ASTRONOMICAL SOCIETY OF SOUTHERN AFRICA

'nDABA

Monthly Newsletter of the Durban Centre

January 2017

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Member Submissions Disclaimer:

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Chairman's Chatter

By Mike Hadlow

Dear Members,

I can hardly believe that January has already arrived and we are to publish our first nDaba and chairman's chat of 2017.

I trust everyone had a restful festive season and I wish everyone the best for the New Year.

We closed our year off with our annual dinner on the evening of 14 December at which time we intended to have telescope draw. However this was postponed as some of the tickets were still outstanding. We however closed ticket sales and will carry out the draw at a later date. We will confirm the date at our next general meeting on 11 January 2017. The dinner was well attended with 55 members and guests. As usual the food and company was great and we managed to raise R 1,100 from fining various members and guests, beware those of you who didn't attend, Logan our secretary might catch you and fine you for not attending.

December was not a great month for viewing although we had one or two great evenings following rain and cold fronts that came through from the south west and cleared the smog and humidity from the sky, allowing for some viewing. The third super moon of the year on the 13th was however hidden behind clouds.

For those of you who viewed on any clear evening, Venus was the bright evening star in the west with Orion being clearly visible in the east, and Aldebaran and Pleiades in the north. For early morning viewers and those getting up early to train for the comrades, Scorpio was visible low on the eastern horizon with Jupiter and Saturn also visible.

Mike with stars in his eyes ….

… Chairmans Chatter

Our next general meeting and the first for 2017 will be held on 11 January. Our speaker for the meeting will be Piet Strauss who will summarise the highlights for monthly viewing during 2017. Debbie Able will also give her usual monthly NASA update.

The public viewing on the 30 December was hosted by Johnny Visser and John Gill. Peter and Hettie Dorhmel came to visit and a family of four were eager to have a look at the night sky. Highlights were Venus, Mars and Orion.

The next public viewing will be on 27 January if it's clear, please contact your facilitator whose details you will find on the web site, to confirm if there will be a viewing.

Looking forward to seeing you all at our next in general meeting on 11 January 2017.

Wishing you clear skies and great viewing.

Scenes from our Christmas dinner

The Merope Nebula

By Brian Ventrudo

A wide field and detailed image of the Pleiades and its enveloping nebulosity by Terry Hancock and Robert Fields.

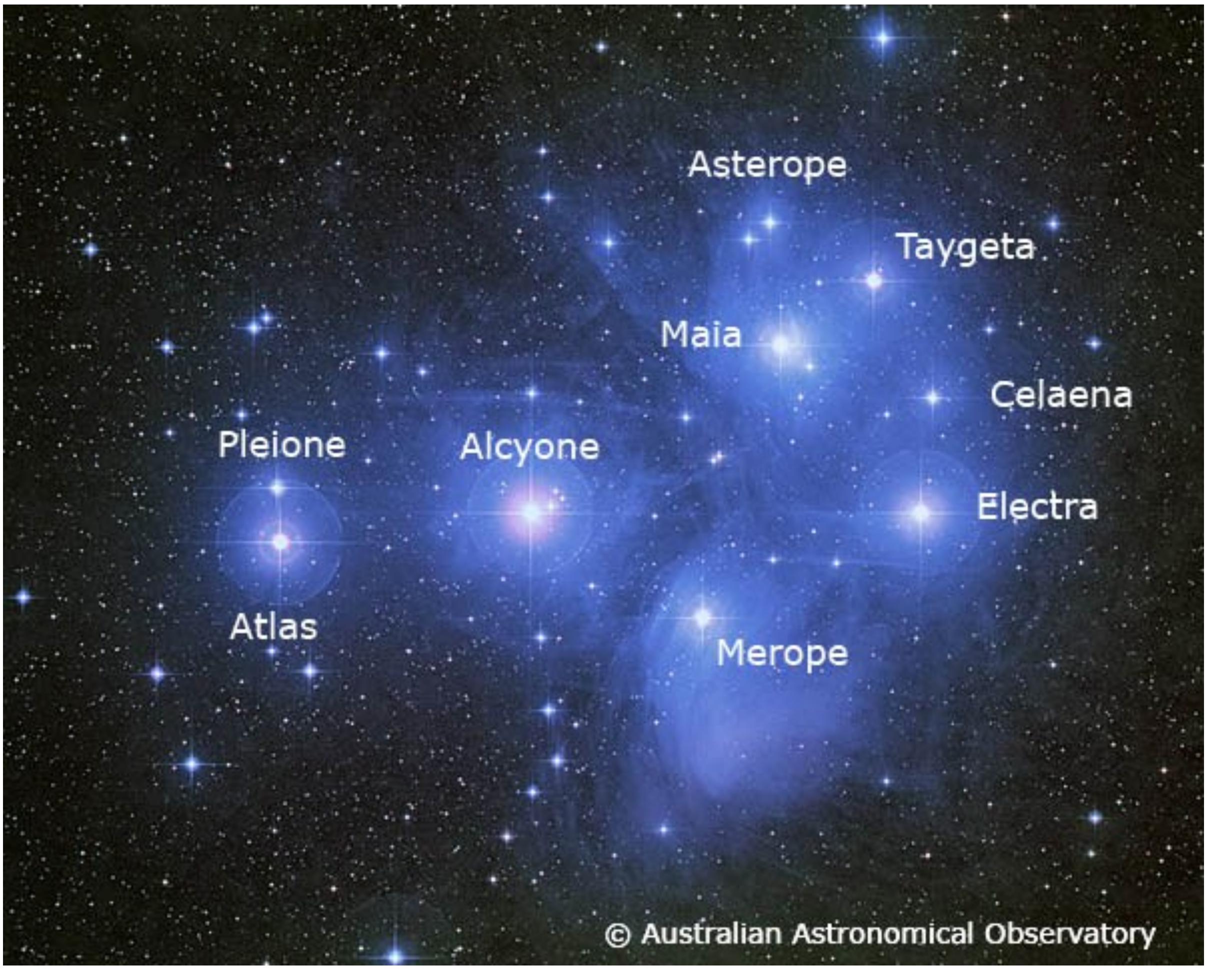
In the months from late November through early March, in both the northern and southern hemispheres, the famous Pleiades star cluster grabs the attention of experienced and untutored stargazers alike. The little dipper-shaped cluster, which is about the width of your little finger held at arm's length, takes its name from the seven sisters who were daughters of the titan Atlas and the sea nymph Pleione, but nearly every world culture has a name and legend for this group. In Sanskrit, the cluster is called Kṛttikā, which refers to the six sisters of the god Murugan.

The Japanese refer to this cluster as Subaru, from which the famous car company takes its name and logo. In the middle ages in Europe, the Pleiades was associated with Halloween because it reached its highest point near midnight on that date. Legend also tells of the Pleiades reaching high into the sky on a night in 1650 B.C. when the island of Santorini in Greece exploded in a volcanic eruption and destroyed the Minoan civilization on a nearby island.

… The Merope Nebula

Without the help of optics, most observers can pick out the six brightest stars in the Pleiades. In a good pair of binoculars or a wide-field telescope at lowest magnification, the cluster explodes into dozens of blue-white stars packed into a 2° field of view. But there's more to see here than just stars.

In 1859, an extensive blue-white nebula was discovered enveloping the stars of the Pleiades. It appears in early images as an oval blue-white gauziness with the cluster member Merope immersed in the brightest end of it. The nebula is easily seen in images from modern amateur astronomers, most particularly in the expert image at the top of this page from astrophotographers Terry Hancock and Robert Fields. The most conspicuous part of the nebula around the star Merope ("mare-OH-pee") is sometimes called the Merope Nebula or, more formally, NGC 1435.



The stars of the Pleiades. Image credit: Australian Astronomical Observatory/David Malin.

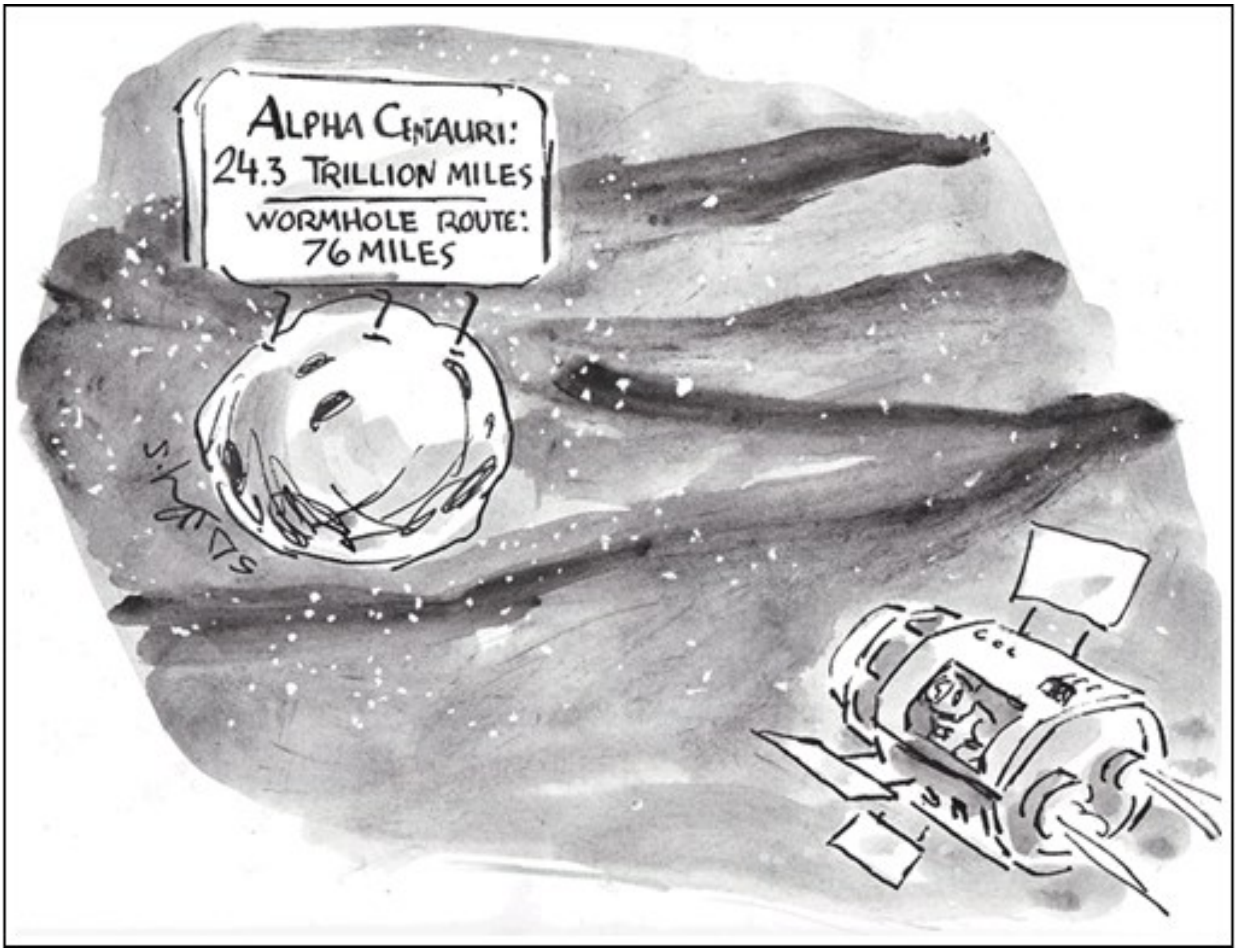
Many star clusters are bathed in gauzy blue nebulosity generated by blue-white starlight reflected by fine and sooty dust particles left over from the formation of the cluster. But at 100 million years of age, the Pleiades is a little long in the tooth for that sort of light show.

Modern studies suggest the dust enveloping the Merope and the other stars of the Pleiades is simply a relatively sooty section of the interstellar medium through which the cluster is passing. As the Pleiades moves through this part of space over the next many hundreds of thousands of years, it will leave this patch of interstellar dust behind and the nebula will disappear.

… Merope Nebula

Getting the Merope Nebula to show up in images isn't a huge challenge these days. But seeing it visually is not easy with anything other than binoculars of 70-80 mm or more in aperture and pristine dark sky. A larger scope with a 4″ or 6″ objective works better, but again, dark sky is essential to see the faint nebulosity. A magnification of 50x will do the job– you don't need high power here. To reduce the overwhelming glow of Merope, place it just out of the field of view as you first look for the nebula.

At first, you may see nebulosity everywhere among the glow of the bright stars of the Pleiades. This is illusory, or it may be caused by dew formation on your objective lens or your warm breathe condensing on your eyepiece. The Merope Nebula itself will be more localized near the star.



At The Eyepiece

January 2017 by Ray Field

THE EARTH is nearest the Sun on the 4th at a distance of 0.9833 A.U.

THE MOON is First Quarter on the 5th, FULL on the 12th, Last Quarter on the 21st and NEW on the 28th. The Moon is closest to the Earth on the 10th at 363241 kms and furthest on the 22nd at 404911 kms.

The Moon is near Regulus on the 15th, Jupiter on the 19th and near Venus at the beginning and end of the month.

MERCURY, in Sagittarius, can be seen in the early morning sky before sunrise, low over the eastern horizon, from about the second week of the month. It is at its greatest elongation on the 19th. At its brightest, Mercury is just visible to the naked eye as a pinkish "star" before the start of twilight. Binoculars will help in locating it.

VENUS is the very bright Evening Star this month setting about 2 hours after the Sun. In a telescope it will appear as a half-illuminated disc. Venus is at its greatest elongation on the 12th.

MARS, in Sagittarius, is above Venus over the west at sunset. It sets about 3 hours after the Sun at the beginning of the month. Mars continues to get further from the Earth and smaller as seen in a telescope.

JUPITER is high over the NNE close to the bright star Spica in Virgo. The Moon is near Jupiter on the 19th. The diagram on page 9 of ASSA SKY GUIDE gives the positions of its 4 brightest moons relative to Jupiter for the month.

SATURN, in Ophiuchus, rises in the morning sky from about 3 am. The Moon is near Saturn on the 24th. To the naked eye Saturn appears about as bright as Mars, only its colour is yellowish and not red.

URANUS, in Pisces, is a very faint object to find. Only under perfect viewing conditions is it just visible to the naked eye. There is a finder chart on page 79 of SKY GUIDE. It is in the evening sky and sets at about 23hrs 30mins mid-month. You will need at least binoculars to see it.

NEPTUNE, in Aquarius, needs binoculars to be seen and is fainter than Uranus. It sets about 21:30 mid-month. There is a finder chart for it on page 79 of Sky Guide.

Minor Planet (4) VESTA passes from Cancer into Gemini this month in the early morning sky. It is bright enough to be seen in binoculars. The finder chart is on page 7 of Sky Guide and shows its position during the month, as it moves between M44 (The Beehive Cluster) and the bright star Pollux. The Moon passes the area on the 13th.

COMET 128 P/ SHOEMAKER-HOLT reaches perihelion on the 10th at a distance 3.06 AU. It has an orbital period of 9.6 years.

METEOR SHOWERS: The ALPHA CRUCIDS reach a maximum rate of less than 5 per hour on the 19th. Their observing prospect is rated as poor.

… At The Eyepiece

Ray Field pointing out a star cluster in the night sky

THE STARRY SKY: By 21 Hrs mid-month, The Southern Cross is very low above the horizon. The "Southern Birds" and Fomalhaut are getting low in the SW. Taurus and the Pleiades are well placed over the north as is Orion.

The bright stars Achernar and Canopus are well up over the south. The bright globular cluster 47 Tucana, which is on the edge of the more distant Smaller Magellanic Cloud, lies between Achernar and the South Celestial Pole. It can be seen with binoculars.

The long constellation of ERIDANUS, "The River", starts and winds down from the bright star RIGEL, in Orion. It winds down to the bright star ACHERNAR, "the end of the river". The brightest star in Orion, Rigel, is 60 000 times more powerful than the Sun and is 900 light years away. Rigel has a seventh magnitude companion at a close separation of 9.5 seconds of arc. Rigel is a very stunning sight when the two components are seen at the same time in the eyepiece of a telescope.

References: ASSA SKY GUIDE Africa South, Norton's Star Atlas 2000, Philips' Planisphere for latitude 35 S and Stars of the Southern Sky by Sir Patrick Moore.

The Cover Image - Ptolemy’s Cluster

Image by John Gill, Text from Sky Portal

Messier 7, also designated NGC 6475, is a large and brilliant open cluster in Scorpius, easily detected with the naked eye.

This splendid cluster was known to Ptolemy, who mentioned it about 130 AD and described it as the "little cloud following the stinger of Scorpius". His description may also include M6, but this is uncertain.

M 7 was observed by Hodierna before 1654, who counted 30 stars. Edmond Halley listed it as No. 29 in his catalog of southern stars of 1678, and Nicholas Louis de Lacaille added it to his catalog of southern objects as Lac II.14. Charles Messier included it as the seventh object in his catalog in 1764.

Messier 7 is a huge open cluster, plainly visible to the naked eye as a concentrated patch in the Milky Way. Telescopic observations reveal about 80 stars within a field of view of 1.3° across. The cluster's brighter stars are near the cluster's center, with jagged star chains running generally east to west.

The cluster's estimated distance is 800-1000 light years, a little more than half as far as M 6. At this distance, it has an actual diameter of 18-25 light years. Its absolute magnitude is a rather modest -3.7, a luminosity of 2,500 suns, and it is approaching us at 14 km/sec.

Modern sources agree on M 7's integrated apparent magnitude at 3.3. Its brightest star is a mag. 5.6 yellow giant of spectral type G8; its hottest main sequence star is of spectral type B6. The age of the cluster is estimated at 220 million years.

Tech Specs:

Imaged on 1 May 2016 from my backyard in Durban
Celestron 8” EdgeHD on AVX mount and Canon 600d
Auto-guiding with ZWO optics

60 x Lights @ ISO 1600 for 30 seconds
15 x Bias, Darks & Flats

Guiding with PHD2 and processed in PixInsight

Ptolemy

From Wikipedia, the free encyclopedia

Early Baroque artist's rendition

Born	c. AD 100 Egypt, Roman Empire
Died	c. AD 170 (aged 69–70) Alexandria, Egypt, Roman Empire
Occupation	Mathematician Geographer Astronomer Astrologer

Claudius Ptolemy (/ˈtɒləmi/; Greek: Κλαύδιος Πτολεμαῖος, *Klaúdios Ptolemaîos*, [kláwdios ptolɛmɛ́ːos]; Latin: *Claudius Ptolemaeus*; c. AD 100 – c. 170) was a Greek writer, known as a mathematician, astronomer, geographer, astrologer, and poet of a single epigram in the Greek Anthology. He lived in the city of Alexandria in the Roman province of Egypt, wrote in Koine Greek, and held Roman citizenship. Beyond that, few reliable details of his life are known. His birthplace has been given as Ptolemais Hermiou in the Thebaid in an uncorroborated statement by the 14th-century astronomer Theodore Meliteniotes. This is a very late attestation, however, and there is no other reason to suppose that he ever lived anywhere else than Alexandria, where he died around AD 168.

Ptolemy wrote several scientific treatises, three of which were of importance to later Byzantine, Islamic and European science. The first is the astronomical treatise now known as the *Almagest*, although it was originally entitled the "Mathematical Treatise" (Μαθηματικὴ Σύνταξις, *Mathēmatikē Syntaxis*) and then known as the "Great Treatise" (Ἡ Μεγάλη Σύνταξις, *Ē Megálē Syntaxis*). The second is the *Geography*, which is a thorough discussion of the geographic knowledge of the Greco-Roman world. The third is the astrological treatise in which he attempted to adapt horoscopic astrology to the Aristotelian natural philosophy of this day. This is sometimes known as the *Apotelesmatika* (Ἀποτελεσματικά) but more commonly known as the *Tetrabiblos* from the Greek (Τετράβιβλος) meaning "Four Books" or by the Latin *Quadripartitum*.

… Ptolemy

Background

Engraving of a crowned Ptolemy being guided by the muse Astronomy, from *Margarita Philosophica* by Gregor Reisch, 1508. Although Abu Ma'shar believed Ptolemy to be one of the Ptolemies who ruled Egypt after the conquest of Alexander the title ‘King Ptolemy’ is generally viewed as a mark of respect for Ptolemy's elevated standing in science.

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The name *Claudius* is a Roman *nomen*; the fact that Ptolemy bore it indicates he lived under the Roman rule of Egypt with the privileges and political rights of Roman citizenship. It would have suited custom if the first of Ptolemy's family to become a citizen (whether he or an ancestor) took the *nomen* from a Roman called Claudius who was responsible for granting citizenship. If, as was common, this was the emperor, citizenship would have been granted between AD 41 and 68 (when Claudius, and then Nero, were Roman emperors). The astronomer would also have had a *praenomen*, which remains unknown.

Ptolemaeus (Πτολεμαῖος – *Ptolemaios*) is a Greek name. It occurs once in Greek mythology, and is of Homeric form. It was common among the Macedonian upper class at the time of Alexander the Great, and there were several of this name among Alexander's army, one of whom made himself King of Egypt in 323 BC: Ptolemy I Soter. All the kings after him, until Egypt became a Roman province in 30 BC, were also Ptolemies.

Perhaps for no other reason than the association of name, the 9th-century Persian astronomer Abu Ma'shar assumed Ptolemy to be a member of Egypt's royal lineage, stating that the ten kings of Egypt who followed Alexander were wise "and included Ptolemy the Wise, who composed the book of the *Almagest*". Abu Ma'shar recorded a belief that a different member of this royal line "composed the book on astrology and attributed it to Ptolemy". We can evidence historical confusion on this point from Abu Ma'shar's subsequent remark “It is sometimes said that the very learned man who wrote the book of astrology also wrote the book of the *Almagest*. The correct answer is not known”.

There is little evidence on the subject of Ptolemy's ancestry, apart from what can be drawn from the details of his name (see above); however, modern scholars refer to Abu Ma’shar’s account as erroneous, and it is no longer doubted that the astronomer who wrote the *Almagest* also wrote the *Tetrabiblos* as its astrological counterpart.

… Ptolemy

Ptolemy wrote in Greek and can be shown to have utilized Babylonian astronomical data. He was a Roman citizen, but most scholars conclude that Ptolemy was ethnically Greek, although some suggest he was a Hellenized Egyptian. He was often known in later Arabic sources as "the Upper Egyptian", suggesting he may have had origins in southern Egypt. Later Arabic astronomers, geographers and physicists referred to him by his name in Arabic: بَطْلُمْيوس *Batlamyus*.

Ptolemy with an armillary sphere model, by Joos van Ghent and Pedro Berruguete, 1476, Louvre, Paris

The *Almagest* is the only surviving comprehensive ancient treatise on astronomy. Babylonian astronomers had developed arithmetical techniques for calculating astronomical phenomena; Greek astronomers such as Hipparchus had produced geometric models for calculating celestial motions. Ptolemy, however, claimed to have derived his geometrical models from selected astronomical observations by his predecessors spanning more than 800 years, though astronomers have for centuries suspected that his models' parameters were adopted independently of observations. Ptolemy presented his astronomical models in convenient tables, which could be used to compute the future or past position of the planets.

The *Almagest* also contains a star catalogue, which is a version of a catalogue created by Hipparchus. Its list of forty-eight constellations is ancestral to the modern system of constellations, but unlike the modern system they did not cover the whole sky (only the sky Hipparchus could see). Across Europe, the Middle East and North Africa in the Medieval period, it was the authoritative text on astronomy, with its author becoming an almost mythical figure, called Ptolemy, King of Alexandria. The *Almagest* was preserved, like most of Classical Greek science, in Arabic manuscripts (hence its familiar name). Because of its reputation, it was widely sought and was translated twice into Latin in the 12th century, once in Sicily and again in Spain. Ptolemy's model, like those of his predecessors, was geocentric and was almost universally accepted until the appearance of simpler heliocentric models during the scientific revolution.

His *Planetary Hypotheses* went beyond the mathematical model of the *Almagest* to present a physical realization of the universe as a set of nested spheres, in which he used the epicycles of his planetary model to compute the dimensions of the universe. He estimated the Sun was at an average distance of 1,210 Earth radii, while the radius of the sphere of the fixed stars was 20,000 times the radius of the Earth.

Ptolemy presented a useful tool for astronomical calculations in his *Handy Tables*, which tabulated all the data needed to compute the positions of the Sun, Moon and planets, the rising and setting of the stars, and eclipses of the Sun and Moon. Ptolemy's *Handy Tables* provided the model for later astronomical tables or *zījes*. In the *Phaseis* (*Risings of the Fixed Stars*), Ptolemy gave a *parapegma*, a star calendar or almanac, based on the hands and disappearances of stars over the course of the solar year.

...Ptolemy

Astrology

The mathematician Claudius Ptolemy 'the Alexandrian' as imagined by a 16th-century artist Ptolemy has been referred to as “a pro-astrological authority of the highest magnitude”. His astrological treatise, a work in four parts, is known by the Greek term *Tetrabiblos*, or the Latin equivalent *Quadripartitum*: ‘Four Books’.

Ptolemy's own title is unknown, but may have been the term found in some Greek manuscripts: *Apotelesmatika*, roughly meaning 'Astrological Outcomes,' 'Effects' or ‘Prognostics’.

As a source of reference, the *Tetrabiblos* is said to have "enjoyed almost the authority of a Bible among the astrological writers of a thousand years or more". It was first translated from Arabic into Latin by Plato of Tivoli (Tiburtinus) in 1138, while he was in Spain. The *Tetrabiblos* is an extensive and continually reprinted treatise on the ancient principles of horoscopic astrology. That it did not quite attain the unrivaled status of the *Almagest* was, perhaps, because it did not cover some popular areas of the subject, particularly electional astrology (interpreting astrological charts for a particular moment to determine the outcome of a course of action to be initiated at that time), and medical astrology, which were later adoptions.

The great popularity that the *Tetrabiblos* did possess might be attributed to its nature as an exposition of the art of astrology, and as a compendium of astrological lore, rather than as a manual. It speaks in general terms, avoiding illustrations and details of practice. Ptolemy was concerned to defend astrology by defining its limits, compiling astronomical data that he believed was reliable and dismissing practices (such as considering the numerological significance of names) that he believed to be without sound basis.

Much of the content of the *Tetrabiblos* was collected from earlier sources; Ptolemy's achievement was to order his material in a systematic way, showing how the subject could, in his view, be rationalized. It is, indeed, presented as the second part of the study of astronomy of which the *Almagest* was the first, concerned with the influences of the celestial bodies in the sublunar sphere. Thus explanations of a sort are provided for the astrological effects of the planets, based upon their combined effects of heating, cooling, moistening, and drying.

Ptolemy's astrological outlook was quite practical: he thought that astrology was like medicine, that is *conjectural*, because of the many variable factors to be taken into account: the race, country, and upbringing of a person affects an individual's personality as much as, if not more than, the positions of the Sun, Moon, and planets at the precise moment of their birth, so Ptolemy saw astrology as something to be used in life but in no way relied on entirely.

A collection of one hundred aphorisms about astrology called the *Centiloquium*, ascribed to Ptolemy, was widely reproduced and commented on by Arabic, Latin and Hebrew scholars, and often bound together in medieval manuscripts after the *Tetrabiblos* as a kind of summation. It is now believed to be a much later pseudepigraphical composition. The identity and date of the actual author of the work, referred to now as Pseudo-Ptolemy, remains the subject of conjecture.

… Ptolemy

Optics

His *Optics* is a work that survives only in a poor Arabic translation and in about twenty manuscripts of a Latin version of the Arabic, which was translated by Eugene of Palermo (c. 1154). In it Ptolemy writes about properties of light, including reflection, refraction, and colour.

The work is a significant part of the early history of optics and influenced the more famous 11th-century *Book of Optics* by Alhazen (Ibn al-Haytham). It contains the earliest surviving table of refraction from air to water, for which the values (with the exception of the 60° angle of incidence), although historically praised as experimentally derived, appear to have been obtained from an arithmetic progression.

The work is also important for the early history of perception. Ptolemy combined the mathematical, philosophical and physiological traditions. He held an extramission-intromission theory of vision: the rays (or flux) from the eye formed a cone, the vertex being within the eye, and the base defining the visual field. The rays were sensitive, and conveyed information back to the observer’s intellect about the distance and orientation of surfaces.

Size and shape were determined by the visual angle subtended at the eye combined with perceived distance and orientation. This was one of the early statements of size-distance invariance as a cause of perceptual size and shape constancy, a view supported by the Stoics. Ptolemy offered explanations for many phenomena concerning illumination and colour, size, shape, movement and binocular vision. He also divided illusions into those caused by physical or optical factors and those caused by judgemental factors. He offered an obscure explanation of the sun or moon illusion (the enlarged apparent size on the horizon) based on the difficulty of looking upwards.

Named after Ptolemy

There are several characters or items named after Ptolemy, including:

The crater Ptolemaeus on the Moon;

The crater Ptolemaeus on Mars;

The asteroid 4001 Ptolemaeus;

The Ptolemy Stone used in the mathematics courses at both St. John's College campuses.

"Mortal as I am, I know that I am born for a day. But when I follow at my pleasure the serried multitude of the stars in their circular course, my feet no longer touch the earth."

- Claudius Ptolemy, 150 AD

A Brief Guide to Observing Venus

By Brian Ventrudo

The planet Venus is the third brightest object in our skies after the Sun and the Moon. Known since the first humans turned their gaze to the sky, the striking appearance of Venus compelled the ancient Greeks and Romans to name the planet after the goddess of love and beauty.

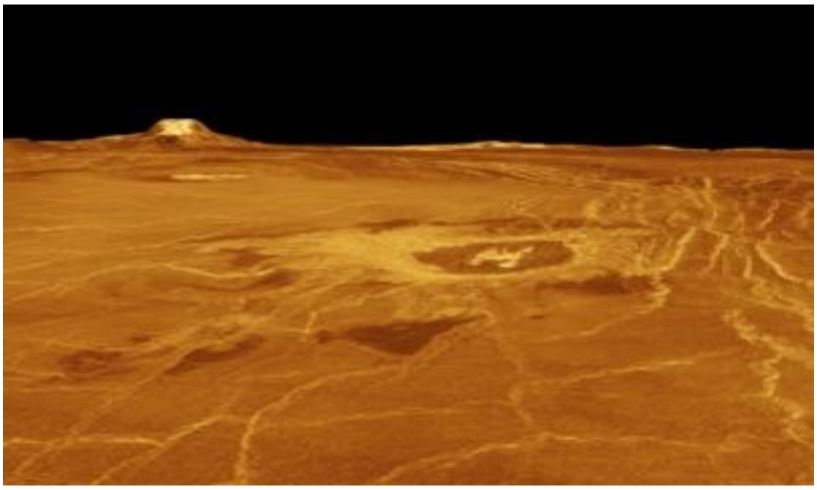
Other cultures, including the Sumerians and the Pawnee in North America also linked this brilliant planet to objects of feminine beauty. The ancient Mayans had a particular interest in Venus and built an observatory at Chichen Itza to, among other things, precisely measure the position of the planet, and some aspects of the Mayan calendar are based on the motions of Venus. While Venus reveals little detail in a telescope, it grows and shrinks and goes through a series of phases similar to the Moon, and comes closer to Earth than any other planet. Here's a little background on the planet Venus and a few tips to help you see the planet for yourself and understand its apparitions and motion in our skies.

A Beautiful But Hellish World

In size and mass, Venus remarkably resembles our own planet. Its diameter is about 12,100 km, just a few percent smaller than Earth's. It has a mass about 82% that of Earth and a surface gravity about 90% that of Earth. This superficial likeness to our planet caused many astronomers and storytellers from the 17th to the 20th centuries to speculate on the existence of life on Venus. Since the planet is a little closer to the Sun and appears to be covered with clouds, many thought Venus must be similar to a tropical rainforest and might be quite hospitable to rich plant life and perhaps even to intelligent beings. An 18th century French philosopher suggested Venus might resemble the then-new French colony of Tahiti. The Nobel laureate Svante Arrhenius in 1918 speculated the planet was a giant wet nursery of short-lived plant life. Even as late as 1960, the science writer G. E. Pendray, a founder of the American Rocket Society, hoped that Venus might "turn out to be a wonderful place to live, like Florida all over".

But no, starting in 1961, space probes were sent to fly by, and in a few cases, orbit or land on the planet. Mariner 2 made a successful flyby in 1962, as did many of the ambitious Russian *Venera* missions from the 1960's through the early 1980's. A closer look at Venus with space probes and with radar observations quickly shattered the illusion that the surface of Venus is anything like that of Earth. Venus has the densest atmosphere of the four rocky inner planets of our solar system. Its atmospheric pressure is almost 100x that of Earth, and its surface temperature is a steady 460°C (about 860°F), more than hot enough to melt lead. That makes the planet the hottest in the solar system, even hotter than sun-baked Mercury. At its surface, at least, Venus is more hell than paradise.

… Venus



A radar rendition of the surface of Venus.

Move about 50 kilometers above the surface of Venus, however, and it's a different story. Here the atmosphere is mostly carbon dioxide, the Sun shines brightly, the pressure is similar to Earth, and the temperature a much more reasonable 75°C, altogether a much more benign and Earth-like environment. While Mars and the Moon get most of the attention for future manned exploration, some imaginative souls at NASA have dreamed up a concept of sending astronauts to explore the upper atmosphere of Venus.

Venus as the "Morning Star" and "Evening Star"

Like Mercury, Venus is a so-called inferior planet, which means its orbit lies inside the orbit of Earth. That has implications for us Earthbound stargazers. For one, it means Venus and Mercury never stray far east or west of the Sun. Venus, for example, always lies within 47.8^{o} of the Sun and either rises before the Sun in the east, when it is called the "morning star", or sets after the Sun in the west, when it is called the "evening star".

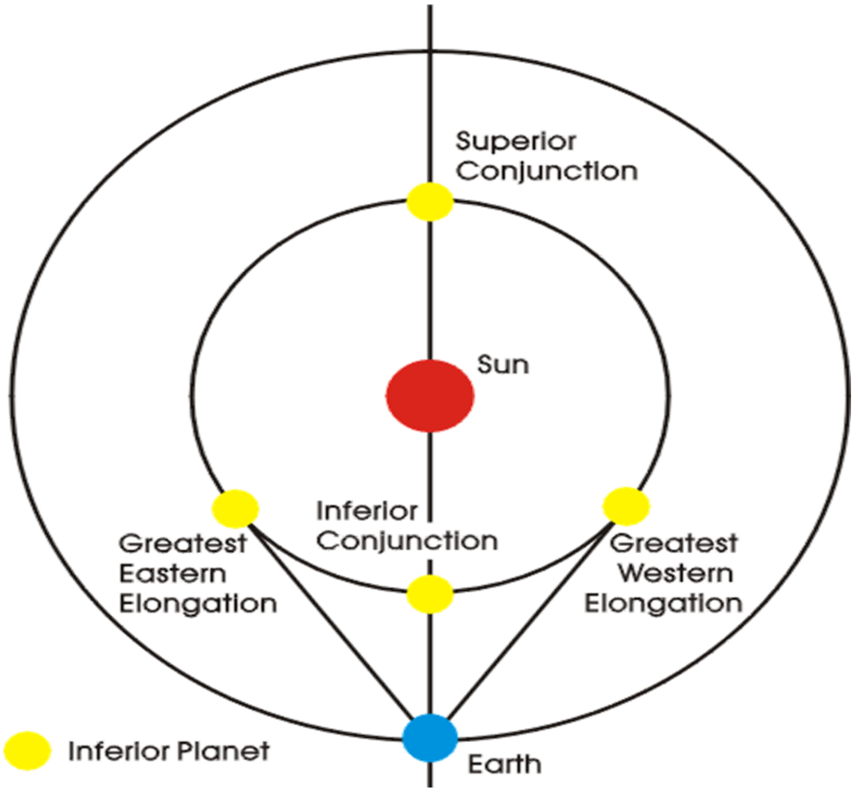
As Earth and Venus make their way around the Sun, speedier Venus will sometimes pass between the Earth and Sun, a position known as *inferior conjunction.* It then moves westward into the morning sky, rising higher each week until it reaches *greatest western elongation.* It then appears to move back towards the Sun and, when it passes behind the Sun, or nearly so, reaches *superior conjunction*. Then it appears again in the evening sky, rising and moving eastward each week until it reaches *greatest eastern elongation*.

It then moves back towards the Sun and repeats the whole process. It takes Venus 224.7 days to move around the Sun, but because of the motion of the Earth, it takes about 584 days for Venus to move through one complete cycle from one inferior conjunction to the next.

… Venus

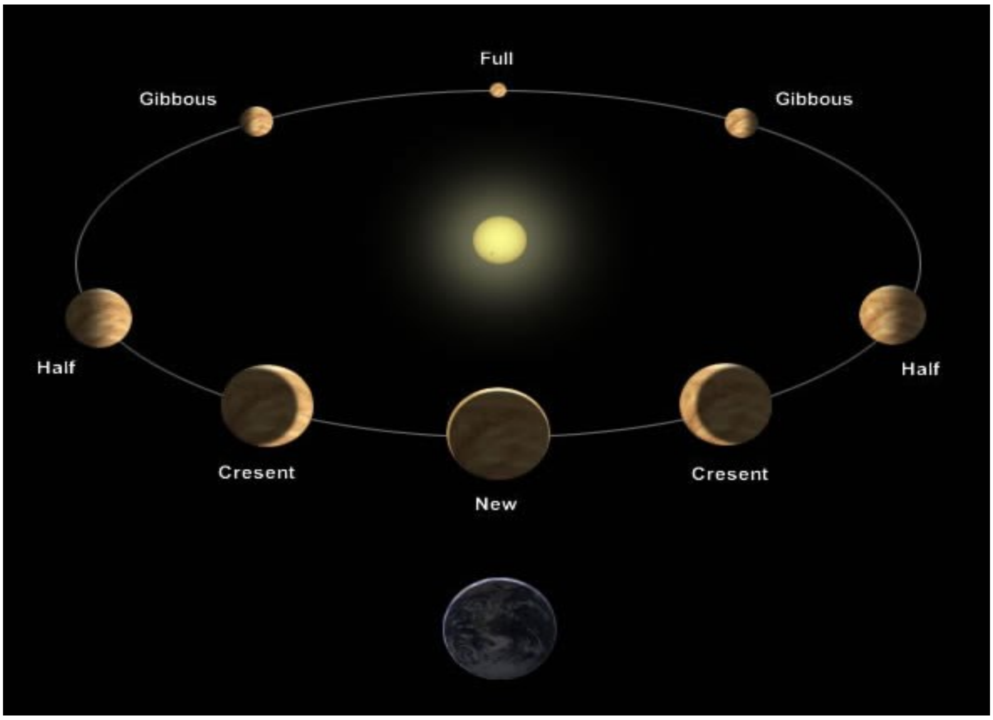
This image shows the relative positions of Venus to Earth and will help you visualize its position and motion in our skies.

The positions of the inferior planets Venus and Mercury as seen from Earth.



The Phases of Venus

Despite its nearness, brightness, and large apparent size, Venus reveals little detail to telescopic observers. But because it's inside the orbit of Earth, the planet does appear to cycle through phases much like the Moon. The image below shows the geometry that leads to the phases. When Venus, for example, lies on the far side of the Sun from Earth, the planet is fully illuminated from our point of view. But its disk is small, just 10″ across, because the planet is nearly 300 million kilometers away. When Venus is almost closest to Earth, just adjacent to the Sun in our sky, it's about 50-60 million kilometers away. That's when it appears as a slender crescent with a disk 40″-50″ across, about as apparently large as the planet Jupiter. In between these extremes, the planet can appear half-lit, like the first-quarter Moon, and in various gibbous phases as it cycles through its 584 day period. Venus appears brightest in the crescent phase because, although it is only partly illuminated, it is much closer to Earth so the total visible surface area is larger than when the planet is fully illuminated.



The geometry of the phases of Venus.

The phases of Venus (and Mercury) are easily visible in a small telescope at 50x or more, and it's great fun to observe the changes of these phases from month to month. When observing the planet near inferior or superior conjunction, take care you do not accidentally catch sight of the Sun, especially through a telescope.

… Venus

The phases of Venus also have historical cosmological significance. How? Before these phases of Mercury and Venus were discovered in a telescope by Galileo in 1610, there was lively debate on whether the Earth or Sun was the center of the solar system. By the early 1600s, there was evidence for and against both views. But there is no reasonable explanation for Venus (and Mercury) to display a complete cycle of phases in an Earth-centered solar system. However, with the Sun at the center, and Earth orbiting the Sun outside the orbit of Venus, the phases, as mentioned above, are easy to explain. So when you see the phases of Venus and Mercury in your telescope, you are seeing strong evidence of a Sun-centered solar system.

Some unconfirmed reports, in modern and ancient times, suggest some sharp-eyed observers have observed the extremely slim and bright crescent phases of Venus without optical aid! The Mesopotamian goddess Ishtar, who was represented by what we call the planet Venus, is described in ancient cuneiform texts as having “horns”.

Observing Venus

Venus is often prominent along the ecliptic at sunrise or sunset and often results in photogenic conjunctions with other bright planets and with the crescent Moon. Such appearances require no optics to enjoy and are wonderful events to share with non-stargazers to get them interested in amateur astronomy. In many cases, binoculars can enhance the view if Venus gets within a few degrees of the Moon or another planet.

At its brightest in dark sky well after sunset, when it reaches a magnitude as bright as -4.8, the planet seems close at hand, almost palpable, and can cast a shadow onto dark ground. And Venus is not particularly difficult to see during the day if you know where to look. If you have a go-to telescope, or if Venus is close to the Moon which acts as a marker, you can easily spot Venus during the day with small optics, and even with your unaided eye.

Many amateur observers have reported seeing in a telescope at high magnification a faint glow on the darkened section of the face of Venus. This is the “ashen glow”. The Moon displays a similar glow called “Earthshine”, which is simply sunlight reflected off the Earth and onto the dark surface of the Moon. You can see this especially on the Moon when it is a crescent. But Earthshine is not the cause of ashen glow on Venus; the Earth is too far away. The effect may be caused by glow in the atmosphere, or it may simply be an optical illusion.

And it IS possible to see some structure in the clouds of Venus with an amateur telescope. You need steady skies, high magnification and a good scope, and a violet filter on your eyepiece to pass only short wavelengths. It’s not an easy project, but it is worthwhile because you will see something rare and quite beautiful.

Seeing Venus in 2017

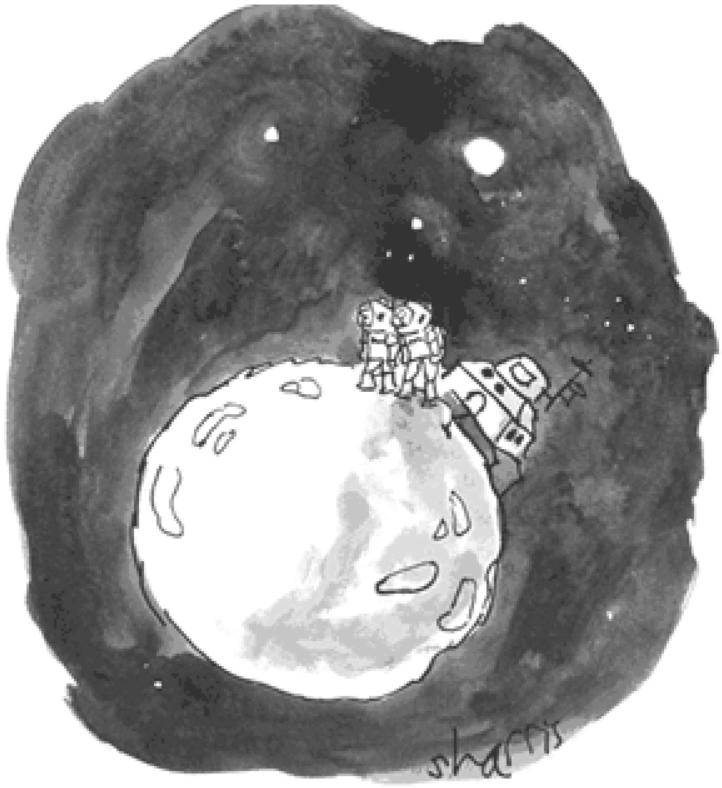
As 2016 comes to an end, the planet Venus plays its role as the “evening star”. The planet is brilliant and prominent in the western sky as the Sun sinks, in both the northern and southern hemispheres. By the end of the year, the planet brightens to magnitude -4.4 and outshines everything in the sky except for the Sun and Moon. In December 2016, the planet moves eastward from Sagittarius into Capricornus, and the slender crescent Moon brushes by on December 2-3. On January 12, 2017, Venus reaches greatest eastern elongation some 47.1° from the Sun. It will be about 50% illuminated. As a remarkable coincidence, on the same day, the planet comes within 1/2 a degree of the planet Neptune. Both planets will fit in the same field of view of a small telescope, though Neptune will present a tiny 2.2″ disk compared to the 25″-wide disk of Venus. Venus will also outshine Neptune by a factor of 30,000!

… Venus

Venus moves towards the Sun for the rest of the spring of 2017, grows in size as it turns into an increasingly slender crescent, and reaches inferior conjunction on March 25. On and around this day, because of the tilt of the orbit of Venus and Earth, Venus does not pass in front of the Sun, but appears about 8° north of the Sun. It will be an impressive 59.3″ across, magnitude -4.2, and appear just 1% illuminated.

Then Venus moves into the morning sky and stays there for the rest of 2017. Here it makes a fine pairing with the waning crescent Moon on May 22, with Uranus on June 3 when the two planets are about 1.8º apart, and with the Moon again on July 20. On October 5, 2017, Venus will come within 1/4 degree of the planet Mars– an impressive event in the sky before sunrise. And on November 13, bright Jupiter comes within about 1/4 to 1/3 of a degree from Venus, depending on your location. The two will be just 14º from the Sun, so you will need a clear view of the eastern horizon before sunrise to see the pair. And if you're ambitious, you can track and observe the two planets very close together during the daylight hours on Nov. 13.

Venus then sinks into the east for the rest of 2017 and becomes lost to the Sun's glare before reaching superior conjunction in early 2018. Then it repeats the cycle again.



"Another one uninhabited. That's three down and several hundred billion to go."

"IT WAS A LOT EASIER TO KEEP AN EYE ON THINGS BEFORE THE BIG BANG. EVERYTHING WAS ALL IN ONE PLACE THEN."

John Glenn, first American to orbit Earth, dies aged 95

The ex-Marine and US Senator had been in hospital in Columbus, Ohio, for more than a week and died surrounded by his children and wife of 73 years.

Glenn is best known for circling the earth in 1962 aboard the Friendship 7 space capsule. His achievement marked the moment the US caught up with the Soviet Union in manned space exploration. Glenn is expected to be buried at Arlington National Cemetery, Virginia.

Obituary: John Glenn

"Though he soared deep into space and to the heights of Capitol Hill, his heart never strayed from his steadfast Ohio roots. Godspeed, John Glenn!" Ohio Governor John Kasich said in a statement.

After returning to Earth, Glenn was elected in 1974 as a Democrat to the US Senate, where he served for 24 years. He blazed another trial in 1998 - 36 years after his historic flight - when he became the oldest man to travel to space, at age 77. The only son of a plumber and schoolteacher, Glenn was born in 1921 in Cambridge, Ohio. His father would recall how the boy used to run around the yard with arms held wide, pretending to fly a plane.

Glenn retained a lifelong love of flight and was piloting his own aircraft as recently as five years ago. He married his childhood sweetheart, Annie Castor, and they had two children, David and Lyn. Glenn's wife still has the $125 diamond engagement ring he bought for her in 1942. He became a combat pilot, serving in World War II and the Korean War before joining America's space agency. Glenn earned six Distinguished Flying Crosses and flew more than 150 missions during the two conflicts.

After setting the transcontinental flight speed record as a test pilot, he joined Mercury 7, America's first class of astronauts.

On 20 February 1962, he blasted off solo from Cape Canaveral aboard a cramped capsule on an Atlas rocket to a new frontier for Americans. He spent just under five hours in space, completing three laps of the world. "Zero G (gravity) and I feel fine," was Glenn's remark on weightlessness.

His capsule's heat shield came loose, leading Mission Control to fear he would be incinerated on re-entry, but the craft held together. After splashdown in the Atlantic, Glenn was treated to a New York ticker-tape parade. During his political career he was briefly considered as a running mate for Democratic presidential candidate Jimmy Carter. But Glenn's star dimmed after a meandering keynote address at the 1976 Democratic National Convention that led Mr Carter to call him "the most boring man I ever met".

… John Glenn

He vied himself to be the party's White House standard-bearer in 1984, but was beaten by Mr Carter's Vice-President, Walter Mondale.

Glenn's business career, which included an investment in a chain of Holiday Inns, made him a multi-millionaire.

When he returned to space in 1998, despite the misgivings of his wife, he said in a news conference from orbit: "To look out at this kind of creation out here and not believe in God is to me impossible."

In 2011, Glenn received the Congressional Gold Medal, the nation's highest civilian award. A year later, President Barack Obama presented him with the Presidential Medal of Freedom.

Mr Obama said in a statement on Thursday that Glenn had "spent his life breaking barriers".

Nasa tweeted that he was "a true American hero".

"Godspeed, John Glenn. Ad astra."

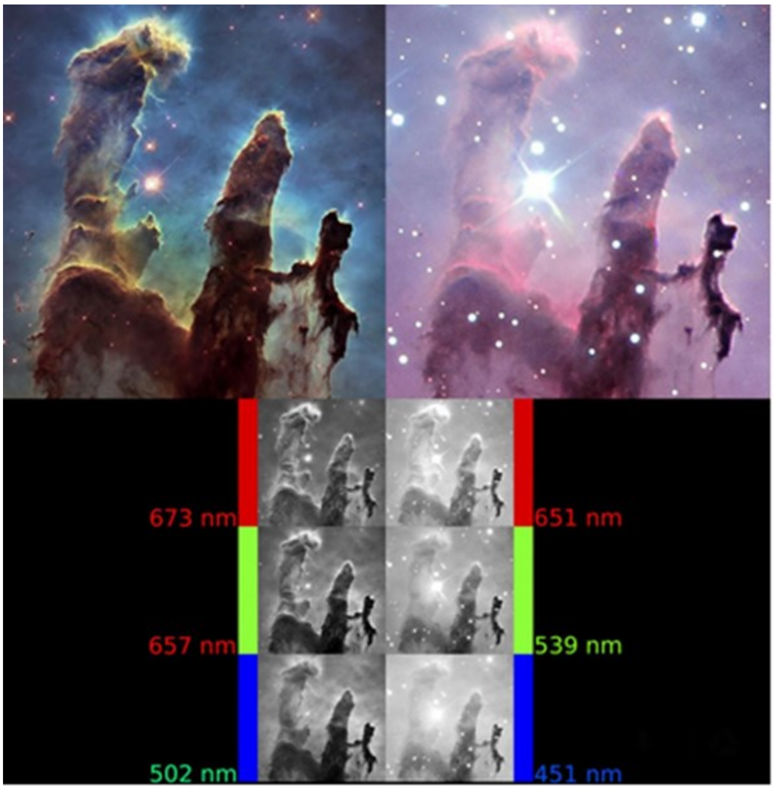
The Thing With Colors in Astrophotography

By Pierre Markuse

Why do objects in space sometimes have different colors in different images?

You have probably seen many stunning and spectacular images of objects in space; galaxies, star clusters, supernova remnants, different nebulae, and many, many more. Oftentimes those images are very colorful, but sometimes images of the same object look very different. Why is that the case?

I see your true colors shining through…



Have a look at these images of the famous "*Pillars of Creation*" in the *Eagle Nebula (M16, NGC 6611)*. The image on the left was taken by the *Hubble Space Telescope*, the image on the right by the *MPG/ESO 2.2-meter telescope*. As you can see, the colors are quite different. But how is that possible?

… Colours in Astrophotography

How we get color

Both images are actually composite images made from three monochromatic images taken through filters for different wavelengths. Those monochromatic images were then assigned (*mapped*) to one of the three color channels in a digital image (*red, green, and blue*), which, combined, result in a color image.

The images taken by those two telescopes used filters for different wavelengths, so after being combined the resulting images of course do look different, although they are images of the same object.

In the image you can see both versions of the "*Pillars of Creation*" and below them the monochromatic images used for each channel. The color of the text more or less *represents the color of the light mapped to the channel*.

But how would the object look like to the naked eye?

In most cases deep space objects seem very faint because of their great distances to Earth, and since our eyes (unlike a camera) cannot change the exposure time to gather more light over a longer period of time, colors are usually not very saturated, if visible to the naked eye at all.

With "super-vision" - ESO CC BY 4.0 / Edited by Pierre Markuse

Some objects are just too faint to trigger the cones in the eyes (*the photoreceptor cells responsible for color vision*) leaving us with a monochromatic view generated by the rods, which are far more sensitive, and triggered by less light.

But if we would have super-sensitive color vision, the "*Pillars of Creation*" would look more like the *MPG/ESO 2.2-meter telescope* image to our naked eyes.

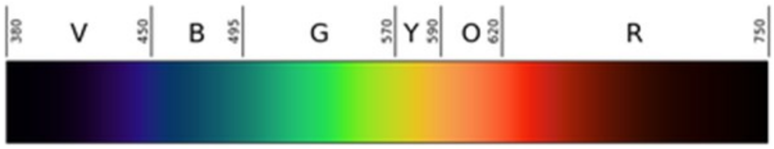
… Colors in Astrophotography

And here is why

The Hubble Space Telescope image used filters with wavelengths of 673 nm, 657 nm and 502 nm and mapped these images to the red, green and blue channel. And while 673 nm is indeed a reddish color mapped to the red channel, they mapped 657 nm, another reddish color, to the green channel and 502 nm, a greenish color to the blue channel. The resulting color image is stunning and beautiful but not like what you would see with your naked eyes.

The MPG/ESO 2.2-meter telescope image used filters with wavelengths of 651 nm, 539 nm and 451 nm and mapped the images to the red, green and blue channel. As you can see these three wavelengths are within the color range of the channel they are mapped to and therefore—when combined—result in an image close to what you could see with your naked eyes. That is, if you had super-vision, sensitive enough to see colors at all.

The image below is showing a linear representation of the visible light spectrum. Aside from filters used to take images in the visible part of the spectrum many telescopes can also take images in the ultraviolet and infrared part of the spectrum. Since we can't see ultraviolet or infrared light, any mapping of those wavelengths to one of the channels in a digital image will always result in an image that looks different from what you would see with your naked eyes.



A linear representation of the visible light spectrum.

Aren't most color images fake then?

Some people would say the colors in the Hubble image are fake, because the image doesn't reflect what it would look like to the human eye.

And while it's true that it does look different, the images aren't fake!

The color in the images reflects certain chemicals within the object and therefore are based on actual data. Sometimes it is possible to map the color of a certain narrowband filter to the corresponding channel of a digital RGB image. Take a look at the Hubble image for example. The *673 nm filter* image (*representing ionized sulfur*) is within the red part of the spectrum and indeed mapped to the red channel. But then we have the *657 nm filter* image (*representing ionized nitrogen and hydrogen alpha*) which is also in the red part of the spectrum.

Now you could map this data to the red channel of the image as well, but then you wouldn't be able to distinguish between the represented chemicals in the final image. So instead, they mapped the *657 nm filter* image to the green channel, making it possible to see the distribution of those chemicals, but also creating an image that looks different from what you would see with your naked eyes. This different view can help to better see and understand the structure of objects.

Therefore, you shouldn't see these images as fakes, an image of you in the infrared part of the spectrum is still you and real, although it does look a lot different than a "normal" photograph which uses the visible part of the spectrum.

… Colors in Astrophotography

But wait, there is more…

Using a narrowband filter and a monochromatic camera is not the only way to take images. Instead, many, especially amateur astronomers, use color cameras (*sometimes standard DSLR cameras, sometimes cameras intended for astrophotography*) to take RGB (*natural color*) images.

And while a digital image only has three color channels (*red, green, and blue*) you are of course not limited to assign just one set of data to each of those channels. You can even combine both methods (*color cameras and the use of filters and monochromatic cameras*) for an image. Take a look at these images of the *Lagoon Nebula*:

Lagoon Nebula (M8); RGB (top) and 50/50 RGB/HOS (bottom) blend. *Photos: Dylan O'Donnell*

In these images you can see how different the same object can look, using different data. The top image is a natural color image taken with a color camera, the bottom image is a 50/50 blend of a natural color image with an image using filters focusing on hydrogen, oxygen, and sulfur (*HOS image*). This means, that each of the three color channels in the digital image gets its data from two sources.

The red channel combines the red light from the natural color image with the hydrogen narrowband image, the green channel combines the green light from the natural color image with the oxygen narrowband image and the blue channel combines the blue light from the natural color image with the sulfur narrowband image.

As you can see, the result looks a lot different than the pure natural color image. It is showing more of the structure of the nebula.

Which data is assigned to which channel can be chosen freely. There are however combinations, that are more popular than others. One of the more popular ones is the one used in this image assigning hydrogen to red, oxygen to green and sulfur to blue (*HOS*).

Another combination, made famous by images from the Hubble Space Telescope and therefore often named "Hubble Palette" or "Hubble Colors" is the combination of assigning sulfur to red, hydrogen to green and oxygen to blue (SHO). An example for an image in this "Hubble Palette" is the Hubble image of the "Pillars of Creation" you have seen before.

… Colors in Astrophotography

Hubble Palette (SHO) - NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

So what is better - taking monochromatic or RGB images?

There are upsides and downsides to both methods. Using a DSLR or a color camera intended for astrophotography saves time, because you don't have to take three images to be able to combine them into an RGB image. Using narrowband filters and a monochromatic camera gives you more freedom of which wavelengths you are going to image, but because you "catch" less light you will end up with way longer exposure times. Both methods can yield very good results, which one is better depends heavily on what you are going to image, the type of image you want, and the time you are able and willing to invest in a single image.

More information

An image of the galaxy NGC 1512, demonstrating how different the same object can look in a whole set of different wavelengths from ultraviolet to infrared.

Image credit: NASA, ESA, Dan Maoz (Tel-Aviv University, Israel, and Columbia University, USA), CC BY 3.0

The Month Ahead

MEETINGS:

The next meeting will be on Wednesday 11th January @ 19:30

MNASSA:

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

MEMBERSHIP FEES:

Members - R 145 Family Membership - R 160 Joining Fee - R 35

Payment by cheque, made payable to **The Astronomical Society of Southern Africa - Natal Centre** and either posted to:

P O Box 20578, Durban North, 4016 or handed in to the treasurer.

EFT: **The Astronomical Society of Southern Africa - Natal Centre**.

Nedbank Account No. **1352 027 674** Durban North Branch Code **135 226**

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Public Viewing Roster

2016-2017	Phone		Phone	Assistant	Date start	Public viewing	Date end
Mike Hadlow	0833264085	Kira Wisniewski	0741034724	Brian Finch	12 Oct 2016	28 Oct 2016	9 Nov 2016
Maryanne Jackson	0828827200	Brian Jackson	0828867100	Debbie Abel	9 Nov 2016	25 Nov 2016	14 Dec 2016
John Visser	0823573091	John Gill	0833788797	Peter Foster	14 Dec 2016	30 Dec 2016	11 Jan 2017
David Ellinger	0837639519	Marcia George	0734288394	Mike Hadlow	11 Jan 2017	27 Jan 2017	8 Feb 2017
Mark Hardie		Kirsty Pirie		Kira Wisniewski	8 Feb 2017	24 Feb 2017	8 Mar 2017
Brian Finch		Debbie Abel	0833264084	Maryanne Jackson	8 Mar 2017	24 Mar 2017	12 Apr 2017
Chanu Chetty		Peter Foster	0826555445	John Gill	12 Apr 2017	28 Apr 2017	10 May 2017
Navi Naidoo	0844660001	Ooma Rambilass	0837783931	John Visser	10 May 2017	26 May 2017	14 Jun 2017
Mike Hadlow		Kira Wisniewski	0741034724	Cheryl Venter	14 Jun 2017	23 Jun 2017	12 Jul 2017
Maryanne Jackson	0828827200	Brian Jackson	0828867100	-	12 Jul 2017	23 Jul 2017	9 Aug 2017
John Visser		John Gill	0833788797	-	9 Aug 2017	18 Aug 2017	13 Sep 2017
David Ellinger	0837639519	Marcia George	0734288394	-	13 Sep 2017	22 Sep 2017	11 Oct 2017
Mark Hardie		Kirsty Pirie		-	11 Oct 2017	20 Oct 2017	8 Nov 2017
Brian Finch		Debbie Abel	0833264084	-	8 Nov 2017	17 Nov 2017	15 Dec 2017
Chanu Chetty		Peter Foster	0826555445	-	13 Dec 2017	15 Dec 2017	10 Jan 2018