



Sacramento Valley Astronomical Society

BSEERVER

MAY 2020

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Board Members

President: Charles Real

Vice President Raj Dixit

Secretary: Gerald Dubesa

Treasurer: Kevin Normington



Website:

<https://svas.org/>

Forums:

<https://groups.io/g/SVASMembers>

Donations:

<https://www.paypal.com/us/fundraiser/charity/2250668>

Directors: Michael Bailey, Thomas Braun,

Niklas Henricson, Charles Jones, Lonnie Robinson

The Sacramento Valley Astronomical Society (SVAS) is a nonprofit educational society. One of the oldest astronomical societies in the United States, it was founded in 1945 by 50 local astronomy enthusiasts. SVAS members range from young students and amateurs curious about the night sky to many college professors and even a world-famous comet hunter.

The SVAS serves the community of Northern California through its successful and long-standing Outreach programs and its membership through programs such as telescope workshops, loaner telescopes program and member star parties. The SVAS maintains an Observatory on Forest Service lands high in the Sierra Mountains for use by its members.

Meetings Location:

Sacramento Public Library,

Carmichael Branch

5605 Marconi Ave

Carmichael CA 95608



Front & Back Cover Image: The Pleiades (*/ˈpliːədiːz/, /ˈplaiədiːz/*), also known as the Seven Sisters and Messier 45, are an open star cluster containing middle-aged, hot B-type stars in the north-west of the constellation Taurus. It is among the star clusters nearest Earth and is the cluster most obvious to the naked eye in the night sky.

Photographer: Brian Peck (<https://www.peck.photos/>) October 2, 2019 - Blue Canyon Observatory

ABOUT BRIAN PECK

My name is Brian Peck and I have been a photographer since I bought a Canon AE-1 when I was 12 years old. A few of the pictures on the Misc page go back to those early days. Over the years, my interests have mostly been in landscapes and birds. I spent 21 years on active duty in the Air Force and my 15 years flying the U-2 gave me a unique perspective for photography. I was a physics major in college and for many years, I wanted to combine my love of science and photography and do astrophotography. The great eclipse in August 2017 was what finally motivated to to make the leap. I have been obsessed with astrophotography ever since and sharing my work is the main reason for this website.

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PRESIDENT'S PERSPECTIVE

Letter to SVAS members - May 2020

Who would ever think that as the Sierra winter snow melts and the night skies turn clear we would be facing a lock down at our Blue Canyon observatory. Times are indeed very different this year as the COVID-19 pandemic sweeps the world with global casualties exceeding 100,000 and California's approaching 1,500. As of late April, the number of cases in Sacramento has passed 1,000 and the number of casualties is near 50.

While this pales in comparison to New York, the virus is here, and the lower numbers throughout California are a reflection of lower population density and our Governor's quick action to impose "social distancing" and "shelter-at-home" directives. As inconvenient as they are these policies do appear to work, and we should restrain ourselves from ignoring them until our region's spread and loss rates have flattened and are heading downward, and health officials give the all clear.

Recently, my wife and I were invited to a neighbor's for a social distance backyard drink and while tentatively accepting, we were both shamed by our daughter who is an ER nurse at a downtown hospital where she assists with care of COVID-19 patients. The view is very different from the front line... No, we didn't accept the invite.

So, what can we do as amateur astronomy enthusiasts to combat the feeling of Ground Hog Day? We are, in fact, very lucky because while it is fun to share the hobby with friends and fellow members, amateur astronomy tends toward a solo challenge as you seek to capture the best image ever, or find that elusive comet or your favorite galaxy.

Now is the time to dust off your equipment and take on the city or suburban skies in your own backyard. See what is possible in the light-polluted sky using a sky glow filter or special imaging techniques. Practice your equipment setup, become more familiar with using your mount, collimate your scope, or practice polar alignment procedures until they are second nature.

Many how-to videos can be found on YouTube. Read up on new, fantastic objects to observe, and maintain connection with fellow SVAS members via groups.io or video conferencing. Engage in the forthcoming SVAS video program via ZOOM. The social restrictions will eventually be lifted, you will be free to mingle again, but you will then be able to hit the road running like never before when the dark skies are clear.

Charles Real

president@svas.org

President of SVAS

CHARLES REAL

SVAS New President

Hello fellow SVAS members, for newer members who may not know me let me begin by saying to all that I look forward to serving as your President. I believe my education and experience will be of value to our organization. For a little background, I have a Bachelor of Science Degree in Geology from California State University Northridge and a Master's Degree in Geological Sciences from the University of Southern California focusing on applied geophysics and seismology. As a career earth scientist, my greatest accomplishment was conducting a feasibility study that led to my working with the California legislature and creating a program that designates regulatory earthquake hazard zones....those zones you may have encountered during disclosure when purchasing a home. For helping create and manage that program for more than 20 years, I received the 2013 Western States Seismic Policy Council Lifetime Achievement Award in Earthquake Risk Reduction.



My interest in science began with the childhood hobby of astronomy when my brother, who had lost interest in a small 2 1/4" inch Gilbert Newtonian reflector, gave it to me. I thank him dearly, for it took only my first look at the moon and I was hooked. I soon yearned for something larger and built a 4 1/4" reflector with parts from Edmund Scientific Co while in middle school. Back then you could easily see the Milky Way from suburbs of northern Los Angeles on a dark night. After having turned my eyes toward the earth during a 40-year career as an earth scientist with the California Geological Survey, I looked forward to returning to my childhood hobby and joined SVAS in 2009. I have been a SVAS board member then Vice President since then except for a one-year break while serving on the board of the Northern California Chapter of the Earthquake Engineering Research Institute in Oakland. What a time to be part of SVAS, as I believe we are experiencing a renaissance in astronomy given the tremendous impact technology is having on observing and analysis of data, and that is having a trickle down effect on amateur astronomy. It has been exciting for me to find that some of the technology in remote sensing and image processing experienced during my career is now available at modest

cost to the amateur astronomer. Since joining SVAS my challenge has been to discover to what degree this technology can improve observing the night sky through a vintage 1980's Celestron C-8 telescope... and the results are nothing short of astounding.

My interest in observing deep sky objects has led to video-astronomy, the use of video technology to rapidly gather more light than viewing through optics alone. Unlike astrophotography, which gathers more light by long camera exposures, video technology utilizes rapid frame integration that enables viewing of faint deep sky objects in seconds...in color. The trade off, however, is that while speedy, such images do not have the fine spatial resolution produced by astrophotography cameras. With an interest in observing rather than astrophotography, my vintage C-8 performs more like a 20-inch optical telescope, and my inventory of faint deep sky objects captured keeps increasing....what fun. Although video astronomy may not be for everyone, it greatly enhances observing without the need for larger, heavier telescopes, and can provide some relief for aging eyes. It is another facet of amateur astronomy shared by our organization. Having adjusted to retirement, I hope to bring my abilities and experience as a scientist and program manager to bear on the future of SVAS, and look forward to helping improve our society by continuing to seek input from our general membership in order to revitalize and help shape the future of SVAS.

Charles Real - May 2020

RAJ DIXIT

SVAS New Vice President

Raj K. Dixit, SVAS's new Vice President, joined SVAS in late 2015. His interest in astronomy was inspired by his late father. When Raj was a boy, he used his father's homemade 6" Newtonian on an equatorial mount (scope made before Raj was born). He even took a community college course on Astronomy while in high school, during the summer.

However, college, then law school, and then life's busy pace caused Raj to fall out of the hobby for many years. In the summer of 2015, Raj was browsing online news articles about the upcoming Perseid meteor shower. One story had a link to Orion Telescopes & Binoculars. Soon, Raj found himself the owner of a new 8" Dobsonian, with which he hunted down several dozen Messier objects. The interest in the hobby had returned full force! Soon the 8" was upgraded to a 10" IntelliScope Push-To Dob, with which Raj completed the Messier Catalogue and the Herschel 400. Last year, the 10" was raffled off at Star BBQ, as Raj had upgraded to an Orion 16" GoTo Dob, which he just can't get enough of.

Raj's favorite observing targets are faint fuzzies, followed by Saturn and Jupiter. He's halfway through the Herschel 400 Part 2 list, but recent events have curtailed his (ok, everybody's) opportunities for observing - although he was lucky enough to see Comet ATLAS (C2019/Y4) in his 16x70 binoculars before it broke up.

After a few months of membership, Raj became Secretary of SVAS, but had to leave that position due to obligations imposed by a job switch (he is an attorney for the State of California). Recently, Raj received the honor of being asked to rejoin the Board of Directors as Vice President, which he accepted. Raj enjoys giving presentations at general meetings, and has done so several times on various subjects. He also enjoys school star parties, as he loves showing kids the wonders of the cosmos. And of course, the highlight of every year for Raj is Star BBQ, which often falls close to his summertime birthday.



NIKLAS HENRICSON

SVAS New Editor



It is always hard writing something about yourself and trying to remember certain events that shaped my interest in astronomy and science overall. I was born in Stockholm, but spent my childhood on a little Mediterranean isle called Crete in a little town called Agios Nikolaos (<https://youtu.be/T6pgm6i5uLs>) with no more than 8,000 people (back in my days). My grandfather was a retired infantry general in the Greek army and had a bunch of binoculars and refractors at his home. The summers were astonishingly beautiful on Crete, making me

spend countless of hours stargazing through these refractors discovering globular clusters, looking at the Andromeda galaxy, studying the topology of the moon's surface and was wondering how it would be to travel to these distant worlds...

I remember clearly the sounds and smells from the local bakeries, to local coffee shops where you could buy freshly roasted coffee beans, to Wednesday's flea markets opening from 7 am in the mornings all day long, filled by vegetables, fruits, among many other things... Summers also meant for me a three months long break from school. Luckily my grandfather had a large library and a large collection of science books and most importantly books about astronomy and Greek mythology. I could spend hours long sessions browsing the night sky images and studying astronomy charts.



As years passed by, around 1996 I moved back to Stockholm, Sweden. It didn't take long before I became a member of Stockholm's Astronomical Society that historically originated by the merge (back in the 60-ies), of three of the oldest astronomy societies in the royal capital. We had access to numerous observatories around the city, some modern some old historic ones that were only preserved for visitors from outside.

Around 2009 I moved to south Sweden in a city called Lund to be able to stay closer to my family. At that point I joined the Astronomical Society of Tycho Brahe and became a board member its director of observatory.

In the meantime I was studying physics at the Lund University, but due to unexpected life events I returned back to IT and continued working as a software engineer. Some years later, around 2016 I left Sweden and moved in with my wife and children in Folsom, CA.

Today I'm still working as a software engineer and been lately developing a system for our CA governor's office. In my free time I try to travel as often as I can to our Blue Canyon Observatory (HGO) where I meet our club members and where I practice astrophotography with my William Optics refractor telescopes.

Niklas Henricson
May 2020

EDITOR'S NOTES



Dear SVAS member,

It is with great honor and excitement I've accepted my participation in the editing and publishing responsibility of the Observer. In these unusual days it becomes even more important to keep our members together and well-informed by providing more exciting content through a series of scientific news and information about upcoming changes both within SVAS but the global astronomical community as a whole.

In the groups.io there was a poll to begin using Zoom-conference system. After some careful consideration, it seemed that the sound and video quality is by far more appealing than the remaining counterpart video-conference software on the market. It is free to download and user-friendly through its settings and other available functions.

When it comes to the Observer, we have a new appearance, exciting content and we also ask members that are interested in writing articles to contact us. Any help will be greatly appreciated and will provide the Observer magazine with more content, thus turning it from a newsletter to a magazine-format. Do not hesitate to contact any member of the board for more information on how to get yourself involved in that area!

There will also be some upcoming changes with the Blue-Canyon observatory once things ease out with this pandemic. There are some exciting plans and ideas that will enhance our observatory by resolving certain practical issues and making it easier to slide the roof thus saving us time and energy for our observing sessions and most importantly provide safety for our equipment and the observatory as a whole against the elements.

I would also like to express a special appreciation and gratitude that goes to all members who provided the Observer with their amazing photos! We found them very inspiring, truly amazing and beautiful and despite that some were taken in light polluted areas around our greater Sacramento areas, you can clearly tell the great effort and patience many of you had to bring out these astonishing details in nebulae, galaxies and other faint night-sky objects! We'll be using these photos on the front cover one by one as we publish forthcoming issues of the Observer. So please, keep them coming! Also, do not miss out the articles in regards to astrophotography and the May-June night sky. We're privileged to have some really beautiful skies in California so take the chance of going outside now more than ever with either your telescopes or binoculars. But remember for everyone's safety to keep social distancing measures.

For members who didn't know already, there's a completely free software that runs in all platforms (Windows, Linux and Mac OS) where you can explore planets, see the positions in all kinds of objects, download databases for the newest comet and Near Earth Objects (NEO) passages, moon phases, the ability to command remotely your telescope, extract star charts and many more features. You'll also be able to download other plug-ins for additional functionality. The software I'm writing about is called Stellarium and can be found at, <http://stellarium.org>

Finally, a reminder to all members, especially in these challenging times; in order to be updated on urgent news and board announcements please visit our website <http://svas.org> from time to time. New members will also receive an invite through e-mail to join our forums and participate in discussions located at <https://groups.io/g/SVASMembres>. We hope that you'll be enjoying this issue's content!

Niklas Henricson

director-niklasnenricson@svas.org

Editor of SVAS Observer, May 2020

TELESCOPE WORKSHOP



Just a note to let everyone know the Telescope Workshop is alive and well, and to welcome our new Newsletter Editor Nick Henricson! I am here to help if you would like to make a 10" to 20" mirror by your self, build your own Dobsonian telescope, add optical encoders for push-to or motorized go-to on your telescope project, or fine tune telescope mounts to improve encoder accuracy. OK, I know that's all technical stuff. Experience has shown most SVAS members just need a little help keeping their optics clean and aligned, along with adding accessories like dovetail mounts for finders. I'm looking forward to our next Telescope Workshop, one was planned for early this spring before the Covid-19 health crisis. It's great fun helping with your telescope issues, and even more fun getting to know you all. Feel free to email me, my contact link is on our website under the SVAS Board.



I've been busy using this pandemic isolation time learning more about using my mirror making machine, and I'm confident that process will never end. Every time I think I know it all, that upstart machine reminds me who's boss. All spring long I have worked on perfecting a 16" f/4.5 for my own telescope, using a new comprehensive all mirror test I developed called EZ Hartmann. About 2010, I ran across a 1940's article in Amateur Telescope; Observatories, The Hartmann Method of Testing From Amateur to Pro, written by Dr. James Cuffy. He wrote about a simplified Hartmann test using only one photo instead of the customary two, and substituting known mask hole locations for the second

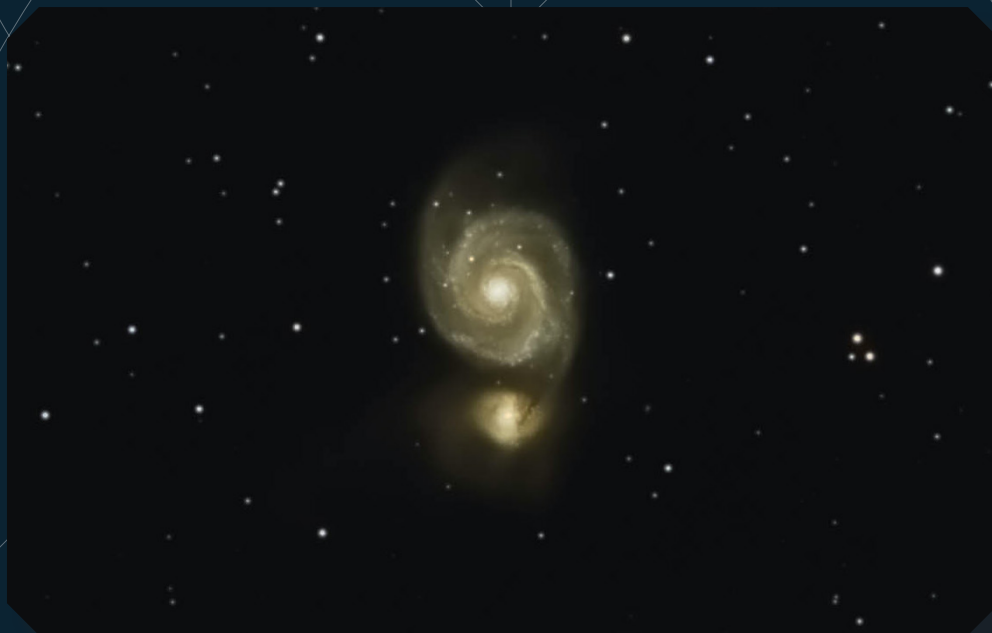
photo. He mentioned this test has been all but ignored by the ATM community, and suggested it could be used by amateurs for all aspects of mirror making. Using his single camera process and William A. Calder's 1949 formula, I wrote an Excel worksheet for the EZ Hartmann test. It has roots dating back to 1900 when the original Hartmann test was created, and it's still used to this day by major observatories star testing their mirrors. A similar test is being used by the Richard F. Caris Mirror Lab at the University of Arizona, a reverse Hartmann called SCOTS (Software Configurable Optical Test System). It's claimed to be as accurate and complete as interferometry, less costly, and far simpler to implement. The simplified Hartmann is also described in Amateur Telescope Making by Ingalls and Richard Suiter's Star Testing Astronomical Telescopes. The EZ Hartmann test reveals a multitude of overall surface errors, detects astigmatism anywhere on the mirror, and elevates the required mirror making skills by a difficulty factor of seven! How did I arrive at the number seven? There are eight edge to center ranges on my mirror mask, and they provide seven times more surface slope data than Foucault testing. Foucault only returns data for a single range, incorrectly assumes the rest of the mirror is identical, and hides numerous potential errors. You can only make a mirror as good as your test! What an unusual springtime from the almost total lack of traffic on my street, needing a haircut big time, shopping while wearing a custom star covered face mask, to social distancing and general isolation. I hesitate saying hello to my mailman; last time he needed to talk to someone and it lasted for 45 minutes! I was thinking since I was retired, things wouldn't change a lot, but it's all the little things we take for granted that I miss. I'm photon starved! Enough about isolation, we will soon be back together enjoying the night skies. The HGO maintenance committee is hard at work planning on a mid June work party to replace HGO's front door and installing metal siding all around the exterior. The HGO Powered Roof committee is gearing up (pun intended) to get this long awaited project in the works. Our slide off roof seems to be getting more difficult for me operate alone, it couldn't be I'm just out of shape! All this starts me thinking about hot coffee and doughnuts under pristine Blue Canyon night skies? I have two favorite observing times at the beginning and end of each observing session. The first is right after sunset when the sky takes on a dark blue hue just prior to that first star appearing. The second is when I'm about ready to turn in and deciding which old friend in the sky to visit last. There is a peacefulness about each of these transition times, sitting back in my chair looking up pondering the vastness of the heavens and how we are all made from star stuff.

Until next time,
Lonnie Robinson
SVAS Board and ATM



MEMBER PHOTOS

*Send your images to director-niklashenricson@svas.org with a short description of the image itself. We will be publishing and archiving all images so that they get published on the front cover over the coming months.



The Whirlpool Galaxy (M51 / NGC 5194) - Radius 30,000 light years - Distance to earth 23.16 million light years - Age 400.3 million years - 100 billion stars. This amazing photo was taken by **Randolph Mohr** from his driveway in Citrus Heights! Here are some technical facts about this photo: Telescope: Stellarvue SVX102 Triplet - Mount: Skywatcher EQ6-r Pro - Camera/Sensor: ASI071mc Pro - Exposure: 100 x 1 minute flats with darks



Trifid Nebula (M20 / NGC 6514) in the constellation of Sagittarius it was discovered by Messier on June 5th, 1764. A beautiful photo of the nebula taken by **Jianheng Li**. Thank you for your contribution! Here are the technical facts about this photo: Telescope: GSO 10" f4 Newton - Camera/Sensor: ASI 1600mm (cooled) - Mount: Celestron's CGX - Filters used: Optolong R 36 mm, Optolong B 36 mm, Optolong G 36 mm, Optolong L 36 mm - Accessory: Skywatcher Coma Corrector



Messier 81 (NGC 3031) is a grand design spiral galaxy about 12 million light-years away, with a diameter of 90,000 light years, about half the size of the Milky Way, in the constellation Ursa Major. GSO 10" RC Truss, ASI 071 MC Pro , ASI 178 MC guide, Losmandy GII, Astro Physics .8 FR, Baader Moon and Sky Glow Filter, Polemaster, ASIAIR management, 120 x 60 sec. lights, master darks and flats, gain 90, temp. -10 PixInsight and Lightroom. **Image by David Scharlach**



The North America Nebula (NGC 7000 or Caldwell 20) is an emission nebula in the constellation Cygnus, close to Deneb (the tail of the swan and its brightest star). The remarkable shape of the nebula resembles that of the continent of North America, complete with a prominent Gulf of Mexico. **Image by Niklas Henricson** - Work in progress - Unprocessed 5 minutes exposure at ISO 1600 with Canon DSLR



The solar eclipse of August 21, 2017, dubbed the "Great American Eclipse" by the media, was a total solar eclipse visible within a band that spanned the entire contiguous United States, passing from the Pacific to the Atlantic coasts. **Image by Bryan Smith - Madras, OR**



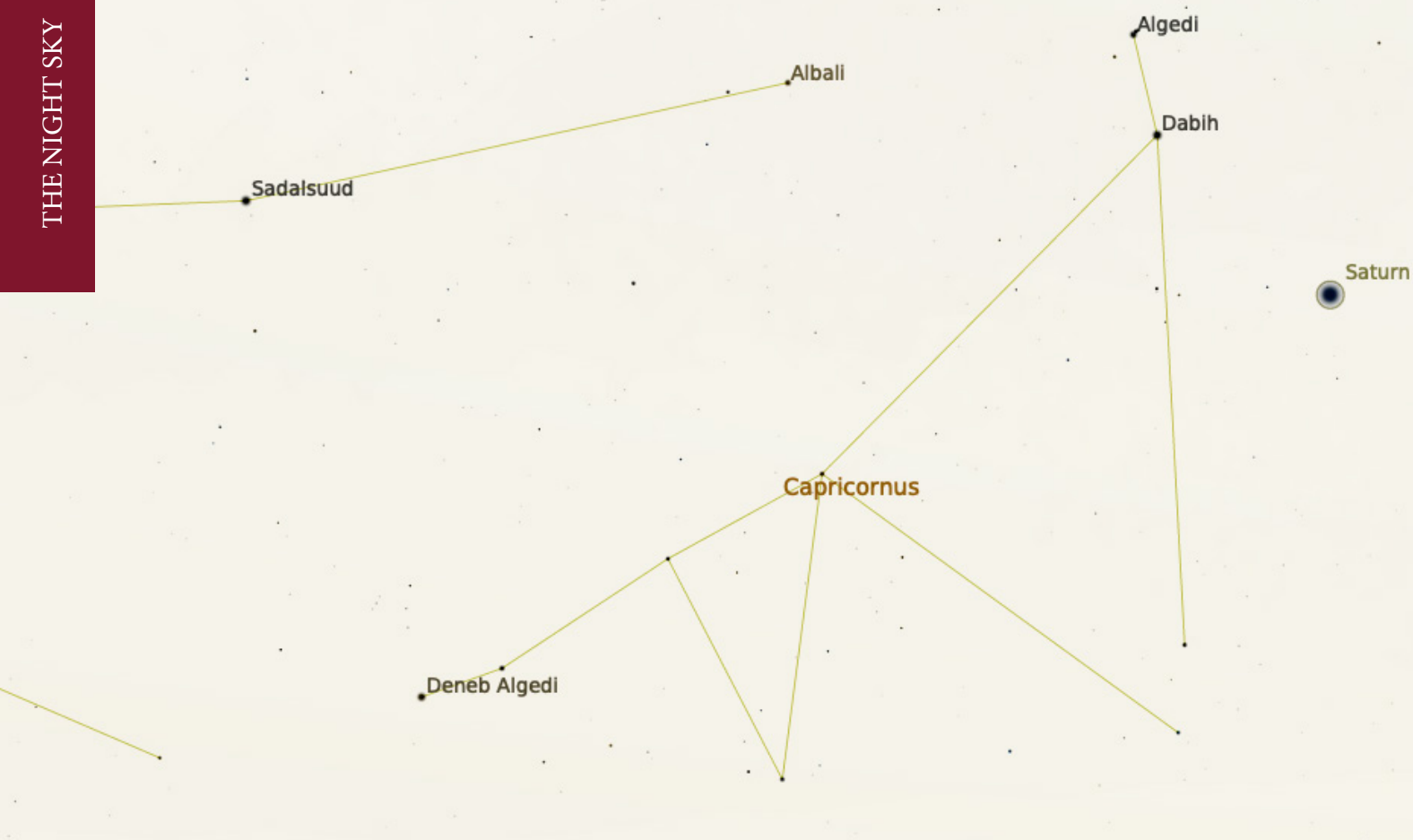
The North America Nebula (NGC 7000 or Caldwell 20) is an emission nebula in the constellation Cygnus, close to Deneb (the tail of the swan and its brightest star). The remarkable shape of the nebula resembles that of the continent of North America, complete with a prominent Gulf of Mexico. **Image by Robert Fink**



The Horsehead Nebula (also known as Barnard 33) is a small dark nebula in the constellation Orion. The nebula is located just to the south of Alnitak, the easternmost star of Orion's Belt, and is part of the much larger Orion Molecular Cloud Complex. **Image by Adam Phillips**



The Elephant's Trunk Nebula is a concentration of interstellar gas and dust within the much larger ionized gas region IC 1396 located in the constellation Cepheus about 2,400 light years away from Earth. The piece of the nebula shown here is the dark, dense globule IC 1396A. **Image by James Cage:** "I took the attached image over a period of 3 weeks approximately 2 hour sessions per night beginning in mid august .. I used Don Goldman 3nm bandpass filters, Ha,O3,S2"



THE NIGHT SKY

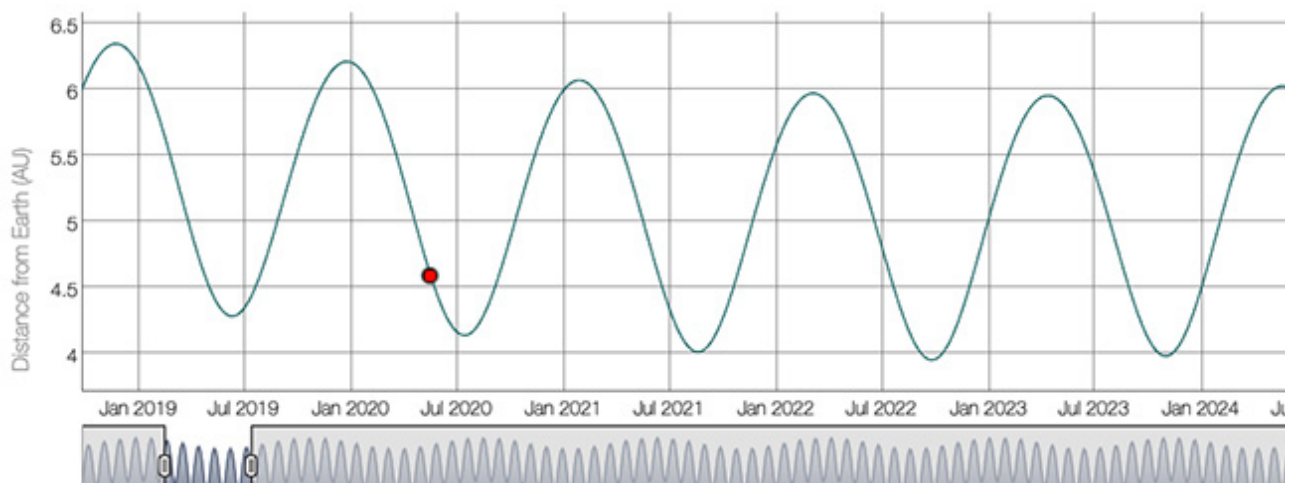
MAY - JUNE 2020

In every issue of the Observer we will be naming a few interesting night sky objects that you can easily locate through either a pair of binoculars or other different telescope variations. We'll be making sure to cover objects that characterize each month with their appearance.

May's most noticeable constellations are **Virgo**, **Coma Berenices**, **Canes Venatici**, **Lyra**, **Boötes** towards East and Southeast, while **Leo** will begin diving towards West earlier each day. When it comes to planetary objects Venus is very bright and makes a nice last appearance in the early days of May, in meanwhile Jupiter, Mars and Saturn are making a really nice appearance in early hours of the day after midnight.

For deep-sky astrophotography there's a plethora of galaxies residing by the constellation of Virgo. Most spectacular and known the Sombrero Galaxy M104, a barred spiral galaxy M61/NGC 4303, M84 which is surrounded by a whole group of other galaxies around. Other noticeable Virgo galaxies are NGC 9647 and M90/NGC 4569.

When we come closer to mid-June the most prominent planetary objects are Jupiter and Saturn which will begin appearing between the constellations of Capricorn and Sagittarius. Around midnight they'll be reaching higher up in the sky between Southeast-South direction. The tilting of Saturn's rings offer a beautiful view for those who plan astro-imaging the planet. Worth mentioning is also Jupiter will be in its closest proximity to earth this summer (see chart in the next page)



One of the most prominent constellations in May is the one of Virgo. To the right hand side of its most bright star Spica (Alpha Virginis) you'll find the infamous Sombrero Galaxy (NGC 4594). Spica is also the 16th brightest star in the night sky, a blue super-giant some 262 light years from earth and is very easy to identify. When it comes to the Sombrero Galaxy (M 104) it is one of the most favorite astro-imaging objects in deep-sky astrophotography.

The galaxy can be easily found through a 7x35 pair of binoculars or a 4-inch telescope. However, in order to see the features of the dust-formed ring surrounding the galaxy's central galactic core, you'll need at least an 8-inch telescope and for more detailed imaging it is recommended to have 10-inch or 12-inch telescope. Initially the galaxy was not part of Messier's catalogue and it wasn't until much later it was given the designation M104.

The following notes are taken from French astronomer Méchain's own recollection in the discovery of M104 in his letter to Bernoulli. M104 was to become a Messier-honorary object:



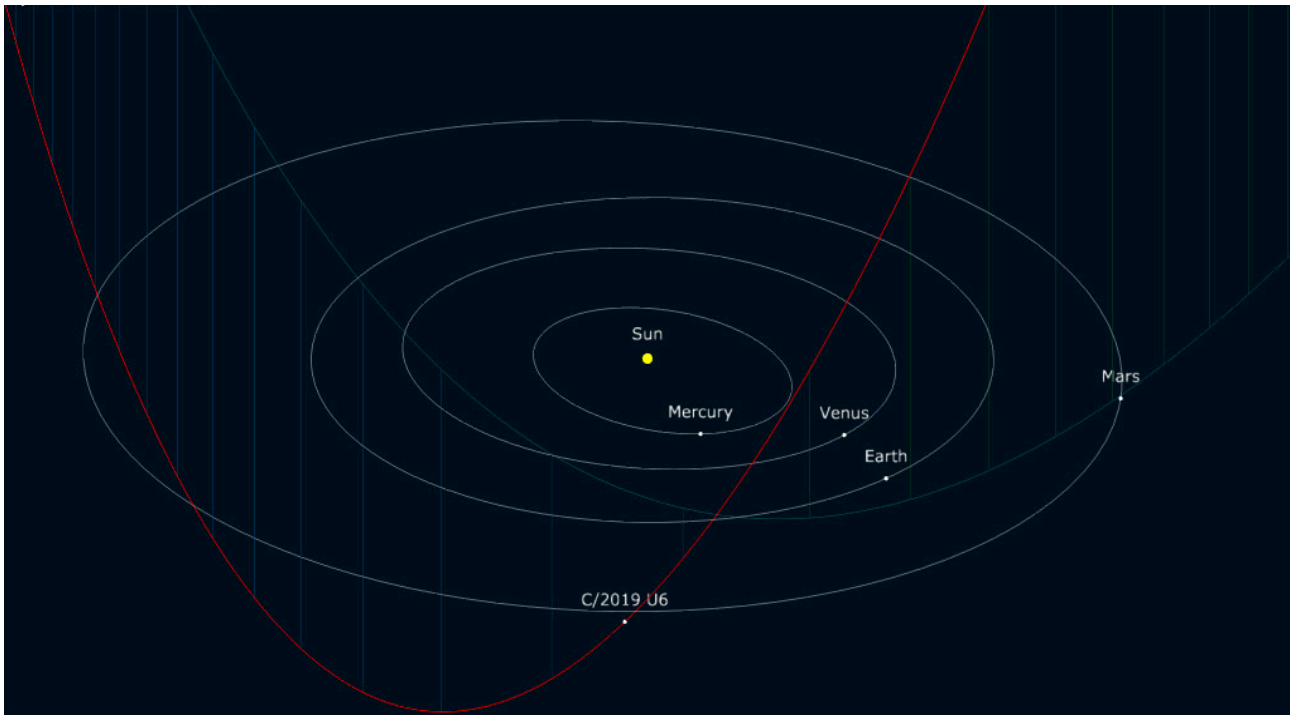
'On May 11, 1781, I discovered a nebula above the Raven [Corvus] which did not appear to me to contain any single star. It is of a faint light and difficult to find if the micrometer wires are illuminated.'

I have compared it [its position] on this day and the following with Spica in the Virgin and from this derived its right ascension 187d 9' 42" and its southern declination 10d 24' 49" [the same position as in Messier's handwritten note]. It does not appear in the Connaissance des Temps.'

Years later, Méchain dedicated his time in establishing the definition of meter which set the fundamentals in modern science and also planted the seeds in the definition of the speed of light.

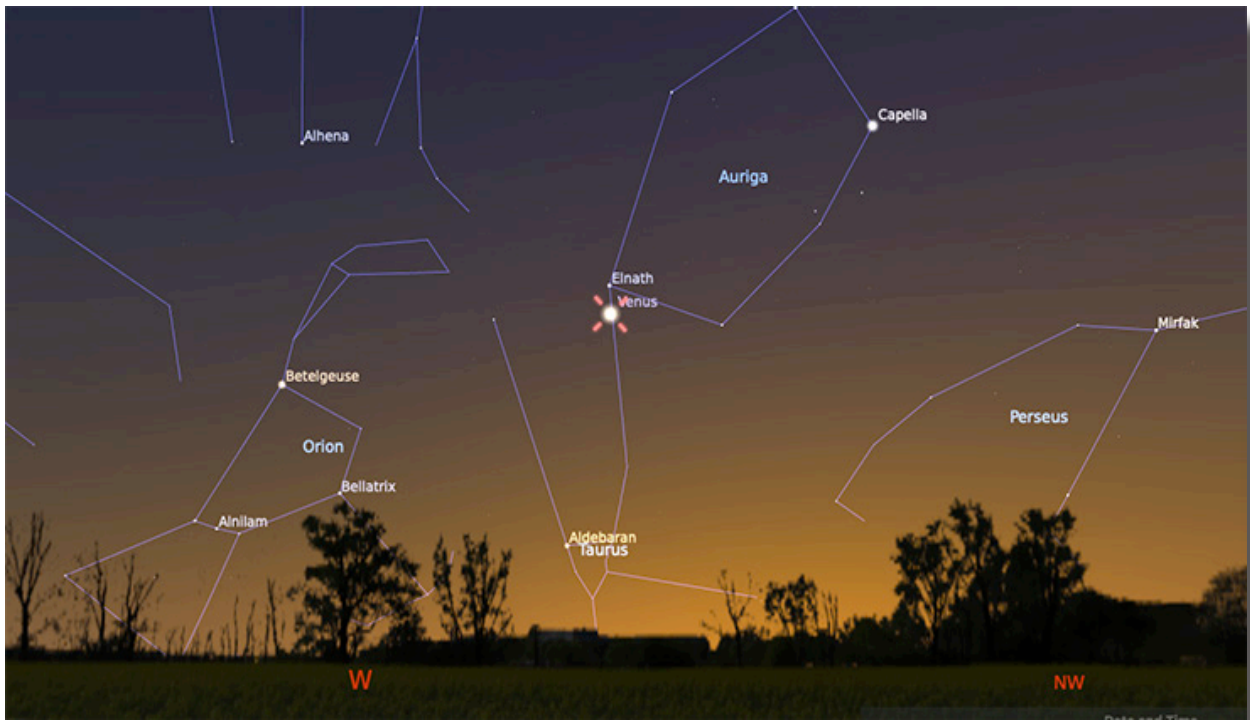
When it comes to comets **C/2019 U6** (*a.k.a. Lemmon Comet*) was discovered by the mount Lemmon Survey in October 2019 and is expected to make its closest approach to the sun on June 18, 2020. The comet currently holds a 7th magnitude. For detailed information including magnitude charts visit:

<http://astro.vanbuitenen.nl/comet/2019U6>



There was a really promising candidate to capture with the eye alone, unfortunate **c/2019 Y4** (*Atlas*) was disintegrated into smaller pieces. Its closest approach is expected on May 23, 2020. Currently the comet has a 9th magnitude (detailed info: <http://astro.vanbuitenen.nl/comet/2019Y4>)

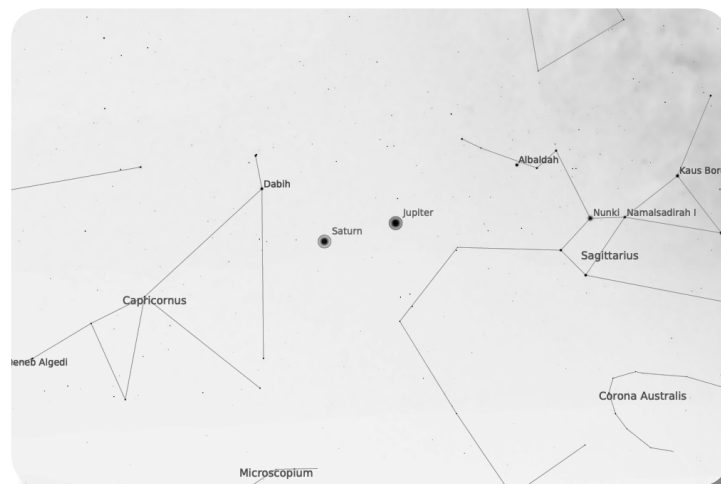
For a complete list of bright comets see Van Buitenen's list here: <http://astro.vanbuitenen.nl/comets>



Venus right after sunset during beginning to mid-May

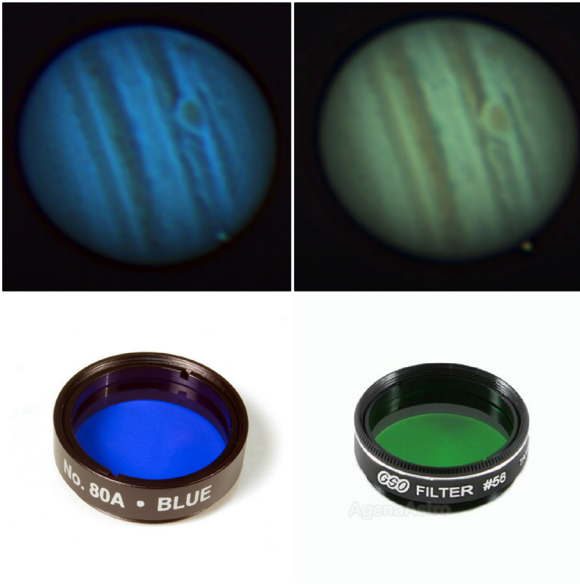
If you're into planetary astro-imaging Venus is one of the hottest candidates (literally) in your astro-portfolio during early to mid-May month. A distinguishably bright planet that is hard to miss out and is often misinterpreted as a star by common folk.

Closer to mid-June you'll be enjoying the appearance of Jupiter and Saturn as a duet. The planets are moving side by side and become more dominant with the presence as time goes. They're both really beautiful planets with very rich features to observe and image. Our Blue-Canyon observatory is well-suited for these purposes and worth visiting.



To pop out more features in Jupiter's atmospheric details you can always use Moon or Sky Glow filters. If you need to see The Great Red Spot in more detail it is suggested to use light green filter or Baader's Contrast Booster filter.

For Saturn you can always use yellow filters to make the rings pop out more, but most people prefer observing Saturn without any filters at all. That is a personal matter on how you want to experience the details by either using filters or not.



In the example to the left you see different features showing better than others through color filters. To the left is an 80A blue filter and to the right is the appearance of the gas giant through a #56 green filter. Another nice feature of Jupiter, if you observe long enough, is that you'll easily catch the Galilean moons (Io, Europa, Ganymede and Callisto).

More breathtaking is to actually see the innermost Jovian moons moving during the same night the longer you'll be observing. Before these moons got their ancient Greek names, Galileo simply designated them the Roman numbers I, II, III and IV. An interesting fact from the creation of our solar system is; we might thank Jupiter for our very own existence as species. Had it not been for Jupiter's size and orbital position, life on earth might not been possible at all. We know for a fact how dinosaurs got extinct through paleontology and geology discoveries and

we've also seen a few years ago how Jupiter cleared out Shoemaker-Levy 9 comet as it was heading towards the inner solar system (discovered by Palomar observatory in California) by shredding the comet to pieces due to the planet's enormous gravitational forces, a year after its discovery, in 1993.

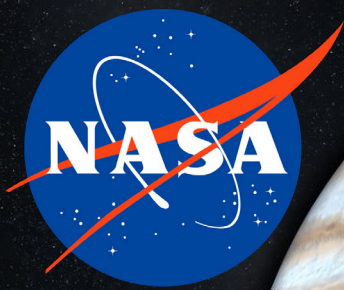
Following the Jupiter's orbit we got large groups of asteroids called the Trojans, Greeks and the Hildas. Each group librates around one of Jupiter's two stable Lagrange points: L4, lying 60° ahead of the planet in its orbit, and L5, 60° behind. The waning moon passes near Jupiter on the morning of June 8. By June 1, Jupiter and Saturn are due south an hour before dawn, a little closer together and snuggled between the stars of Sagittarius the Archer and Capricornus the Sea-Goat (see image by the article opening).

PLANET	RISE	SET	MERIDIAN	COMMENT
Mercury	Tue 7:06 am	Tue 10:10 pm	Tue 2:38 pm	Average visibility
Venus	Tue 6:30 am	Tue 9:24 pm	Tue 1:58 pm	Fairly good visibility
Mars	Tue 2:07 am	Tue 1:07 pm	Tue 7:37 am	Average visibility
Jupiter	Mon 11:54 pm	Tue 9:41 am	Tue 4:48 am	Perfect visibility
Saturn	Tue 12:10 am	Tue 10:04 am	Tue 5:07 am	Perfect visibility
Uranus	Tue 4:28 am	Tue 6:00 pm	Tue 11:14 am	Very difficult to see
Neptune	Tue 2:31 am	Tue 2:06 pm	Tue 8:18 am	Very difficult to see

Visible planets in Sacramento close to May 25, 2020

PLANET	RISE	SET	MERIDIAN	COMMENT
Mercury	Tue 7:21 am	Tue 10:18 pm	Tue 2:50 pm	Slightly difficult to see
Venus	Tue 5:54 am	Tue 8:32 pm	Tue 1:13 pm	Very close to Sun, not visible
Mars	Tue 1:52 am	Tue 1:03 pm	Tue 7:27 am	Average visibility
Jupiter	Mon 11:26 pm	Tue 9:12 am	Tue 4:19 am	Perfect visibility
Saturn	Mon 11:42 pm	Tue 9:36 am	Tue 4:39 am	Perfect visibility
Uranus	Tue 4:02 am	Tue 5:35 pm	Tue 10:48 am	Difficult to see
Neptune	Tue 2:03 am	Tue 1:39 pm	Tue 7:51 am	Very difficult to see

Visible planets in Sacramento close to June 1, 2020



Become a Citizen Scientist with NASA!

Ever want to mix in some science with your stargazing, but not sure where to start? NASA hosts a galaxy of citizen science programs that you can join! You'll find programs perfect for dedicated astronomers and novices alike, from reporting aurora, creating amazing images from real NASA data, searching for asteroids, and scouring data from NASA missions from the comfort of your home. If you can't get to your favorite stargazing spot, then NASA's suite of citizen science programs may be just the thing for you. Jupiter shines brightly in the morning sky this spring. If you'd rather catch up on sleep, or if your local weather isn't cooperating, all you need is a space telescope - preferably one in orbit around Jupiter!

Download raw images straight from the Juno mission, and even process and submit your favorites, on the JunoCam website! You may have seen some incredible images from Juno in the news, but did you know that these images were created by enthusiasts like yourself? Go to their website and download some sample images to start your image processing journey. Who knows where it will take you? Get started at bit.ly/nasajunocam.

Interested in hunting for asteroids? Want to collaborate with a team to find them?? The International Astronomical-Search Collaboration program matches potential asteroid

hunters together into teams throughout the year to help each other dig into astronomical data in order to spot dim objects moving in between photos. If your team discovers a potential asteroid that is later confirmed, you may even get a chance to name it! Join or build a team and search for asteroids at iasc.cosmosearch.org

Want to help discover planets around other star systems? NASA's TESS mission is orbiting the Earth right now and scanning the sky for planets around other stars. It's accumulating a giant horde of data, and NASA scientists need your help to sift through it all to find other worlds! You can join Planet Hunters TESS at: planethunters.org

Intrigued by these opportunities? These are just a few of the many ways to participate in NASA citizen science, including observing your local environment with the GLOBE program, reporting aurora with Aurorasaurus, measuring snowpack levels, training software for Mars missions – even counting penguins! Discover more opportunities at science.nasa.gov/citizenscience and join the NASA citizen science Facebook group at facebook.com/groups/Sciencing/ And of course, visit nasa.gov to find the latest discoveries from all the research teams at NASA!



HUBBLE AT 30: THREE DECADES OF COSMIC DISCOVERY

The Hubble Space Telescope celebrated its 30th birthday in orbit around Earth in April! It's hard to believe how much this telescope has changed the face of astronomy in just three decades. It had a rough start -- an 8-foot mirror just slightly out of focus in the most famous case of spherical aberration of all time. But subsequent repairs and upgrades by space shuttle astronauts made Hubble a symbol of the ingenuity of human spaceflight and one of the most important scientific instruments ever created. Beginning as a twinkle in the eye of the late Nancy Grace Roman, the Hubble Space Telescope's work over the past thirty years changed the way we view the universe, and more is yet to come! We've all seen the amazing images created by Hubble and its team of scientists, but have you seen Hubble yourself? You actually can! Hubble's orbit -- around 330 miles overhead -- is close enough to Earth that you can see it at night. The best times are within an hour after sunset or before sunrise, when its solar panels are angled best to reflect the light of the Sun back down to Earth. You can't see the structure of the telescope, but you can identify it as a bright star-like point, moving silently across the night sky. It's not as bright as the Space Station, which is much larger and whose orbit is closer to Earth (about 220 miles), but it's still very noticeable as a single steady dot of light, speeding across the sky. Hubble's orbit brings it directly overhead for observers located near tropical latitudes; observers further north and south can see it closer to the horizon. You can find sighting opportunities using satellite tracking apps for your smartphone or tablet, and dedicated satellite tracking websites. These resources can also help you identi-

fy other satellites that you may see passing overhead during your stargazing sessions. NASA has a dedicated site for Hubble's 30th's anniversary at [bit.ly/NASAHubble30](https://www.nasa.gov/feature/nasa-celebrates-30-years-of-hubble-space-telescope). The Night Sky Network's "Why Do We Put Telescopes in Space?" activity can help you and your audiences discover why we launch telescopes into orbit, high above the interference of Earth's atmosphere, at [bit.ly/TelescopesInSpace](https://www.nasa.gov/feature/nasa-celebrates-30-years-of-hubble-space-telescope). Amateur astronomers may especially enjoy Hubble's images of the beautiful objects found in both the Caldwell and Messier catalogs, at [bit.ly/Hubble-Caldwell](https://www.nasa.gov/feature/nasa-celebrates-30-years-of-hubble-space-telescope) and [bit.ly/HubbleMessier](https://www.nasa.gov/feature/nasa-celebrates-30-years-of-hubble-space-telescope). Want to take a look for yourself at some of Hubble's targets? Hubble's team at NASA's Goddard Space Flight Center has created a list of 10 objects that you can observe with a backyard telescope. Now, what you see is not going to look nearly as colorful or brilliant as Hubble's imagery from space, but you may be able to see a fuzzy black and white outline of these galaxies through your telescope if your skies are good. If you get a ghostly peek at one of these galaxies, consider the incredible difference between what you can see with your own eyes, and the amazing level of detail that Hubble is able to capture with its long exposures high above our atmosphere! Find the list at: <https://www.nasa.gov/content/news-hubbles-30th-anniversary-hubble-stargazing>. As we celebrate Hubble's legacy, we look forward to the future, as there is another telescope ramping up that promises to further revolutionize our understanding of the early universe: the James Webb Space Telescope!



ASTROPHOTOGRAPHY 101

TELESCOPES & TELESCOPE MOUNTS

In September's article - Astrophotography 101, we covered some basics in regards to different telescope types. It is partly a personal preference but it was also important to understand the advantages vs. disadvantages in each setup in regards to limitations in optics.

This hobby requires truly a great deal of patience, budget and investment in time. Another way to see a purchase for a telescope is as a long-term investment. When it's time to give up on electronics such as your cell phones, or other gadgets at home, your telescopes will be still serving you faithfully for years to come, if you - of course - keep continuously taking a good care of them. Learning how to observe the night sky is a lifelong commitment and your telescopes will be there to help you discover, teach you and hopefully allow you to share the experience with others around you, including your family members and friends.

When it comes to mounts there are many more areas to cover. In actuality, mounts can be the most important part of your setup, almost at the same level as your camera sensors. Without a good mount, guiding and accuracy in tracking a night-sky object or the ability to carry the large weight in your telescopes, cameras, auto-guiding cameras, cables, etc would cause your mounts drifting

inaccurately around. Some mounts have crippling compatibility with software and modern operating systems, limited support in updates, etc. That can cause a great deal of disappointment to the point it might take away the pleasure of going out for imaging the night sky. There are ways however to bypass those issues and we will be covering soon a separate article in regards to **ASCOM** that is truly a blessing to us astronomers.

Many of the modern motorized mounts support GPS sensors, measure temperature, include USB or RS-232 ports (COM) to connect either with your hand controller, or your computers and offer a large amount of advanced features and controls over their built-in functions. As you've already guessed these telescope mounts are over the years increasingly sophisticated, that the quality in their parts determine the accuracy in following your objects around the night sky and also bring up other challenges in acquiring the proper knowledge to operate them.

There are mainly five categories of mounts,

- Fork
- Alt-Azimuth
- Equatorial
- German Equatorial
- Dobsonian

When it comes to software and remote control, we'll be covering that area in a separate article. It is a whole new chapter installing the right platform and drivers for your mount while making sure you avoid damaging your equipment through the wrong settings, software or getting stuck by accidentally flashing your ROM-chipsets inadequately and leaving you with an inoperable mount or hand controller. Sometimes I find manufacturers ability to do knowledge transfer a tedious and frustrating experience.

You'll also hear others mentioning something called backlash-issues. As matter of fact motorized mounts are nothing else than heavily geared clockworks full of cogwheels and other motorized parts, backed up with sophisticated software to assist in tracking objects through their build-in star charts.

Just like the optics, telescope mounts come also with built-in flaws in their mechanical parts preventing the mount to move absolutely accurately. Whether it is the consistent and smooth movement in their built-in motors, or flaws in the rotation and the space between their gears. Actually, most mounts have these issues some more than others and there's nothing to do about it other except from just accepting these imperfections or choose to modify and replace gears with higher quality ones (for example from plastic to bronze or even elastic bands instead of gear). There are excellent guides on internet how to proceed with these modifications if you're into reaching a smoother axis rotation by replacing gears to other solutions. All these mechanical issues are simply referred to with one word as "**backlash**" and as matter of fact all astrophotographers "accept" a certain amount of it in which they normally find workarounds. One of the ways is by making small RA/Dec adjustments right before you reach out to your object within your field of view (*We'll cover that topic in a separate article*).

Another crucial part when it comes to mounts is prior your rough polar alignment, to balance the telescopes and all accessories on it (including DSLR cameras, oculars, guiding telescope and cables) by moving counterweights and loosening the Dec & RA knobs so that a mount can move freely and easily without leaning heavily towards any direction. Once the mount has been neutral-

ly balanced it'll make life easier for the mount to work and carry that weight around as it slews towards and follows objects around the night sky.

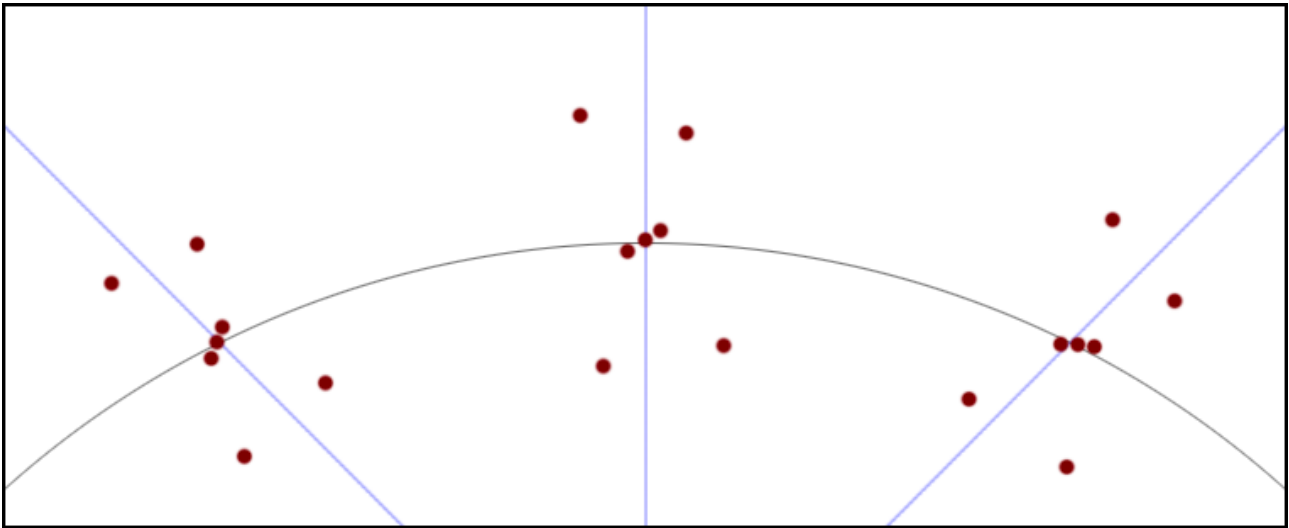


For longer life expectancy especially when you're working with Schmidt-Cassegrain (SCT:s) or refractor telescopes that are naturally heavy, make absolutely sure you always balance your equipment once everything is installed on top of your mount and before switching on your mounts.

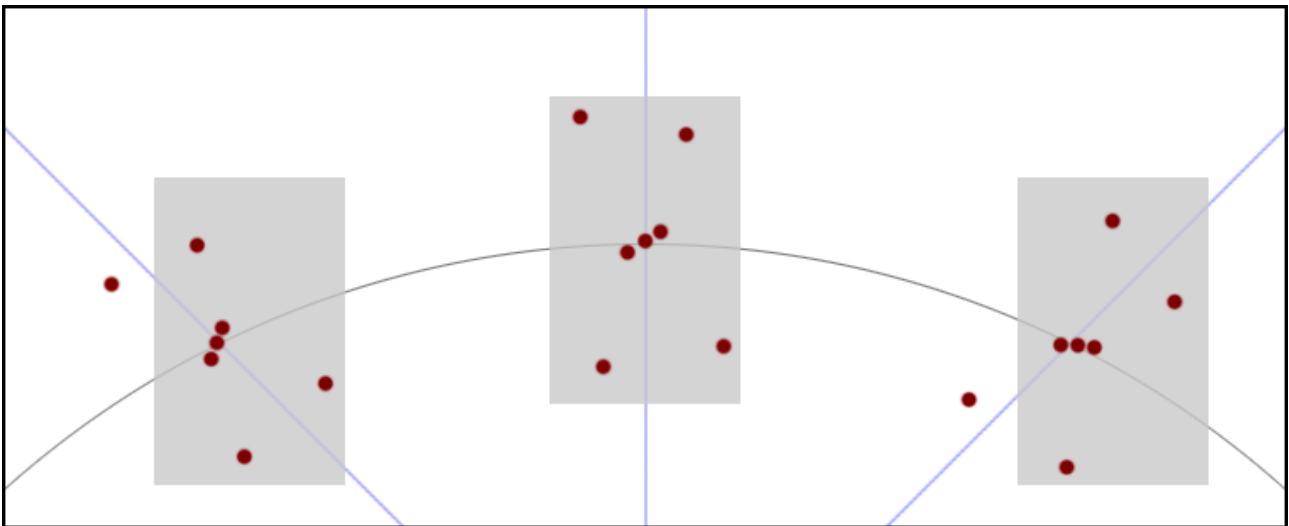
When it comes to Alt-azimuth mounts those are not really suitable for long exposure astrophotography but are easy to maneuver as they consist of two-axis rotation - one vertical and the other horizontal perpendicularly to each other. Dobsonian telescopes are carried typically by an alt-azimuth mount construction and are excellent tools for observing the night sky in great detail. Other alt-azimuth mounts host typically radio telescopes so their simple construction benefits many areas both in amateur and in research astronomy.

In **Example 1**, the illustration is showing how Orion's constellation moves naturally across the southern horizon of the night sky from East to West (left to right) through the Meridian. As the constellation rises from East it leans slightly to the left, then later that night as it passes the Meridian's center it appears standing upright, and as it sets it leans towards right.

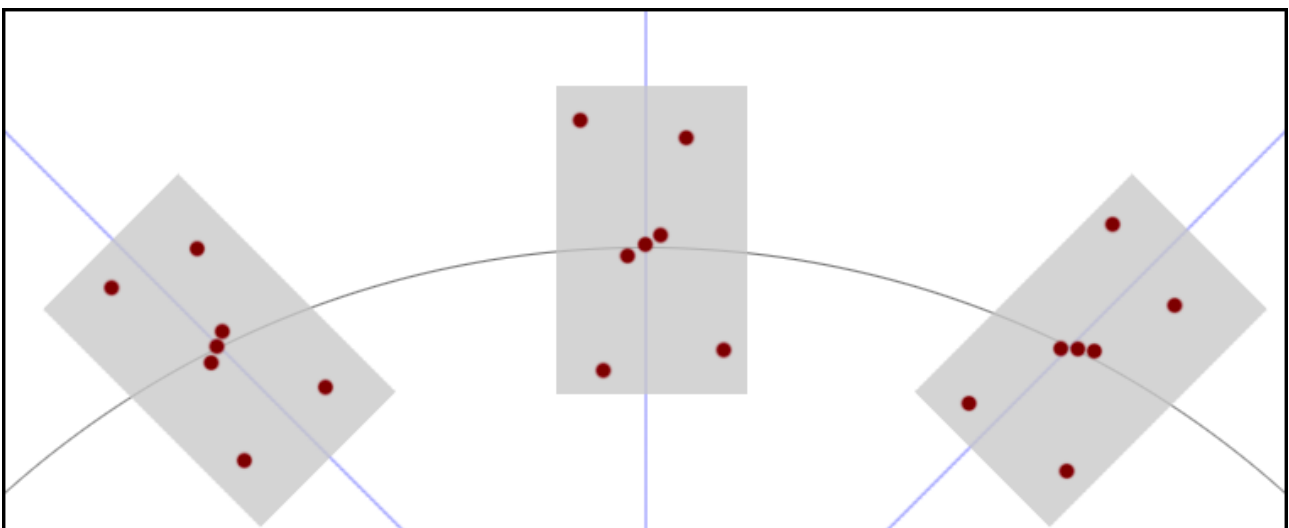
The field rotation illustrated in **Example 2** is an undesirable effect of a fork/alt-azimuth mount. The gray colored squares is a representation of



Example 1: Orion's constellation across the night sky



Example 2: Astro-imaging Orion through altazimuth configuration



Example 3: An equatorial mount's field of rotation

the camera sensor's field of view (FOV). While the constellations rotate around in an arc-movement using long exposures with that type of mount would prevent from keeping them within the FOV. Hence why there are other solutions to this type of issue for long exposures such as post-processing software which automatically tracks and corrects the FOV-rotation, or by choosing to use more suitable mounts instead.

German-Equatorial mounts similarly to alt-azimuth mounts move in two axis rotations, but with the main difference that one axis is aligned with the earth's rotation (RA-axis) and the other axis is perpendicular to the first (Declination axis). This construction allows us to point to a specific celestial object and with the help of the built-in sidereal clock we track continuously the movement of that object as illustrated in **Example 3**.



Another typical characteristic of a German-equatorial mount is due to the rotational axis the weight distribution on the mount is constantly shifted around and therefore you'll notice all German-equatorial mounts are accompanied by counter-weights to assist in less stress for the internal gear and motorized parts.

German-equatorial mounts also include polar-alignment during their setup process and often a star-alignment/triangulation of 3 bright

stars to maintain good accuracy. There are numerous guides on polar alignment on Youtube. One I found particularly easy to follow and understand is this one: <https://youtu.be/xVECV1yCAjU>

For star-alignment look at AA&S Youtube-guide here: <https://youtu.be/47GZKNPaQZU>

Generally in astrophotography it is not always desired or needed to have a mount tracking an object (*for example in landscape or Milkyway astrophotography*) where the exposure time in your photos depend on the size of your sensor and focal length of your telescope/camera lens and stationary tripods. In the next issue of the Observer we'll be going through the math behind long exposures in different configurations and what you need to watch out for (over- vs. under-exposed images) and how to read your image data.

Overall mounts serve different purposes depending your needs in your astrophotography. Before you attempt loading a mount with telescopes and accessories, make sure you read the specification on how much the workload can be. Don't keep loading weight on your mount and especially don't have German-equatorial mounts working unbalanced.

Make sure to also update your firmware for your hand-controllers, focusers and mounts as often as once per year. There are many guides on Youtube and manufacturer's websites to follow, or ask your fellow club astronomer who might own the same type of mount.

Niklas Henricson

DONATIONS

Dobsonian Telescope by Tony Drake

The following is an offer to take possession of a very special 16.5" Dobsonian telescope for free (SVAS members only!).

It comes with accessories and is about 8.5 feet long.

The following is the donator's (Tony Drake) message:

I am a long time astronomy enthusiast and own a 16.5" Dobsonian. I built the telescope when I was in high school in the 1970's under the guidance of John Dobson. I took a telescope making class from John and he always told his students that "bigger was better." In college I was a part-time astronomy lecturer at the old Morrison Planetarium in Golden Gate Park and was also a Teaching Assistant for intro astronomy classes at UC Davis. My interests in astronomy have always remained part of my life but it is now time to part with my old friend that has remained in our family since it was built. The telescope has always been stored indoors and has no damage. It is in "original condition," complete with a twin laminated porthole glass mirror (figured by John), rack and pinion eyepiece holder (2" and 1-1/4 inch), finder scope, guide scope, associated eyepieces, and custom made counter weights.

Thank you,

Tony Drake

Fair Oaks, CA

(760) 780-8026

(Please contact the donator directly by phone)



Glossary

Asteroids: are minor planets, especially of the inner Solar System. Larger asteroids have also been called planetoids. These terms have historically been applied to any astronomical object orbiting the Sun that did not resolve into a disc in a telescope and was not observed to have characteristics of an active comet such as a tail. As minor planets in the outer Solar System were discovered that were found to have volatile-rich surfaces similar to comets, these came to be distinguished from the objects found in the main asteroid belt.

Bernoulli Johann III (also known as Jean; 4 November 1744, Basel – 13 July 1807, Berlin), grandson of Johann Bernoulli, and son of Johann II Bernoulli. He was known around the world as a child prodigy. He studied at Basel and at Neuchâtel, and when thirteen years of age took the degree of doctor in philosophy. When he was fourteen, he got the degree of master of jurisprudence. At nineteen he was appointed astronomer royal of Berlin. A year later, he reorganized the astronomical observatory at the Berlin Academy. Some years after, he visited Germany, France and England, and subsequently Italy, Courland, Russia and Poland. His travel accounts were of great cultural and historical importance (1772–1776; 1777–1779; 1781). He wrote about Kashubians.

Constellation: is an area on the celestial sphere in which a group of stars forms an imaginary outline or pattern, typically representing an animal, mythological person or creature, or an inanima-

te object. The origins of the earliest constellations likely go back to pre-history. People used them to relate stories of their beliefs, experiences, creation, or mythology.

Dobsonian, telescope is an altazimuth-mounted Newtonian telescope design popularized by John Dobson in 1965 and credited with vastly increasing the size of telescopes available to amateur astronomers. Dobson's telescopes featured a simplified mechanical design that was easy to manufacture from readily available components to create a large, portable, low-cost telescope.

Eclipse: The term eclipse is most often used to describe either a solar eclipse, when the Moon's shadow crosses the Earth's surface, or a lunar eclipse, when the Moon moves into the Earth's shadow. However, it can also refer to such events beyond the Earth–Moon system: for example, a planet moving into the shadow cast by one of its moons, a moon passing into the shadow cast by its host planet, or a moon passing into the shadow of another moon.

Equatorial, equatorial mount is a mount for instruments that compensates for Earth's rotation by having one rotational axis parallel to the Earth's axis of rotation. The advantage of an equatorial mount lies in its ability to allow the instrument attached to it to stay fixed on any celestial object with diurnal motion by driving one axis at a constant speed. Such an arrangement is called a sidereal or clock drive.

Extinction: Extinction is the termination of a kind of organism or of a group of kinds (taxon), usually a species. The moment of extinction is generally considered to be the death of the last individual of the species, although the capacity to breed and recover may have been lost before this point.

Galaxy: A galaxy is a gravitationally bound system of stars, stellar remnants, interstellar gas, dust, and dark matter. The word galaxy is derived from the Greek galaxias (γαλαξίας), literally "milky", a reference to the Milky Way. Galaxies range in size from dwarfs with just a few hundred million stars to giants with one hundred trillion stars, each orbiting its galaxy's center of mass.

H-alpha (H α) is a specific deep-red visible spectral line in the Balmer series with a wavelength of 656.28 nm in air; it occurs when a hydrogen electron falls from its third to second lowest energy level. H-alpha light is the brightest hydrogen line in the visible spectral range. It is important to astronomers as it is emitted by many emission nebulae and can be used to observe features in the Sun's atmosphere, including solar prominences and the chromosphere.

IC (Index Catalogue) The first major update to the NGC is the Index Catalogue of Nebulae and Clusters of Stars (abbreviated as IC), published in two parts by Dreyer in 1895 (IC I,[5] containing 1,520 objects) and 1908 (IC II,[6] containing 3,866 objects). It serves as a supplement to the NGC, and

contains an additional 5,386 objects, collectively known as the IC objects. It summarizes the discoveries of galaxies, clusters and nebulae between 1888 and 1907, most of them made possible by photography. A list of corrections to the IC was published in 1912.

Juno is a NASA space probe orbiting the planet Jupiter. It was built by Lockheed Martin and is operated by NASA's Jet Propulsion Laboratory. The spacecraft was launched from Cape Canaveral Air Force Station on August 5, 2011 (UTC), as part of the New Frontiers program. Juno entered a polar orbit of Jupiter on July 5, 2016 (UTC; July 4 U.S. time), to begin a scientific investigation of the planet. After completing its mission, Juno will be intentionally deorbited into Jupiter's atmosphere.

Méchain, Pierre François André (16 August 1744 – 20 September 1804) was a French astronomer and surveyor who, with Charles Messier, was a major contributor to the early study of deep-sky objects and comets.

Meridian, A (geographic) meridian (or line of longitude) is the half of an imaginary great circle on the Earth's surface, terminated by the North Pole and the South Pole, connecting points of equal longitude, as measured in angular degrees east or west of the Prime Meridian.

Messier, Charles (26 June 1730 – 12 April 1817) was a French astronomer. He published an astronomical catalogue consisting of 110 nebulae and faint star clusters, which came to be known as the Messier objects. The purpose of the catalogue was to help astronomical observers distinguish

between permanent and transient visually diffuse objects in the sky.

Nebula: A nebula (Latin for 'cloud' or 'fog'; pl. nebulae, nebulae or nebulas) is an interstellar cloud of dust, hydrogen, helium and other ionized gases. Originally, the term was used to describe any diffuse astronomical object, including galaxies beyond the Milky Way. The Andromeda Galaxy, for instance, was once referred to as the Andromeda Nebula (and spiral galaxies in general as "spiral nebulae") before the true nature of galaxies was confirmed in the early 20th century by Vesto Slipher, Edwin Hubble and others.

Newtonian telescope, also called the Newtonian reflector or just the Newtonian, is a type of reflecting telescope invented by the English scientist Sir Isaac Newton (1642–1727), using a concave primary mirror and a flat diagonal secondary mirror. Newton's first reflecting telescope was completed in 1668 and is the earliest known functional reflecting telescope.

NGC The New General Catalogue of Nebulae and Clusters of Stars (abbreviated as NGC) is a catalogue of deep-sky objects compiled by John Louis Emil Dreyer in 1888. It expands upon the cataloguing work of William and Caroline Herschel, and John Herschel's General Catalogue of Nebulae and Clusters of Stars. The NGC contains 7,840 objects, known as the NGC objects. It includes many types of deep space objects, including galaxies, star clusters, emission nebulae and absorption nebulae. Dreyer also published two supplements to the NGC in 1895 and 1908, known as the Index Catalogues, describing a further 5,386 astronomical objects.

Refracting telescope (also called a refractor) is a type of optical telescope that uses a lens as its objective to form an image (also referred to a dioptric telescope). The refracting telescope design was originally used in spy glasses and astronomical telescopes but is also used for long focus camera lenses. Although large refracting telescopes were very popular in the second half of the 19th century, for most research purposes the refracting telescope has been superseded by the reflecting telescope which allows larger apertures.

Schmidt–Cassegrain is a catadioptric telescope that combines a Cassegrain reflector's optical path with a Schmidt corrector plate to make a compact astronomical instrument that uses simple spherical surfaces.

Variable: A variable star is a star whose brightness as seen from Earth (its apparent magnitude) fluctuates. This variation may be caused by a change in emitted light or by something partly blocking the light, so variable stars are classified as either: Intrinsic variables, whose luminosity actually changes; for example, because the star periodically swells and shrinks. Extrinsic variables, whose apparent changes in brightness are due to changes in the amount of their light that can reach Earth; for example, because the star has an orbiting companion that sometimes eclipses it. Many, possibly most, stars have at least some variation in luminosity: the energy output of our Sun, for example, varies by about 0.1% over an 11-year solar cycle.



