Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers June 2018

Events:

General Meeting :

Monday, June 4, 2018 at the Temecula Library, Room B, 30600 Pauba Rd, at 7 pm.

After opening comments by President Mark Baker, Vice President Skip Southwick will present "What's Up" and Clark Willams will do the "IFI" The main presentation is "An Effort for Dark Sky Recognition: the Julian Dark Sky Network" by Todd Rogelstad.

Please consider helping out at one of the many Star Parties coming up over the next few months. For the latest schedule, check the Calendar on the web page.

Albireo is the traditional name for the double star also designated Beta Cygni (β Cygni, abbreviated Beta Cyg, β Cyg) Source : Wikipedia

WHAT'S INSIDE THIS MONTH:

Send newsletter submissions to Mark DiVecchio <markd@silogic.com> by the 20th of the month for the next month's issue.

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General information:
Subscription to the TVA is included in the annual $25 membership (regular members) donation ($9 student; $35 family).

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Cosmic Comments
by President Mark Baker

OUTREACH…once it's in your system, it is hard to ignore. We recently commuted our Malaysian friend, Anita Yusof, from LAX to where she was a keynote speaker at the Overland Expo in Flagstaff, AZ…of course, we took a slight detour by way of the Grand Canyon, Marble Canyon, Horseshoe Bend, and Antelope Canyon before settling in at Monument Valley for two nights. Being blessed with awesome weather, the dark clear skies at the Grand Canyon and then Monument Valley were breathtaking. So our first night at MV I had the opportunity to do a What's Up for some fellow campers and then I broke out the 90mm Meade on the second night. I never tire of the ooh's and ahh's from young and old alike, whether it be from using my laser pointer to explain things celestial, or actually showing them with a telescope. One young man hung around for several hours and was rewarded of a great look at Jupiter…and some of Deborah's hot chocolate too!!! And of course, at every stop, the TVA magnetic sign was proudly on display and was a great ice breaker…I hope you all get an opportunity to look up and by doing so, inspire others to do the same…there is so much to wonder about. As always, here's to all you do to promote the Cosmos and a better understanding of it…

Clear, Dark Skies my Friends…

Looking Up Redux
by Clark Williams

ALL TIMES ARE LOCAL PST WILDOMAR

*Times are given in 24-hour time either as hh:mm:ss or hhmmss. A time given as hhmm**+** indicates that it is the hour of the next day. Similarly a time hhmm− indicates a time in a previous day.*

Moon Phases for the month by date: (all times are PDT)

Wednesday the 6th @ 11:32:52 LAST QTR
Wednesday the 13th @ 12:44:24 NEW
Wednesday the 20th @ 03:52:03 FIRST QTR
Wednesday the 27th @ 21:54:22 FULL

Perigee comes on 2018-06-14 @ 16:52 – 359,503 km (223,385 mi)
Apogee comes on 2018-06-02 @ 09:34 – 405,317 km (251,852 mi)

2018 has: (12) new moons, (12) 1st Qtr moons, (14) Full moons, (13) 3rd Qtr moons
(2) Blue moons and (1) Black moon

Luna:

The Lunar phases are all on Wednesday this month. Luna can be found rising in Sagittarius at the beginning of the month about 1037 PDT. By mid month Luna is rising in Gemini and transiting in mid-afternoon about 1455 PDT. By the end of the month Luna is rising in Capricornus at 2200 PDT.

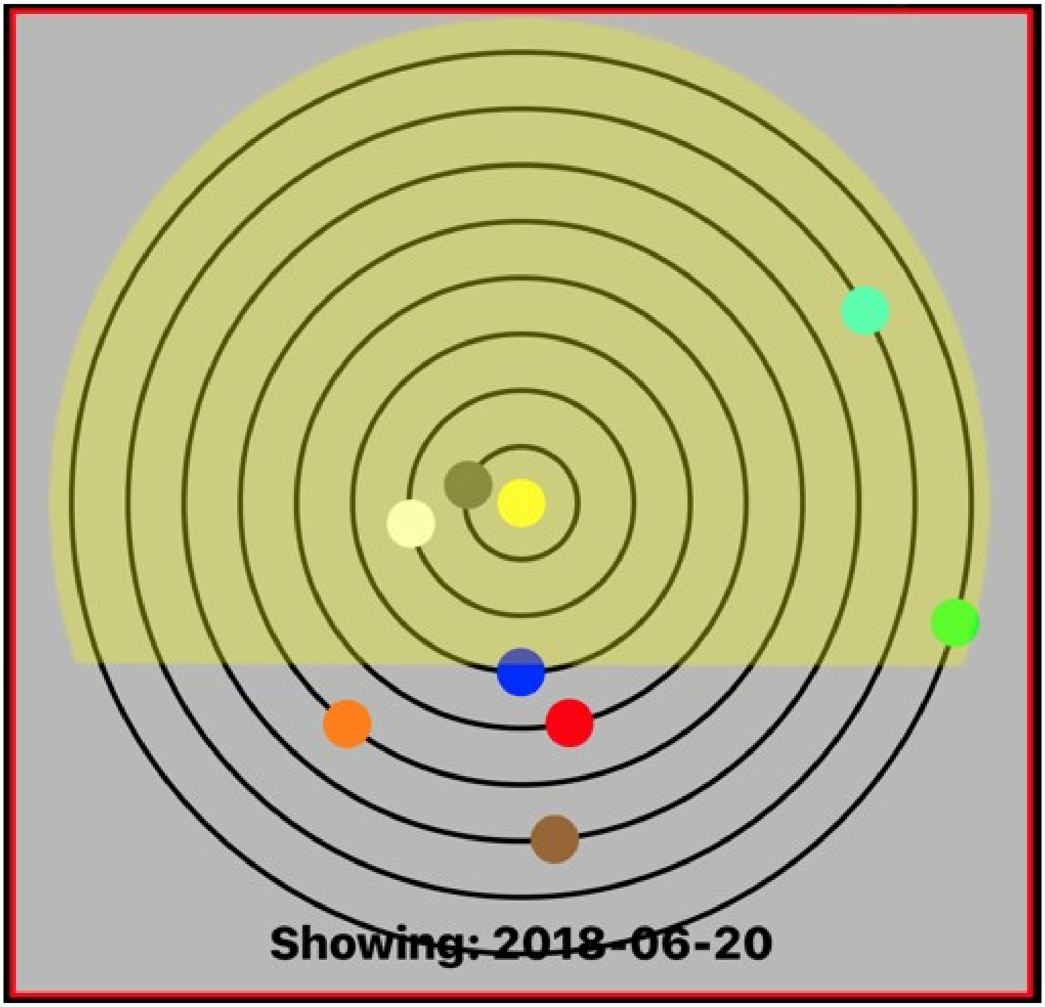
Highlights: (from Sky & Telescope)

19-20 June: Vesta is at opposition with the Sun and, at magnitude 5.3, visible throughout the night even to the naked eye at dark enough locations; see page 48. To find this minor planet, look just under 1° upper left of the halfway point along a line connecting λ-Sagittarii (the top star of the Teapot) and η-Ophiuchi.

Summer: Summer begins on June 21st the longest day of the year in the Northern Hemisphere. The solstice is at 10:07 UT (03:07 PDT).

27-28 June: Saturn with its rings tilted at almost maximum extent shines at mag +0.0. The full Moon is only about 1° away, but don’t let that deter you from trying to spot this glorious planet.

Planets:
Planetary Positions June 2018:



- **Mercury:** Mercury will be at superior conjunction will occur on June 5th. You my be abl tto catch a glimpse of Mercury by the middle of the month just after sunset. Look to the North West at 2030 PDT about 4-½° above the horizon. Mercury will be at about 80% illumination. If the glare is not too bad Mercury should be visible.
- **Venus:** At 1900 PDT (midnight UT) on June 1st Venus passes 4°.0 North of the optical double star ζ-Mekbuda (mag. +3.9), positioned at the right knee of the Southern twin. The planet passes 2° North of the star δ-Wasat (mag. +3.5) on June 4th. In early June Venus is showing a phase of about 80%. A consequence of celestial mechanics and spherical astronomy means that Venus now sets around 2½ hours after sunset from across the inhabited world. At any given interval after sunset, observers have been seeing Venus creep Northwards along the horizon since February. The planet's Northward motion ceases in early June then afterwards Venus heads back southwards. During the 2018 evening apparition the Southern latitudes see the planet higher in the sky for a longer calendar period than in the Northern hemisphere. From mid-Southern latitudes in particular Venus covers a much greater span in azimuth over the course of the apparition. On June 6th Venus passes 8° South of Castor. On June 7th the

planet passes 11° South of the star o-Jishui (mag. +4.9). The star is positioned close to the constellation's Northern border with Lynx. On June 15th Venus passes 12° North of Cancer's brightest star β-Altarf (mag. +3.5). From June 19th-20th Venus passes 0°.7 North of the star cluster commonly known as Praesepe (the Beehive Cluster [M44 or NGC 2632]). On June 21st Venus passes between the stars γ-Asellus Borealis (mag. +4.6) and β-Asellus Australis (mag. +3.9) passing half-way between them at around midnight UT. By June 24th Venus passes a 7º North of α-Acubens (mag. +4.3). Venus reaches an apparent disk size of 15" on June 24th and an elongation of 40° East on June 28th. The planet moves from Cancer into Leo the Lion on June 29th, where it will remain throughout the month of July.

- **Mars:** The Red Planet's apparent motion against the stars by early June has slowed from 0º.6 per day to just 0º.2 per day. By mid-month Mars has returned to naked-eye view from Northern latitudes fairly low down over the South-eastern horizon. Mars passes 3º.3 North of the star Psi ψ-Capricorni (mag. +4.1) on June 14th. On June 28th Mars' Eastward motion ceases as the planet reaches its Eastern stationary point, positioned 3º to the NNE of ψ-Capricorni. Mars is now moving slightly Southward but by the start of July its motion becomes retrograde (Westward), which will continue over the next two months
- **Jupiter:** Jupiter is already visible in the south-east at nightfall during June and is highest around 2300 local time as the month begins and 2100 by month's end. Jupiter dims from magnitude –2.5 to –2.3 during June and its angular diameter decreases from 44″ to 41½″. This is still excellent observing time for Jupiter. The largest gas-bag in the Solar System (sans Sol) continues drifting westward relative to the stars of Libra in June.
- **Saturn:** Saturn comes to opposition on June 27th, only half a day before the full Moon passes about a degree to the upper left of Saturn. Saturn brightens from magnitude +0.2 to +0.0 in June. Its globe is a little more than 18″ across. The rings span a distance about 2-½ times greater than the globe and are tilted 25° to our line of sight – almost the maximum possible. This month is the best for trying to see special Saturnian wonders, such as the Encke Gap in the A-ring out beyond the wide Cassini Division. The only problem with these observations for viewers at mid-northern latitudes is the lowness of Saturn in the southern sky. The planet still floats just above the Teapot of Sagittarius. If you have trouble remembering the order of the rings you can use the mnemonic: **D**usty **C**ircles **B**ar **A**liens **F**rom **G**azing **E**arthward. Of course post Cassini the rings are now:

Ring	Kilometers from Saturn (inner to outer)		
D Ring	66,900 – 74,510	7,500	
C Ring	74,658 – 92,000	17,500	
B Ring	92,000 – 117,580	25,500	
Cassini Division	117,580 – 122,170	4,700	Giovanni Cassini
A ring	122,170 – 136,775	14,600	
Roche Division	136,775 – 139,380	2,600	Édouard Roche
F Ring	140,180 (3)	30 – 500	
Janus/Epimetheus Ring(4)	149,000 – 154,000	5,000	Janus and Epimetheus
G Ring	166,000 – 175,000	9,000	
Methone Ring Arc(4)	194,230	?	Methone
Anthe Ring Arc(4)	197,665	?	Anthe
Pallene Ring(4)	211,000 – 213,500	2,500	Pallene
E Ring	180,000 – 480,000	300,000	
Phoebe Ring			

- **Uranus:** Uranus gets high enough to observe by morning twilight during June.
- **Neptune:** Neptune like Uranus gets high enough to observe by morning twilight during June.
- **Pluto:** Pluto begins the month rising early in the evening at 2234 PDT and transiting around 0339 PDT. By mid-month it is rising at 2138 PDT and transiting around 0243 PDT. By the end of the month Pluto is rising at 2038 PDT and transiting round 0143 PDT.

Asteroids:

- Vesta's the brightest of all the main belt asteroids at opposition. This year Vesta shines in Sagittarius at magnitude 5.3 and will be visible without optical aid under dark skies. It's a bit dimmer the rest of the month, ranging from magnitude 5.6 to 5.8, but still naked eye visible under good skies.

Meteors:

- There aren't any really good meteors of reasonable magnitude out there this month.

Comets:

- Comets come in various classifications:
  - 1) Short Period comets – further broken down into:
    - Halley Type: The Halley Types are believe to come from the Kuiper Belt and have periods in excess of 20-years.
    - Jupiter Type: The Jupiter types have a period less than or equal to 20-years.
    - Short period comets may have a near circular orbit or an elliptical orbit. The latter being far more common.
  - 2) Long Period comets – thought to originate from the Oort cloud these comets have periods of over 200 years and have random inclinations around the celestial sphere.
- C/2015 F5 (SWAN-Xingming) reaches its brightest Tuesday 2018 June 12
- P/2013 CU129 (PANSTARRS) at perihelion Saturday 2018 June 23
- C/2016 M1 (PANSTARRS) reaches its brightest Thursday 2018 June 28

Deep Sky:

In each case you should look for the following on or about the 15th Day of June 2018 at 2100 PDT and you will have about 20 minutes of viewing time total.

The one thing June brings us is the potential for "June Gloom":

- **Albireo** – Albireo, or β-Cygni, is the fifth brightest star in the constellation Cygnus (mag: 3.0). This is one of my favorite stars to view and image. It has many common names: "hen's beak", "beak star", etceteras but my favorite (especially during water polo season) is the "UCLA star". β-Cygni A is gold in color. It is a jewel in the summer sky contrasting sharply with its blue companion β-Cigni B. Albireo is a variable double star but no one is certain if it is a physically bound double or just an optical double. It is composed of a golden (some USC people say 'amber') star β-Cigni A and a companion, fast rotating, "Be Star" β-Cygni B which is strikingly pastel-blue. Its name originates in a misunderstanding and several bad translations. Albireo's original Arabic name was "Minqar al-Dajajah", meaning "the hen's beak". Latin scholars misunderstood and thought that the name came from a kind of herb and translated it into "ab ireo" ("from ireus"). Later this was treated as a misprint and transcribed as "al-bireo". The distance to β-Cygni A is under some debate while β-Cygni B is approximately 415-LY away. Deneb, Gamma Cygni (Sadr), Delta Cygni, Epsilon Cygni (Gienah) and Alberio form the asterism called the Northern Cross. You can find it in the eastern sky at α: 19h 31m 27.37s δ: +28° 00' 20.9"

- **NGC 6210** – This is a medium imaging challenge that is well worth the effort. NGC 6210 is a small bright planetary nebula located about 6,500 LY away in the constellation of Hercules. The entire nebula measures about 1.6 LY in diameter while the inner shell measures about a ½ LY across. The nebula is moving away from us at 14 kilometers per second; a little slower than Voyager at 17 kilometers per second. NGC 6210 is similar to our Sun. It is a future image of what may happen to Sol in about five-billion years. When a star has consumed most of its fuel, it becomes unstable and ejects its outer layer forming a “planetary nebula” (having nothing to do with planets at all). It leaves behind a tiny and very hot, remnant, called a white dwarf. You can easily get a good image of the white dwarf at the center of this planetary nebula. Surrounded by the blue and red filaments of hydrogen and oxygen being thrown out from the white dwarf. The white dwarf star cools down and fades very slowly after ejecting its outer layer. You can find NGC 6210 in Hercules in the eastern part of the sky at α: 16h 45m 15.04s δ: +23° 45' 57.0"
- **NGC 4631** – NGC 4631 is another imaging challenge. NGC 4631 is an edge-on spiral galaxy in the constellation Canes Venatici. The galaxy appears slightly distorted due to gravitational interaction with its companion galaxy, NGC 4627. The slightly distorted wedge shape gives NGC 4631 the appearance of a herring or a whale. NGC 4631 was discovered by William Herschel in 1787. The name Herring Galaxy was first given in the Deep Sky magazine Interstellarum (No. 3, May-July 1995). The name "Whale Galaxy" first occurred in the Thompson and Bryan Supernova Search Chart series. The Whale Galaxy is an enormous Sc type spiral galaxy seen edge-on. It has a visual magnitude of 9.8. NGC 4631 has a nearby companion dwarf elliptical galaxy, NGC 4627. The center of NGC 4631 contains a region of intense star formation. So many supernovae have exploded in the center of NGC 4631 that they are creating a "super-wind" of ionized hydrogen gas blowing out of the plane of the galaxy. This super-wind has produced a giant, diffuse corona of hot, X-ray emitting gas around the whole galaxy.

June is great for both planetary and deep sky viewing and imaging. Spend some time outside with your scope. Summer is coming.

For now – Keep looking up.

Random Thoughts
by Chuck Dyson

IT ALL BEGAN WITH READING ROCKS

Actually this month's random thought and subsequent ramble through history began with the purchase of a new telescope. For reasons unknown I have a penchant for refractor telescopes and they are the preferred type of telescope for me to take to the various public star parties that the Temecula Valley Astronomy club promotes. Although I am happy to share the views of the heavens that my refractors provide with the public having a pack of excited children running circles around my classic and restored refractor makes me just a little nervous, flying basketballs, on the other hand, make me hysterical.

Therefore, for the last year or so I have been searching for a refractor that I will be completely comfortable taking to star parties and will give good views of objects in the heavens. Enter the Bresser S127 it is a basic Fraunhofer design, with a "twist". The scope is a 127mm (5 inch) F5 refractor and it should throw up plenty of color when viewing Jupiter at moderately high-power (127X) but it does not and that is because of the "twist" that happens to be a second set of lenses at the back of the telescope and provide an extra amount of chromatic correction for the scope, not one of today's apochromats but good enough.

How did we come to have such a sophisticated piece of equipment available at such a reasonable price today? Well believe it or not it all started with humans living long enough to have bad eyes. Mind you that living long enough to have bad eyes was for a three to four foot tall bipedal animal with small teeth and fingernails instead of claws was no small feat. But, with time, the little fella grew to five feet tall and developed the intelligence to make and use sharp sticks, spears, and swing heavy sticks, clubs, and as he became more difficult to kill he started to live longer.

Figure 1: Nimrud Lens in the British Museum

The real breakthrough came, we think, 23,000 years ago when we find the first signs of settlements with farming and by 12,000 years ago there are full blown farming communities and in these communities there is the safety to live longer, relatively speaking. However, it is not until 750 to 710 B.C. that we find in the Assyrian Palace of Nimrud the first optical lens (see Fig. 1) that is made to help those old eyes read the print of the day.

The Nimrud lens is made from polished quartz and has a focal length of 12 cm and will magnify things around 3X. Several of these reading stones have been discovered made from quartz and other gem stones although it should be noted that some of these lenses were used to make the eyes of statues so that the eyes would appear to follow you as you walked around the chamber room, spooky. Both Euclid 300 B.C. and Ptolemy 150 A.D. studied the reflection and refraction of light but nothing seems to have come of their studies at this time. The roman philosopher Seneca the Younger around 30 A.D. notes that he was able to read all of the books in Rome with the aid of a glass ball filled with water that magnified the words; the ability of roman glass makers to produce clear glass at this time certainly supports this claim (see Fig. 2).

After this and following the collapse of the Roman empire nothing happens in the western world and only mathematical studies on optics are done in the Islamic world, very good studies though that would bear fruit when translated during the age of enlightenment. It is not until 1267 that the Oxford monk Roger Bacon works out a formula for making a magnifying glass and then working with a new glass formula from Murano Italy produces the first hand held magnifying lens. One of the earliest indications we have of people using Brother Bacon's lenses is a painting by Tommaso da Modena from 1352 showing monks using both a hand held magnifying glass and hand held spectacles while working on illuminated manuscripts.


Figure 2: Roman Glass

Everyone appears to be happy with reading spectacles and hand held magnifiers until 1608 when Hans Lippershey applied for a patent on a telescope and things started to move rapidly from that point. Within a year of Lippershey filing for a patent Galileo had made his own telescope and then made a second scope that improved on the first one. Even though telescope design advanced rapidly to try and deal with the horrible amount of chromatic aberration that the original single objective lens telescopes produced, by the addition of additional field lenses in the center of the telescope, makers were still plagued by inconsistent glass, poor grinding methods, and lens quality testing procedures that were not sensitive enough to reveal many manufacturing flaws. On the other end of the telescope in the 1660's both Christiaan Huygens and Jesse Ramsden came up with multiple lens eyepieces that while they do not solve the object lens aberration problem they didn't significantly add to it, and the view gets better.

Finally in 1733 a Mr. Chester Moore Hall an English lawyer and inventor manages to come up with the crown and flint two glass arrangement for the objective lens of the telescope. Crown and fling glasses have different refractive indexes and when fitted together greatly reduce, but do not eliminate, chromatic aberration. Mr. Hall being a very cautious man and wishing to keep his idea secret contracts for two separate opticians to grind his two lenses; unfortunately, the two opticians want the commission but not the work so they both subcontract out the actual work to a third party and unfortunately for Mr. Hall they both use the same optician a Mr. George Bass. Now as Mr. Bass was grinding both lens he soon realized what they were for, how they worked, and what an improvement in the quality of the image they produced. Realizing that there was only one thing to do, Mr. Bass paid a visit to Mr. Hall and told him that he had a partner, like it or not.

For the next 20 years the team of Hall & Bass build telescopes for customers but in 1758 a Mr. John Dollond wants Mr. Bass to make an objective lens doublet of his design; Mr. Bass unable to contain himself makes suggestions to Mr. Dollond on things he should change with his design and Mr. Dollond, being quick on the up take, realizes that Mr. Bass has just told him how he and Mr. Hall make their lenses. Mr. Dollond goes home and with his son a Mr. Peter Dollond copies and improves on the original achromatic design and soon thereafter files for a patient on the design. Hall & Bass challenge the claim sighting their prior art but the judge rules that patients are designed to protect the inventor while, whilst if you are British, bringing the benefits of the invention to the public and as they Hall & Bass had not done this in 20 years thy had forfeit their right to any patient claim. This judge's ruling is still cited and used today in courts when patient cases are heard. End result Dollond & Dollond collect royalties and Hall & Bass go home and eat sour grapes.

So, why isn't the achromatic scope of today called a Dollond instead of a Fraunhofer? It turns out that although the Dollond scope was a great improvement the company still had problems with consistent glass quality, poor grinding compounds, and poor quality control due to poor testing methods. However, around 1805 Joseph Fraunhofer, who is completely self-taught in math, chemistry, and physics literally pops onto the scene in Munich and starts improving grinding compounds, testing methods, optical design of the achromats elements, and his secret weapon is a sand pit in the town of Lippe in Saxony. The sand from this pit has an iron oxide content of .009% and it is the iron oxide that is one of the compounds that cause glass to have color and by using this sand he manufactures some of the clearest glass in the world.

Because of all of the improvements and changes that Fraunhofer made to the Dollond design the telescope that we use today really is a Fraunhofer and not a Dollond. Around 1839, in France, a photographic assistant named Louis Daguerre using Fraunhofer lenses starts taking portrait photographs of people with a new technique that he has developed, the Daguerreotype. The pictures are quite sharp and it becomes all the rage to have your portrait taken. The only problem with the process is that the lens in the camera are so slow, lets in only a little light and the film is so slow, needs a lot of light to become exposed that the subjects must sit absolutely still tor three to five minutes, try to get an eight year old to do that.

In 1840 Joseph Maximilian Petzval introduces a lens design using only mathematical calculations and not trial and error to design. A lens system that will permit a large aperture short focus lens that will reduce the exposure time to a minute or less and still produce sharp photographs.

Thus in 1840 all the work of the Greek, Roman, Islamic, and Western mathematicians finally comes to fruition. The Petzval lens consists of a standard Fraunhofer doublet with a pair of

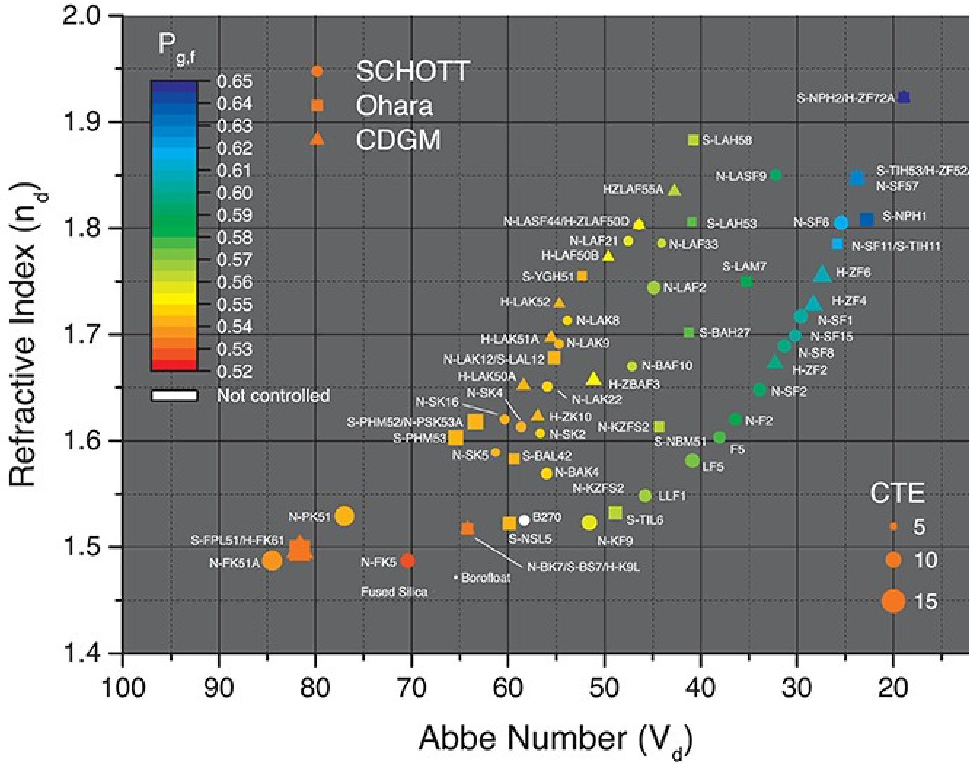


Figure 3: Edmund Optics Abbe diagram with Coefficient of Thermal Expansion and Relative Partial Dispersion

secondary corrector lenses at the back of the telescope that further correct the chromatic aberration and as a small lens is easier and cheaper to manufacture this results in a telescope that is more economical to produce than a three or four lens apochromats, “apo” means no color, where all the lenses are at the front of the telescope.

Just as a note of interest the apochromatic telescope was invented in 1763 by Mr. Peter Dollond but apparently not produced because of issues with glass and the cost of grinding three lens at that time, advances in glass and production techniques has partially remedied that. Today with literally hundreds of different glass formulas available to the opticians (see Fig. 3) the Petzval design lives on in several telescope; the Vixen NP140SS, the TeleVue NP 127, the Russian TAL-125-5APO, and the Bresser AR127s the scope that I just bought.

And this brings us almost to the end of our story for tonight, I say almost because I have not mentioned Sir Isaac Newton who was a staunch detractor of the refractor telescope and always claimed that the chromatic aberration problem would never be solved and, in order to provide the world with a truly workable telescope, produced the first practical design of a reflecting telescope in 1668. Mr. Newton, as always, was not completely wrong and not completely right.

Good Night and Cheers to All
Chuck

What Is the Asteroid Belt?

By Linda Hermans-Killiam

There are millions of pieces of rocky material left over from the formation of our solar system. These rocky chunks are called asteroids, and they can be found orbiting our Sun. Most asteroids are found between the orbits of Mars and Jupiter. They orbit the Sun in a doughnut-shaped region of space called the asteroid belt.

Asteroids come in many different sizes—from tiny rocks to giant boulders. Some can even be hundreds of miles across! Asteroids are mostly rocky, but some also have metals inside, such as iron and nickel. Almost all asteroids have irregular shapes. However, very large asteroids can have a rounder shape.

The asteroid belt is about as wide as the distance between Earth and the Sun. It's a big space, so the objects in the asteroid belt aren't very close together. That means there is plenty of room for spacecraft to safely pass through the belt. In fact, NASA has already sent several spacecraft through the asteroid belt!

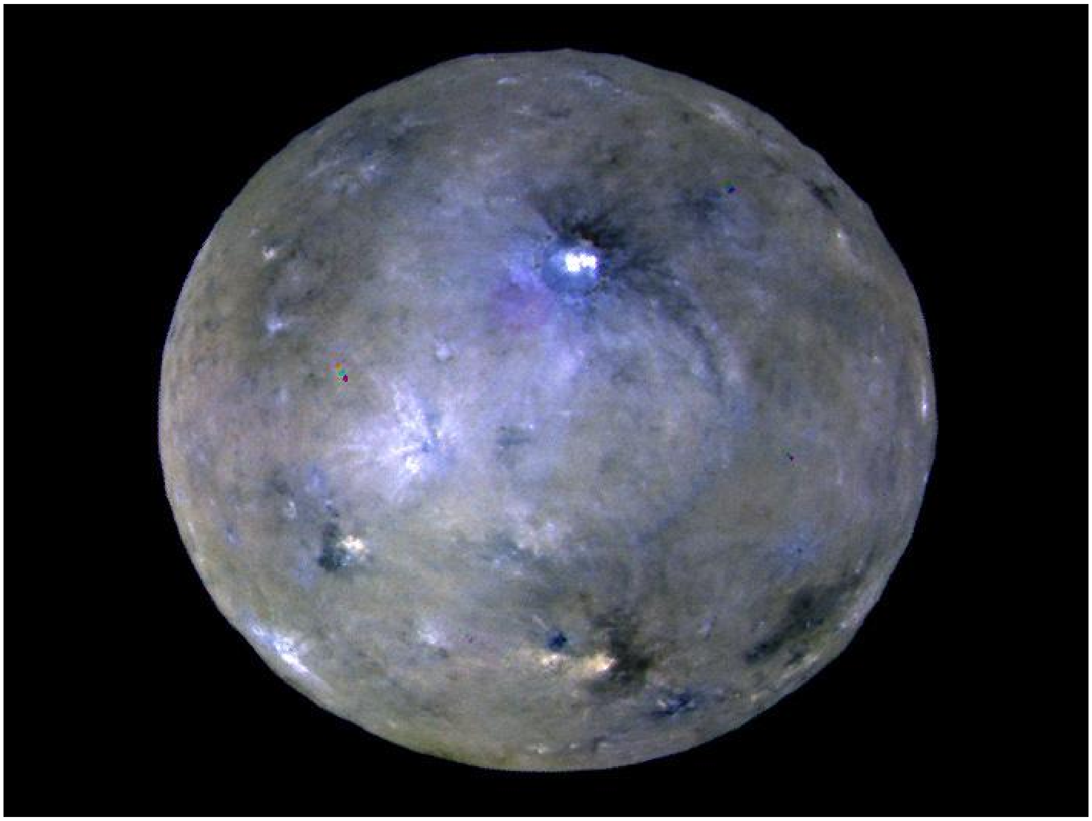
The total mass of objects in the asteroid belt is only about 4 percent the mass of our Moon. Half of this mass is from the four largest objects in the belt. These objects are named Ceres, Vesta, Pallas and Hygiea.

The dwarf planet Ceres is the largest object in the asteroid belt. However, Ceres is still pretty small. It is only about 587 miles across—only a quarter the diameter of Earth's moon. In 2015, NASA's Dawn mission mapped the surface of Ceres. From Dawn, we learned that the outermost layer of Ceres—called the crust—is made up of a mixture of rock and ice.

The Dawn spacecraft also visited the asteroid Vesta. Vesta is the second largest object in the asteroid belt. It is 329 miles across, and it is the brightest asteroid in the sky. Vesta is covered with light and dark patches, and lava once flowed on its surface.

The asteroid belt is filled with objects from the dawn of our solar system. Asteroids represent the building blocks of planets and moons, and studying them helps us learn about the early solar system.

For more information about asteroids, visit: https://spaceplace.nasa.gov/asteroid



Caption: This image captured by the Dawn spacecraft is an enhanced color view of Ceres, the largest object in the asteroid belt. Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

The TVA is a member club of The Astronomical League.