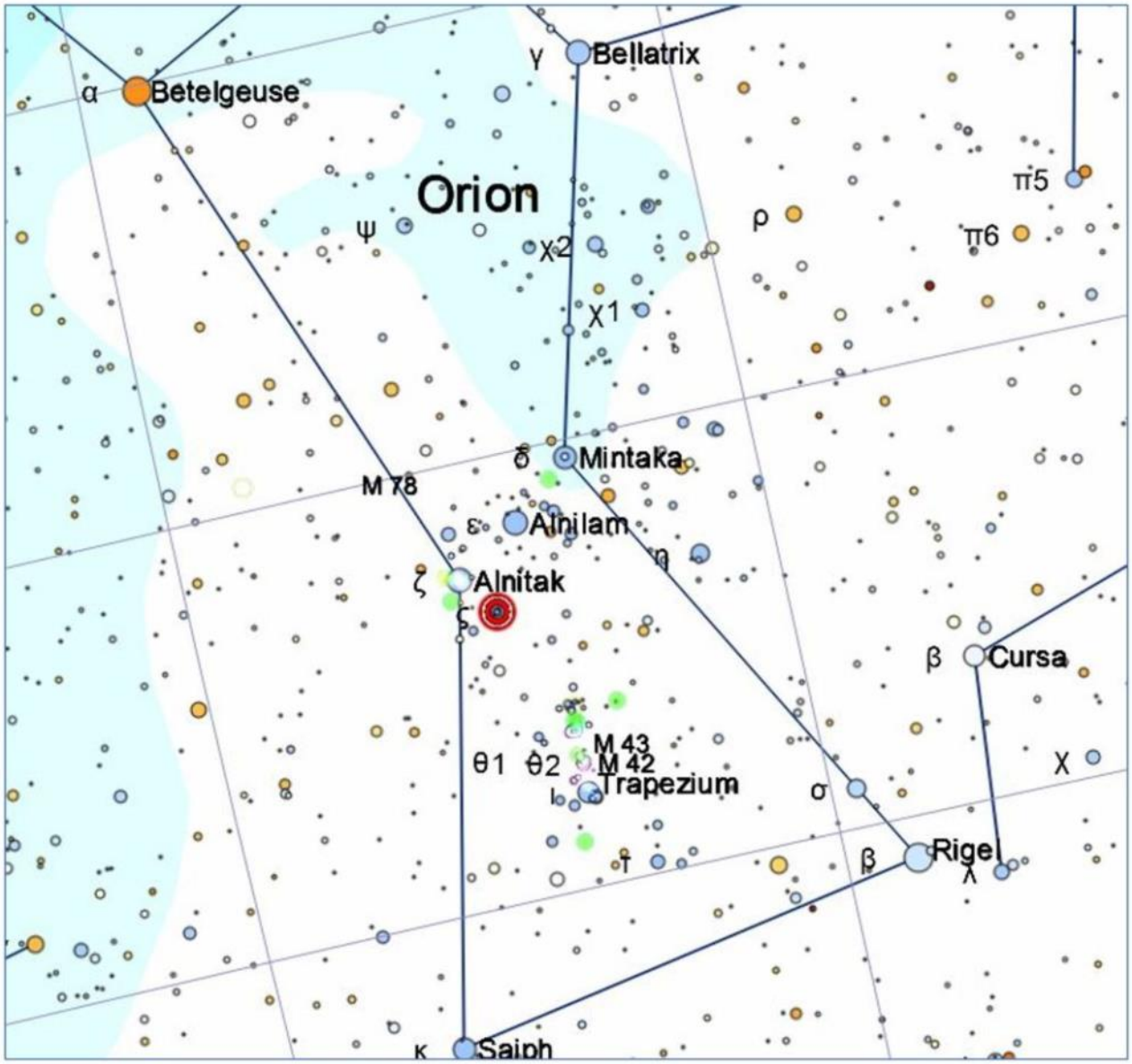


Image of the Sigma Orionis star system (upper left) showing each component star. The A-B components are unresolved. At lower right is the triple star Struve 761. Image credit: Astronomical Society of Southern Africa/SAAO.

...A Quintupple Star

As an observing bonus, don't forget to look just northwest of Sigma Orionis with your telescope to see the triple star system Struve 761. Depending on your optics, you might see this system within the same field of view as Sigma Orionis. The triple is widely split, and all three 8th-magnitude components are visible in a small telescope.

Sigma Orionis, Struve 761, the stars of Orion's belt, and the stars forming in the Orion Nebula are all part of the magnificent Orion OB1 association, a recently-formed aggregation of gas, dust, and new stars that's only now starting to disperse into the Orion arm of the Milky Way.



The red circle marks the location of the 3rd-magnitude star Sigma Orionis, just south of the star Alnitak in the constellation Orion. Remember this is the view from the Northern hemisphere.

This region of Orion's belt is an astrophotographer's dream. Within the same field as Sigma Orionis lies the Horsehead and Flame Nebulae along with other beautiful emission and reflection nebulae (see image at top). A visual observer will only see stars in this region of the sky, although you may see glimpses of the Flame Nebula and, if you have a big telescope, pitch-black sky, and an H-Beta filter, a hint of the Horsehead Nebula itself.

The Cover Image - Messier 51

The data was made available by AdamBlockStudios.com and processed by John Gill

The graceful, winding arms of the majestic spiral galaxy M51 appear like a grand spiral staircase sweeping through space. They are actually long lanes of stars and gas laced with dust. Such striking arms are a hallmark of so-called grand-design spiral galaxies. In M51, also known as the Whirlpool galaxy, these arms serve an important purpose: they are star-formation factories, compressing hydrogen gas and creating clusters of new stars.

Some astronomers think that the Whirlpool's arms are particularly prominent because of the effects of a close encounter with NGC 5195, the small, yellowish galaxy at the outermost tip of one of the arms. The compact galaxy appears to be tugging on the arm, the tidal forces from which trigger new star formation. Hubble's clear view shows that NGC 5195 is passing behind M51. The small galaxy has been gliding past the Whirlpool for hundreds of millions of years.

The red represents infrared light as well as hydrogen within giant star-forming regions. The blue color can be attributed to hot, young stars while the yellow color is from older stars.

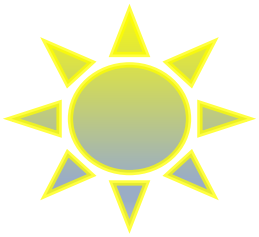
Discovered by Charles Messier in 1773, M51 is located 31 million light-years from Earth in the constellation Canes Venatici. It has an apparent magnitude of 8.4 and can be spotted with a small telescope most easily during May. The Whirlpool galaxy's beautiful face-on view and closeness to Earth allow astronomers to study a classic spiral galaxy's structure and star-forming processes.

TECH SPECS:

IMAGES:
- 79 x Lum for 1200 seconds
- 21 x Red for 1200 seconds
- 22 x Green for 1200 seconds
- 42 x Blue for 1200 seconds
- 24 x Darks for 1200 seconds
- 35 x Flats
- 121 x Bias

INTEGRATION TIME:
- 50+ Hours

SOFTWARE:
- PixInsight

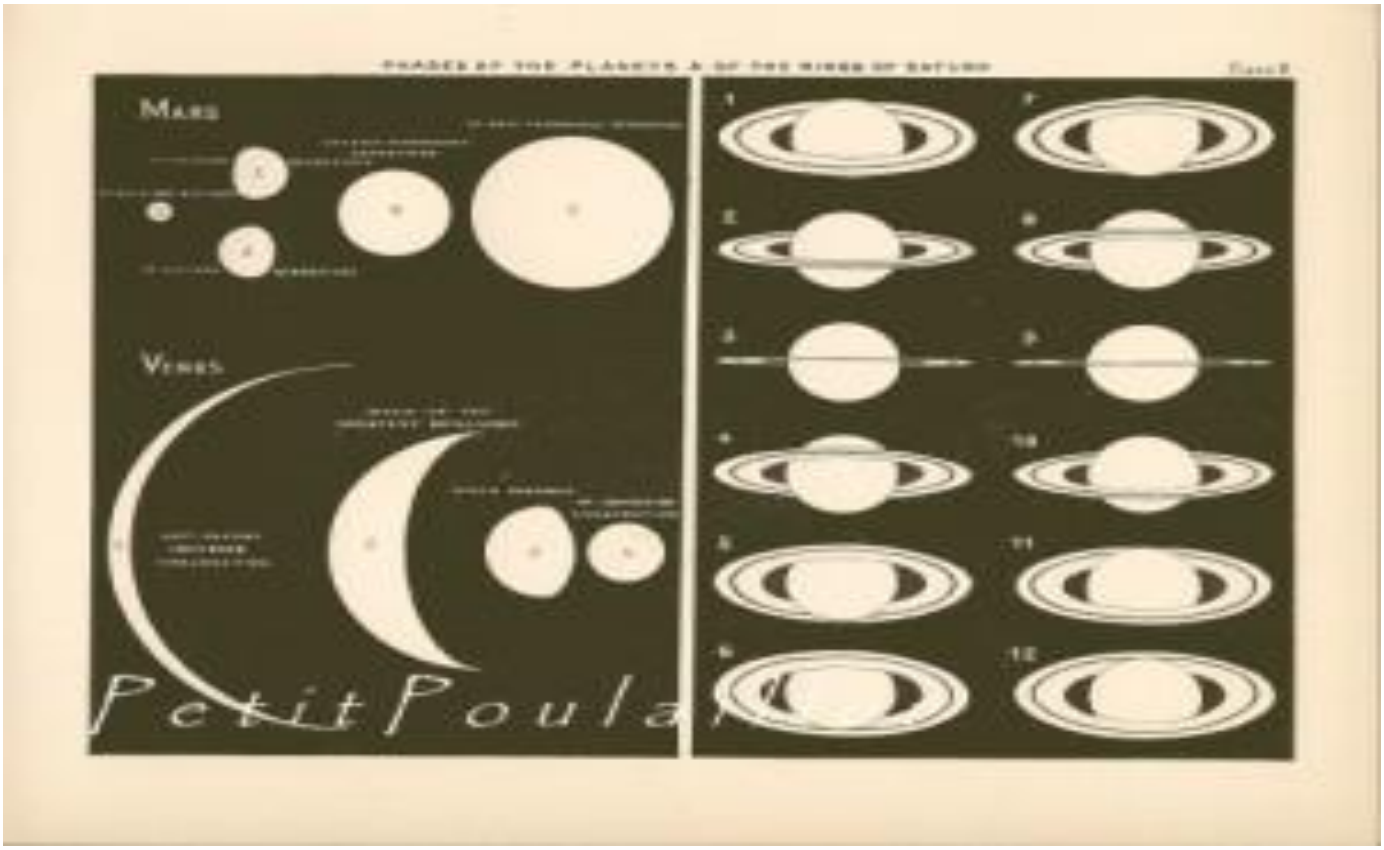


Left: Sun halo captured by Daniel Conner on 13 January 2022.

Victorian Astronomy

Discovery and Images

Astronomy is a branch of natural science that deals with the study of celestial objects (stars, galaxy, planets, asteroids, comets, and nebulae) and its processes supernovae (explosions and gamma-ray bursts). This includes the physics, chemistry and evolution of cosmic objects that generally originated outside the atmosphere of Earth.



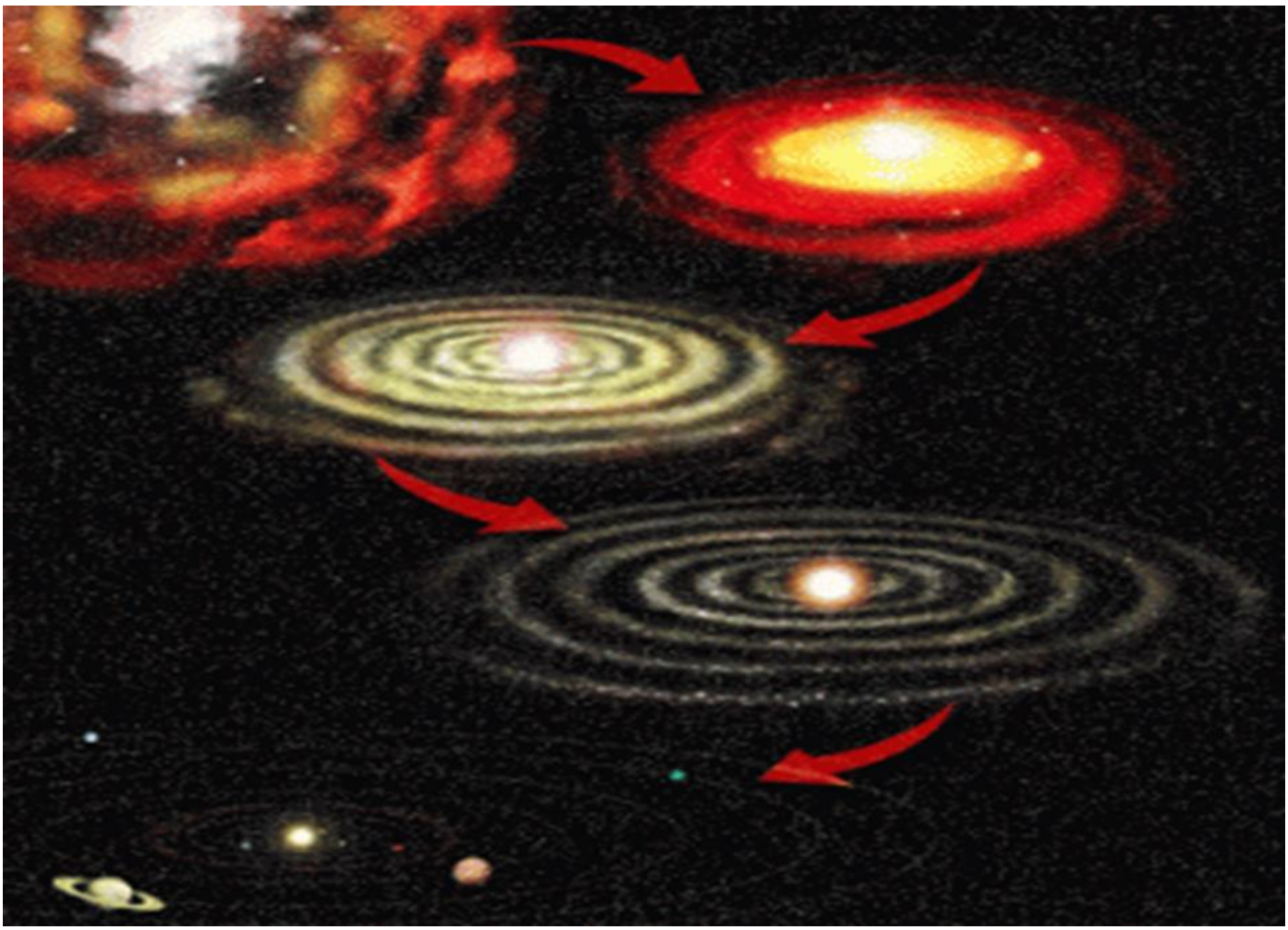
Victorian Astronomy is considered one of the oldest sciences where a lot of Victorian people, especially those from the middle class, participated in. Unlike most fields of sciences like, physics, chemistry, and medicine, the government did not fund the study of Astronomy. It was instead supported by various private sectors of the affluent men, or the Victorian upper class, as they show the most interest in this field of study.

The Nebular Hypothesis

William Whewell (1794 – 1866) in his *Bridgewater Treatise* suggested the Nebular Hypothesis to be the name of one of the major theories in astronomy that were discovered during the Victorian era. This suggestion adapted the findings of Pierre-Simone Laplace in his *System of the World* (1796) that nebulae might be a new emerging solar system.

Through the assistance of many upper classes, the building, and expansion of many astronomical conservatories and equipment were made possible. This followed the further study on the Nebular Hypothesis and various astronomical research outputs during the Victorian era. Refer to the diagram on the following page.

...Victorian Astronomy



Victorian Astronomy Discoveries

Various new technological advancements occurred during the Victorian era. In the field of Victorian Astronomy, spectroscope – an apparatus for producing and recording spectra for examination – and photography were introduced. These scientific materials allowed Astronomy to document data and images discovered and detected. For instance, Fraunhofer's discovery of 600 bands in the Sun spectrum followed the notion that stars are similar to Earth's sun but with a wide difference in temperature, masses and sizes.

Surely, Victorian Astronomy contributed a lot to the scientific discoveries during the Victorian era.

...Victorian Astronomy

Victorian Astronomical Images

Here are some of the images recorded during the Victorian era:

Left: The Great Comet of 1851

Below: The planet Jupiter

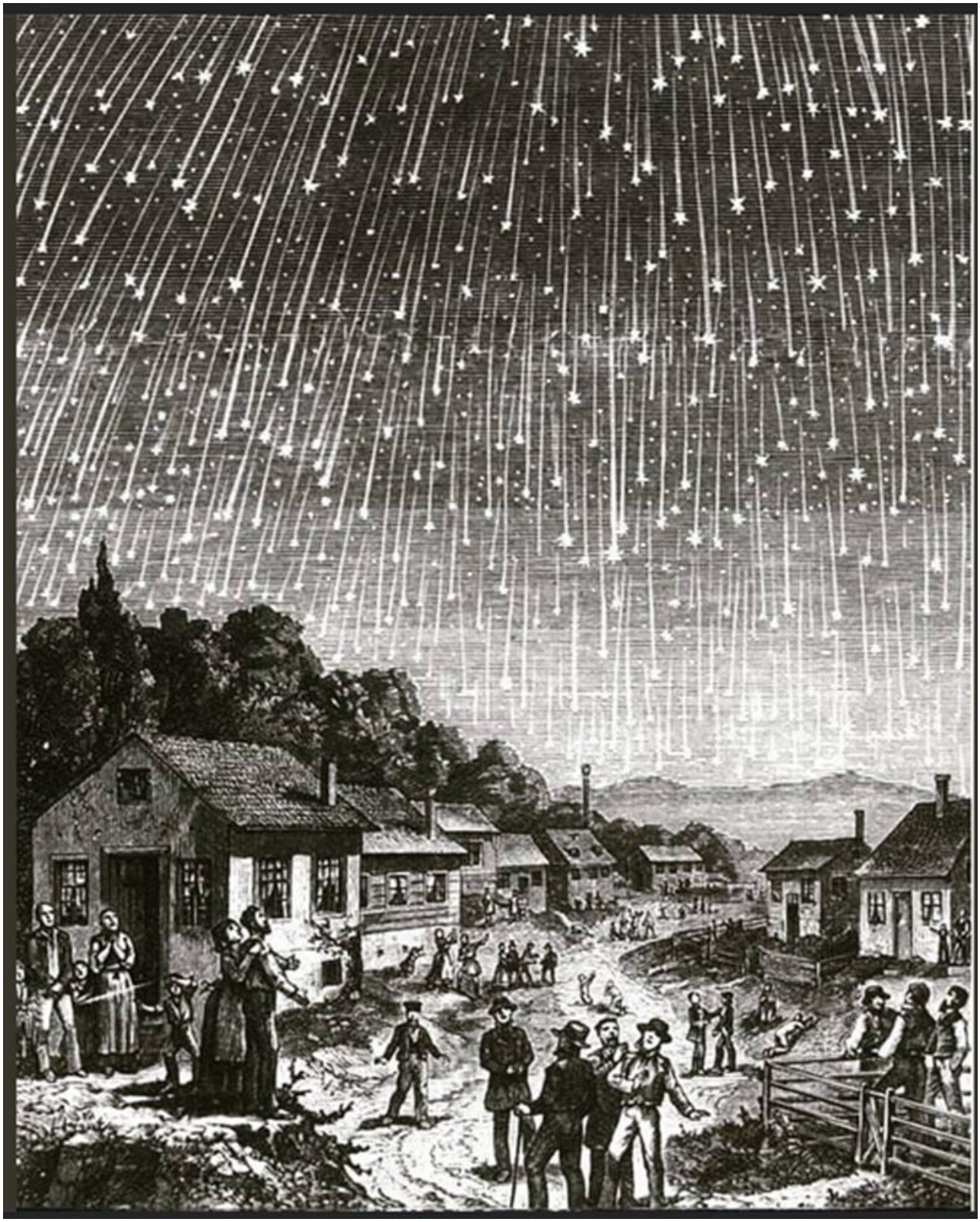
...Victorian Astronomy

Left: Total Eclipse of the Sun

Left: The planet Mars

Left: The Great Nebula in Orion

...Victorian Astronomy



On November 12, 1833, there was a meteor shower so intense that it was possible to see up to 100,000 meteors crossing the sky every hour. At the time, many thought it was the end of the world, so much so that it inspired this woodcut by Adolf Vollmy. The sky was scored in every direction with shining tracks and illuminated with majestic fireballs. At Boston, the frequency of meteors was estimated to be about half that of flakes of snow in an average snowstorm. Their numbers ... were quite beyond counting; but as it waned, a reckoning was attempted, from which it was computed, on the basis of that much-diminished rate, that 240,000 must have been visible during the nine hours they continued to fall. "- Agnes Clerke's, Victorian Astronomy Writer.

International Space Station
Ground Facilities

United States of America: National Aeronautics and Space Administration (NASA)

NASA Headquarters (HQ)
NASA headquarters, in Washington, D.C., exercises management over the NASA Field Centers, establishes management policies, and analyzes all phases of the ISS program.

Johnson Space Center (JSC)
Johnson Space Center in Houston, directs the station program. Mission control operates the U.S. on-orbit segment (USOS) and manages activities across the station in close coordination with the international partner control centers. JSC is the primary center for spacecraft design, development, and mission integration. JSC is also the primary location for crew training.

Kennedy Space Center (KSC)
Kennedy Space Center, in Cape Canaveral, Fla., prepares the station modules and space shuttles for each mission, coordinates each countdown, and manages space shuttle launch and post-landing operations.

Marshall Space Flight Center (MSFC)
Marshall Space Flight Center's Payload Operations and Integration Center (POIC) controls the operation of U.S. experiments and coordinates partner experiments aboard the station. MSFC oversaw development of most U.S. modules and the station's Environmental Control Life Support System.

Telescience Support Centers (TSCs)
Telescience Support Centers around the country are equipped to conduct science operations on board the station. These TSCs are located at Marshall Space Flight Center in Huntsville, Ala.; Ames Research Center (ARC) in Moffett Field, Calif.; Glenn Research Center (GRC) in Cleveland; and Johnson Space Center in Houston.

The control centers of NASA are:

- NASA - Payload Operations and Integration Center (POIC), Marshall Space Flight Center in Huntsville, Ala.;
- NASA – Mission Control Center (MCC), Houston;

NASA's Payload Operations Center serves as a hub for coordinating much of the work related to delivery of research facilities and experiments to the space station as they are rotated in and out periodically when space shuttles or other vehicles make deliveries and return completed experiments and samples to Earth.

The payload operations director leads the POIC's main flight control team, known as the "cadre," and approves all science plans in coordination with Mission Control in Houston, the international partner control centers and the station crew.

...ISS

Russia: Roscosmos, The Russian Federal Space Agency

Roscosmos oversees all Russian human space flight activities.

Moscow Mission Control Center (TsUP)
Moscow Mission Control Center is the primary Russian facility for the control of Russian human spaceflight activities and operates the station's Russian segment. It is located in Korolev, outside of Moscow, at the Central Institute of Machine building (TsNIIMASH) of Roscosmos.

Gagarin Cosmonaut Training Center (GCTC)
The Gagarin Cosmonaut Training Center (GCTC), at Zvezdny Gorodok (Star City), near Moscow, provides full-size trainers and simulators of all Russian station modules, a water pool used for spacewalk training, centrifuges to simulate g-forces during liftoff, and a planetarium used for celestial navigation.

Baikonur Cosmodrome
The Baikonur Cosmodrome in Kazakhstan is the chief launch center for both piloted and unpiloted space vehicles. It supports the Soyuz and Proton launch vehicles and plays an essential role in the deployment and operation of the station.

The control centers of Roscosmos are:

- Roscosmos – Flight Control Center (TsUP), Korolev, Russia;
- Roscosmos – Transport Vehicle Control Room, Korolev, Russia;

Canada: Canadian Space Agency (CSA)

Mobile Servicing System (MSS) Operations Complex (MOC)
Located in Saint Hubert, Quebec, the MSS Operations Complex is composed of the following facilities:

- Space Operations Support Center (SOSC)
- MSS Operations and Training System (MOTS)
- Virtual Operations Training Environment (VOTE)
- Canadian MSS Training Facility (CMTF)

These facilities provide the resources, equipment and expertise for the engineering and monitoring of the MSS and provide crew training on Canadian systems.

Space Station Remote Manipulator System (SSRMS) Design and Development
The SSRMS was designed and built for the CSA by MDA of Brampton, Ontario.

Payload Telescience Operations Centre (PTOC)
The PTOC in Saint Hubert supports real time operations for Canadian Payloads onboard the station.

The control centers of CSA are:

- CSA-Payloads Operations Telesciences Center, St. Hubert, Quebec, Canada;
- Canadian Space Agency Mission Control Center (CSA-MCC), Longueuil, Quebec, Canada

...ISS

Europe: European Space Agency (ESA) European Space Research and Technology Center (ESTEC)

The European Space Research and Technology Centre in Noordwijk, the Netherlands, is the largest ESA establishment, a test center and hub for European space activities. It has responsibility for the technical preparation and management of ESA space projects and provides technical support to ESA's ongoing satellite, space exploration, and human space activities.

Columbus Control Center (COL-CC) and Automated Transfer Vehicle Control Center (ATV-CC) Two ground control centers are responsible for controlling and operating the European contribution to the station program. These are the Columbus Control Centre and the Automated Transfer Vehicle (ATV) Control Center. The COl-CC, located at the German Aerospace Center (DLR), in Oberpfaffenhofen, near Munich, Germany, controls and operate the Columbus laboratory and coordinates the operation of the European experiments. The ATV-CC, located in Toulouse, France, on the premises of the French space agency, Centre national d'Etudes Spatiales (CNES), operates the European ATV during the active and docked mission phases of the ATV.

Guiana Space Center (GSC)

Europe's Spaceport is situated in the northeast of South America in French Guiana. Initially created by CNES, it is jointly funded and used by both the French space agency and ESA as the launch site for the Ariane 5 vehicle.

European Astronaut Center (EAC)

The European Astronaut Centre of the European Space Agency is situated in Cologne, Germany. It was established in 1990 and is the home base of the 13 European astronauts who are members of the European astronaut corps.

User Centers

User Support and Operation Centers (USOCs) are based in national centers distributed throughout Europe. These centers are responsible for the use and implementation of European payloads aboard the ISS.

The control centers of ESA are:

ESA - Columbus Control Center (Col-CC), Oberpfaffenhofen, Germany (near Munich**);**

- ESA ATV – Control Center, Toulouse, France;
- ESA – European User Support Operations Centers:
- CADMOS, Toulouse, France
- MARS, Naples, Italy
- MUSC, Cologne, Germany
- B-USOC, Brussels, Belgium
- E-USOC, Madrid, Spain
- DAMEC, Odense, Denmark
- BIOTESC, Zurich, Switzerland

Right: Sun Halo on 13 January 2022 - Captured by John Gill with a cell phone

...ISS

Japan: Japan Aerospace Exploration Agency (JAXA)

In addition to the JAXA headquarters in Tokyo and other field centers throughout the country, Tsukuba Space Center and Tanegashima launch Facility are JAXA's primary ISS facilities.

Tskuba Space Center (TKSU)
JAXA's Tsukuba Space Center (TKSU), located in Tsukuba Science City, opened its doors in 1972. The TKSC is a consolidated operations facility with world-class equipment, testing facilities, and crew training capabilities. The Japanese Experiment Module (JEM) or "Kibo," which translates in English as "Hope," was developed and tested at TKSC for the station. The Kibo Control Center plays an important role in control and tracking of the Japanese laboratory.

Tanegashima Space Center (TNSC)
The Tanegashima Space Center is the largest rocket launch complex in Japan and is located in the south of Kagoshima Prefecture, along the southeast coast of Tanegashima. The Yoshinobu launch complex is on site for H-IIA and H-IIB launch vehicles. There are also related developmental facilities for test firings of liquid- and solid-fuel rocket engines.

The control centers of JAXA are:

Japan Experiment Module Mission Control (JEMMC), Tsukuba-shi, Ibaraki, Japan;

Research and Technology Facilities

Managing the international laboratory's scientific assets, as well as the time and space required to accommodate experiments and programs from a host of private, commercial, industry and government agencies nationwide, makes the job of coordinating space station research critical.

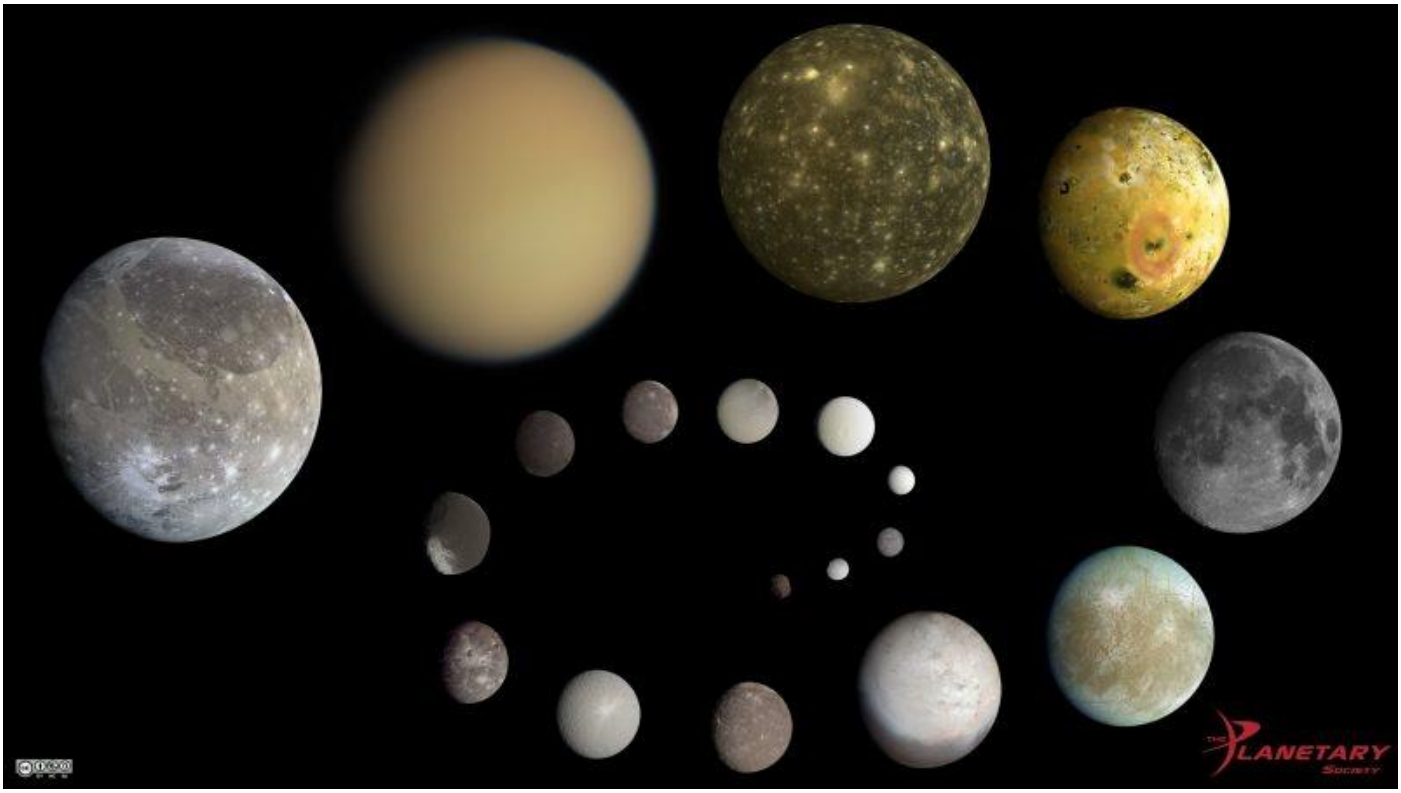
Flight controllers on console in the Mission Control Center monitor the undocking of the Expedition 42 crew in the Soyuz TMA-14M spacecraft from the International Space Station March 11, 2014.

Teams of controllers and scientists on the ground continuously plan, monitor and remotely operate experiments from control centers around the globe. Controllers staff payload operations centers around the world, effectively providing for researchers and the station crew around the clock, seven days a week.

State-of-the-art computers and communications equipment deliver up-to-the-minute reports about experiment facilities and investigations between science outposts across the United States and around the world. The payload operations team also synchronizes the payload time lines among international partners, ensuring the best use of valuable resources and crew time.

Can Moons have Moons?

by Paul Scott Anderson



Size comparison of the major moons in our solar system via Emily Lakdawalla.

Most of the planets in our solar system have orbiting moons, and even some asteroids have their own moons. But do any *moons* have moons? Is it possible? Could there be so-called *submoons*? Carnegie Science's Juna Kollmeier said her 4-year-old son sparked her interest in this subject by asking this seemingly logical question. It's a simple enough question. If most other objects in the solar system can have moons, why not moons themselves?

Kollmeier decided to try to answer the question, along with her colleague Sean Raymond of Université de Bordeaux. Their results have now been published in a new peer-reviewed paper in the February 2019 issue of the *Monthly Notices of the Royal Astronomical Society*.

As explained by Raymond in a statement from Carnegie Science: Planets orbit stars and moons orbit planets, so it was natural to ask if smaller moons could orbit larger ones.

So far at least, no submoons have been found orbiting any of the moons considered most likely to support them – Jupiter's moon Callisto, Saturn's moons Titan and Iapetus and Earth's own moon. According to Kollmeier: The lack of known submoons in our solar system, even orbiting around moons that could theoretically support such objects, can offer us clues about how our own and neighboring planets formed, about which there are still many outstanding questions.

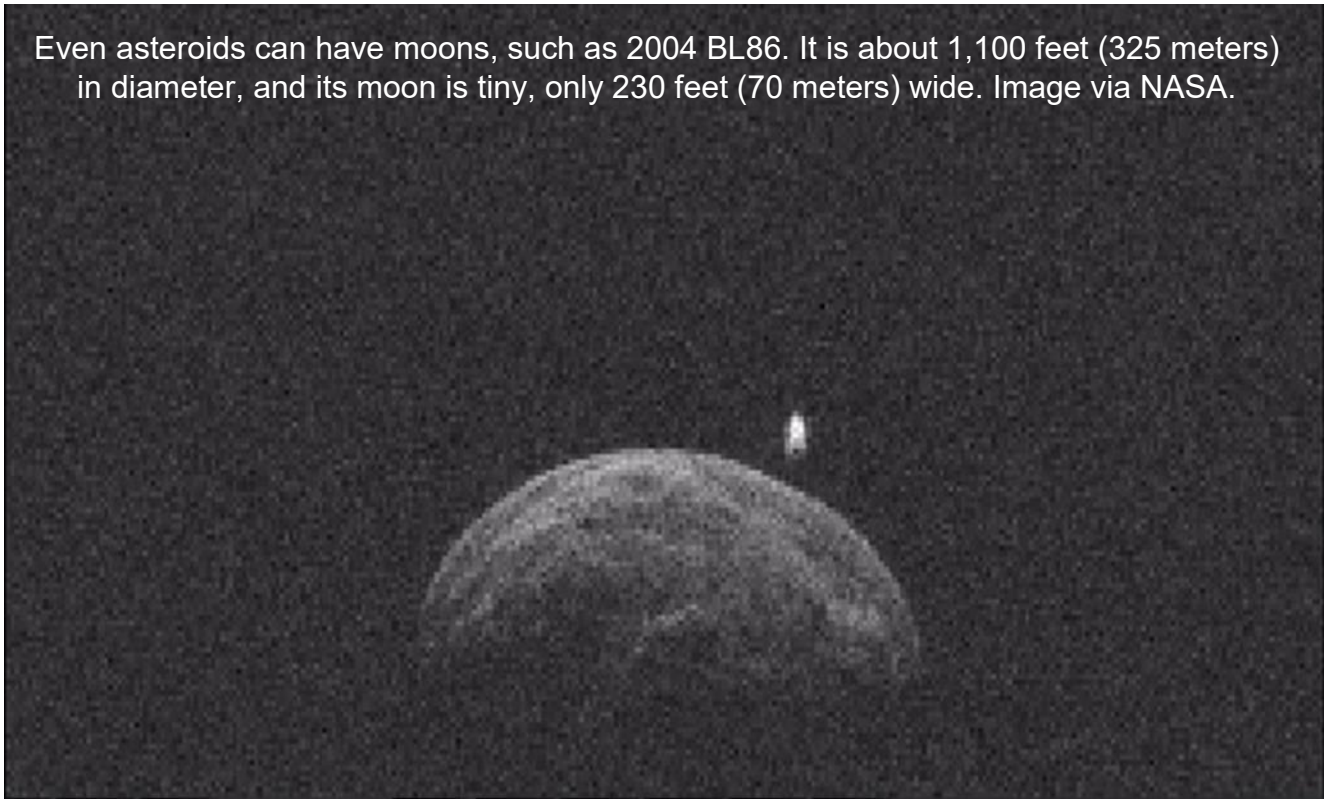
The researchers found that only large moons on wide orbits from their host planets would be capable of hosting submoons. Usually, any submoons orbiting smaller moons closer to their planet would have their orbits destabilized by tidal forces. Jupiter's large moon Callisto, Saturn's large moon Titan, another Saturn moon called Iapetus and Earth's moon could all theoretically have submoons, so why don't they?

...Can Moons have Moons?

Earth’s moon should theoretically be able to have its own moon. Why doesn’t it? Image via NASA/Goddard.

There may be other sources of submoon instability, such as the non-uniform concentration of mass in Earth’s moon’s crust, according to the researchers.

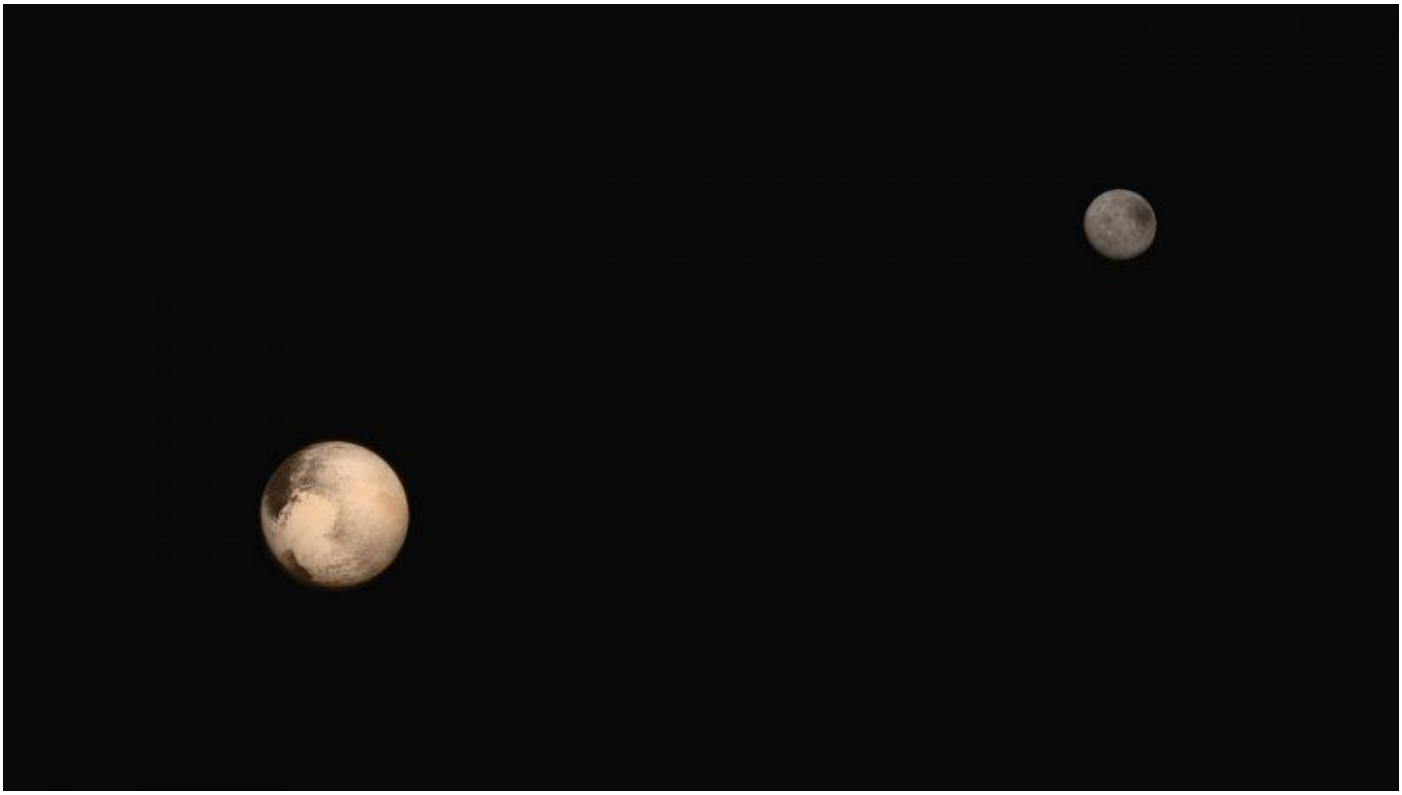
Even asteroids can have moons, such as 2004 BL86. It is about 1,100 feet (325 meters) in diameter, and its moon is tiny, only 230 feet (70 meters) wide. Image via NASA.



...Can Moons have Moons?

Part of the answer might also have to do with how the primary moons formed in the first place. Earth's moon is thought to have been born out of a collision between Earth and another body about the size of Mars – and that collision may have helped life on Earth to get started. But some other moons, like those orbiting Jupiter and Saturn, originated from the same cloud of gas and dust that the planets themselves formed from. Kollmeier added: And, of course, this could inform ongoing efforts to understand how planetary systems evolve elsewhere and how our own solar system fits into the thousands of others discovered by planet-hunting missions.

It may be that in many or even most cases, there are multiple factors that make the orbits of submoons inherently unstable. Knowing whether that is true or not may have to wait for discoveries of moons orbiting distant exoplanets. Moons themselves are much harder to detect and only one promising candidate has been found so far – a possible exomoon orbiting the Jupiter-sized exoplanet Kepler-1625b. That possible moon – about the size of Neptune – is large enough and far enough from its planet that submoons should be possible as well. Astronomers will need to verify that primary moon first – if it does exist – before looking for any submoons.



Even little Pluto has *five* moons, including the largest one – Charon – shown here. So how many moons with their own moons could there be out there? Image via NASA/JHUAPL/SWRI.

Even though Earth's moon doesn't have a submoon now, it may in the future, according to the researchers – an *artificial one*, perhaps NASA's planned Lunar Gateway. The Lunar Gateway would help to establish humanity's presence in deep space, as outlined by William Gerstenmaier, associate administrator of Human Exploration and Operations Mission Directorate at NASA Headquarters:

The Gateway will give us a strategic presence in cislunar space. It will drive our activity with commercial and international partners and help us explore the Moon and its resources. We will ultimately translate that experience toward human missions to Mars.

Bottom line: The possibility of moons having their own moons is a fascinating one, even though we haven't found any examples yet. This new research from Carnegie Science shows that it is indeed *possible*, but only under the right circumstances.

Can Moons Orbit Moons?

the poem by Sean Raymond

Can moons orbit moons? wondered Juna and I.
Some planets have moons, you know, up in the sky
But none of those moons has its own moon around it.
When Juna's son learned this he just was astounded!
We wanted to figure it out, solve the mystery:
Where did those moons of moons go? What's their history?

And one thing that gave this another dimension
The exomoon candidate got our attention.
When Teachey and Kipping found evidence for it
Those submoons called up and we couldn't ignore it.

"Submoons" or "moonmoons" — now what's in a name?
A name tends to stick so it shouldn't be lame.
What should we call them? There's oodles of choices
And plus, thanks to Twitter, there's millions of voices.
There's lots of opinions, there's: moonmoons, mooncitos,
There's moonlets and lunettes and planet burritos.

It's only a name, there's no science or glory
I'm sticking with *submoons*. Now, back to our story…

Around every planet there's sort of a zone
In which a moon's stable if left all alone
It orbits in peace 'round the planet in charge
And up in its sky, well, that planet looms large.
And 'round every moon there's a similar space,
A submoon in there should just orbit in place.

Where things can get messy and fall off the table:
It's tides, it turns out, that can make things unstable
The planet's large gravity tugs on the moon
And stretches it out like a poodle balloon

When stretched out, its gravity changes a nick
The submoon can feel this and gets a small kick
The kicks push the submoon first to and then fro
Its orbit can either get smaller or grow.
The submoon can crash down upon the moon's lawn
Or else can be pushed out until it's just gone

The very best spot for a submoon to thrive
Is 'round a big moon. And to help it survive
The moon also needs to be far from its planet
And that applies whether it's icy or granite.

There's three or four moons in our system that work
Around which a nice stable submoon could lurk
There's our Moon, Callisto and also Iapetus
(a weird moon of Saturn's — now let's check my abacus).

If submoons are stable, then where could they be?
Those moons don't have submoons. No, none of the three. **...**

…Can Moons Orbit Moons?

For Earth's Moon, we think at the time of its birth
Its orbit was much much much closer to Earth
So even though submoons are stable there now
They never could form. They just didn't know how.

Callisto is one of the moons Galilean,
There's four around Jupiter with room to play in.
The gravity kicks from the moons all add up;
The safe zone for submoons just shrivels right up.

Iapetus *is* kinda weird. Just a smidge.
Along its equator it's got a long ridge
We think that a submoon *did* form up around.
The ridge was produced when the submoon crashed down.

The exomoon candidate's really quite big
With plenty of space for a sweet submoon rig.
The bad thing is submoons are real hard to find
And, to *exo*-submoons we're totally blind.

Moons might be friendly to life, up in space.
So what about submoons? Are they a good place?

To have a big submoon that might have tectonics
And don't forget water (and, yes, gin and tonics)
The host moon must be pretty big and quite far.
It also should orbit a pretty big star.

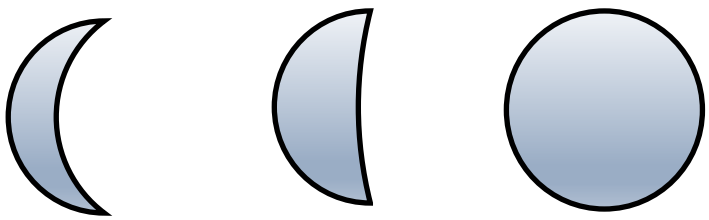
For big stars the hab zone is farther away
And planets out there give moons more space to play
Tides are much weaker, so submoons can thrive
Even a submoon like Earth might survive!

Let's not hold back. Let's see this thing through.
Subsubmoons: could they exist out there too?
The answer is yes but they'd have to be wimpy
'Cuz tides get so strong that the stable zone's shrimpy.

And now a last thought: tell me, what should humanity
Do just in case we succumb to insanity?
Where can we stash all the best things we've done:
Inventions, discoveries, art by the ton?

A human-made submoon that orbits the Moon
Could hold all that stuff in a giant cocoon.
For billions of years it could tell our last fable
(Although we should make sure its orbit is stable).

And now we are done. So I'll head off to bed
With visions of submoons afloat in my head….



ASSA Durban Minutes of General Meeting
2022-01-12 Via Zoom

1. **Welcome (Durban meeting):**
   - The Chairman, Amith Rajpal, welcomed all attendees, and visitors.

2. **Guest Speaker:**
   - Piet Strauss introduced the speaker. Dr Sinenhlanhla Sikhosana, who spoke about the "James Webb Telescope"

3. **Present and Apologies:**

Speaker:	Dr Sinenhlanhla Sikhosana
Present	ASSA - DBN Members
	ASSA - JHB Members
Apologies:	Sheryl Venter

4. **Previous meeting minutes:**
   - Minutes proposed by Graham Alston and seconded by Corinne Gill
   - There were no matters arising from previous minutes

5. **Finance:**
   - Corinne Gill presented Finance and Sky Guide reports

ASSA DURBAN FINANCIALS **2021/01/12**

Financials Meeting	Date	Current	Investment	Petty Cash
General Meeting	**2022-01-12**	**R 20 880,58**	**R 60 992,72**	**R 1 000,00**

ASSA DURBAN - MEMBERS

Date	No off	Paid Members	Honoury	Removed
2022-01-12	**124**	**120**	**4**	**0**

Membership App received - Awaiting payment

SURNAME	First Name	Title	Type	No off
Ramlall	Sunette			1
Xhakaza / Maukusa	Happiness / Nkosingiphile	Ptnrs	Fam	2

5.1 Sky Guides:
- 50 Sky Guides were ordered from ASSA.
- 34 sold, 16 remaining.
- ASSA delivered 20 Sky Guides too many. To be returned. Publisher to send courier.

6. **ASSA 100:**
   - Compiling history page to submit to ASSA National.
   - If anyone has a contribution, please contact Amith or Debbie

...Minutes of the Meeting

7. Events:
- x No new reports

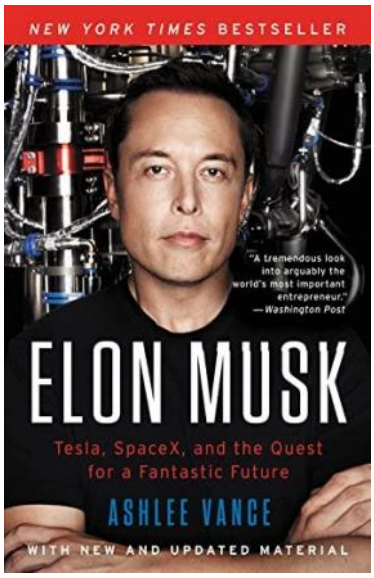
7.1 Viewing evenings
- x Local weather hampering viewing

8. General:
- x 'Dark Sky' initiative to be discussed by Amith at next meeting
- x The next General Meeting will be held at the year-end event on 9th February 2022
- x Times and venue details will be sent via email and WhatsApp
- X Young Astronomers WhatsApp group proposed by Corinne Gill for budding astronomers

9. Meeting closed:
- x The Chairman closed the meeting

Book Review

by Claire Odhav



ELON MUSK
A 2015 biography, by Ashlee Vance.

* This is the first book available in our soon to be (fingers crossed) digital library! If you would like to read it, contact the librarian for a PDF copy! (0833955160)

Veteran technology journalist Ashlee Vance offers an unprecedented look into the remarkable life of the most daring entrepreneur of our time. The book paints a portrait of a complex man who has renewed American industry and sparked new levels of innovation—from PayPal to Tesla, SpaceX, and SolarCity - overcoming hardship, earning billions, and making plenty of enemies along the way.

Elon Musk spotlights the technology and vision of Elon Musk, the renowned entrepreneur and innovator behind SpaceX, Tesla, and SolarCity, who sold one of his Internet companies, PayPal, for $1.5 billion. Ashlee Vance captures the full spectacle and arc of the genius's life and work, from his tumultuous upbringing in South Africa and flight to the United States to his dramatic technical innovations and entrepreneurial pursuits.

More than any other entrepreneur today, Musk has dedicated his energies and his own vast fortune to inventing a future that is as rich and far-reaching as the visionaries of the golden age of science-fiction fantasy.

For Sale - Between the Earth and the Moon

If you're looking for a challenge, try these unusual and cool 1000 piece circular puzzles of the Earth and the Moon. R 195:00 each.

Records stands at 6 hours for completing the Earth Puzzle.

Whose up for the challenge?

WhatsApp Claire on 083 395 5160 to order.

Public Viewing Roster ASSA Durban

Dome Master	Phone	Assistant	Telescope Volunteer	New Moon	Public Viewing
John Gill	083 378 8797	Alan Marnitz	Anyone	1 February	4 February
Mike Hadlow	083 326 4085	Alan Marnitz	Anyone	2 March	4 March

PUBLIC VIEWING RESUMED:

Public viewing is allowed back on site at the school in the dome and around the pool; due to revised lockdown level 1. This may change according to any revised lockdown conditions.

Please note there is a roster with a booking system. Once the number of telescopes are confirmed, Individuals will be contacted to confirm dates and times. Please book your place !

Kindly note, everyone will be required to adhere to the Covid & social distancing regulations of 1.5m and all will need to sign the attached mandatory questionnaire. Temperatures will also be taken on site.

NOTIFY OBSERVATORY MANAGER:

Members interested in attending the above viewing evenings and/or becoming involved in assisting with the viewing evenings, please send your names to Mike Hadlow at the following address: mike@astronomydurban.co.za

Volunteers to please identify which role you are willing to assist with, Dome Master, Viewing Assistant or a Telescope Volunteer.

After which, attendance will be confirmed and viewing dates will be announced.

VOLUNTEERS REQUIRED:

Dome Master - Taking responsibility for the viewing evenings and learning how to set up, manage and use the new telescope.

Viewing Assistant - Learning about the new telescope, assisting with the viewing evenings, assisting viewing members as required.

Telescope Volunteers - Members willing to bring their telescopes to the viewing evenings to set up around the pool for public viewing. **VOLUNTEERS REQUIRED:**

Viewing Contacts:	Phone	Email
Mike Hadlow	083 326 4085	mike@astronomydurban.co.za
Alan Marnitz		alan@astronomydurban.co.za
John Gill	083 3788 797	john@astronomydurban.co.za

2022 ASSA Sky Guide
Now available to members for only
R 100:00
Please deposit into the ASSA bank
Details on Noticeboard page.
Use your personal reference
SG - Surname & First Name
E-mail proof of payment to
treasurer@astronomydurban.co.za

Notice Board

MEETINGS:

- GENERAL MEETING: to be held on **9th February 2022**
- PUBLIC VIEWING MEETINGS - please refer to website under the tab "Viewing and Events" for any updates with regards dates & public viewing under the current Covid restrictions; or click here: https://astronomydurban.co.za/events-viewing/

MNASSA:

- Monthly Notes of the Astronomical Society of Southern Africa.
- Available at www.mnassa.org.za to download your free monthly copy.

NIGHTFALL:

- Fantastic astronomy magazine. Check it out.
- Available from the ASSA website assa.saao.ac.za/about/publications/nightfall/

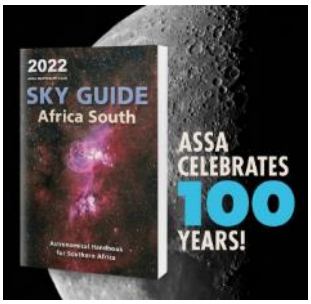
MEMBERSHIP FEES & BANKING:

- Many thanks to all the members who have paid their Membership fees for the 2021-07-01 to 2022-06-30 financial year.

Membership fees are indicated below:

- Single Members: R 170:00
- Family Membership: R 200:00 for parents
- Under 18 members: Free
- Cash/Cheques: Please note: NO cheques or cash will be accepted
- Account Name: **ASSA Natal Centre**
- Bank: **Nedbank**
- Account No. **1352 027 674**
- Branch: **Nedbank Durban North**
- Code: **135 226**
- Reference: **SUBS - SURNAME and FIRST NAME**
- Proof of Payment: treasurer@astronomydurban.co.za

Pay Fees Online



SKY GUIDE 2022 and ASSA MASKS - Limited number available !!!

- Sky Guides: R 100:00 each with payment reference: SG - SURNAME and FIRST NAME
- Masks: R 50:00 each with payment reference: MK - SURNAME and FIRST NAME

Please ensure proof of payment is sent to treasurer@astronomydurban.co.za

RESIGNATIONS from ASSA:

Please send an email immediately notifying the Secretary of your wish to resign from the society to : secretary@astronomydurban.co.za

NEW COMMITTEE POSITIONS & CONTACTS:

Chairman	Amith Rajpal	Amith@astronomydurban.co.za	
Vice Chair	Debbie Abel	Debbie@astronomydurban.co.za	
Secretary	Francois Zinserling	Secretary@astronomydurban.co.za	
Treasurer	Corinne Gill	Treasurer@astronomydurban.co.za	
Guest Speaker Liaison	Piet Strauss	Piet@astronomydurban.co.za	
Observatory & Equipment	Mike Hadlow	Mike@astronomydurban.co.za	083 326 4085
Observatory Assistant	Alan Marnitz	Alan@astronomydurban.co.za	
Publicity & Librarian	Claire Odhav	Claire@astronomydurban.co.za	083 395 5160
Out-Reach - Public	Sheryl Venter	Sheryl@astronomydurban.co.za	082 202 2874
Out-Reach - Schools	Sihle Kunene	Sihle@astronomydurban.co.za	
St. Henry's Marist College Liaison	Moya O`Donoghue	Moya@astronomydurban.co.za	
'nDaba Editor, Website & Facebook	John Gill	John@astronomydurban.co.za	083 378 8797

ELECTRONIC DETAILS:

- Website: www.astronomydurban.co.za
- Emails : AstronomyDurban@gmail.com
- Instagram: https://www.instagram.com/astronomydurban/
- Facebook: https://www.facebook.com/groups/376497599210326

For Sale - Telescope Stuff

Celestron CGEM Computerised Equatorial Go-To Mount

Mount, tripod and counterweight.
Includes an extra upgraded USB port Nexstar Hand Controller.
All original boxes

Price: **R 20 000**

Contact: **Gerald de Beer**
Cell: **082 781 3888**
gerald@edpharm.co.za

3 x Explore Scientific Eyepieces

All in Immaculate (as new) condition, hardly used and in original packaging. All either nitrogen or argon filled. Quality engineering at its best.

82 Degree Series, 18mm focal length, 2” barrel
92 Degree Series, 12mm focal length, 2” barrel
82 Degree Series, 11mm focal length, 1.25” barrel
Purchased from B&H Photo for $ 800, $ 320 & $ 230

All three for sale for combined price of R 14 000

Jason de Beer – 083 257 1786
Jason.deBeer@cennergi.com

Astrophotography Filters

Baader 1.25 inch / 32 mm filters

Luminance (clear), Red, Green, Blue, and a UV/IR – Cut/L filters.

Narrowband Ha 7nm, Oiii 8.5nm and Sii 8.0nm.

Still in the original packaging. Have never been opened.

Originally Paid: R 12 000

Asking Price: **R 10 000**

CONTACT: **Johnny Visser**

Cell Number: **082 357 3091**

Email address: ximatrix@telkomsa.net