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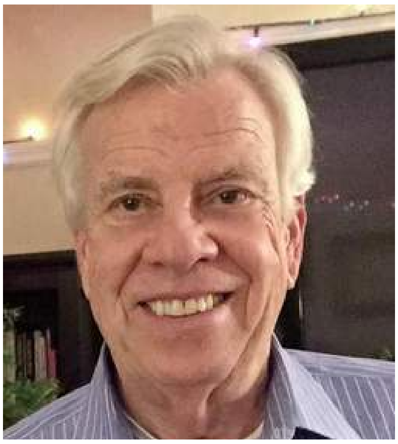
PAStimes

A Publication of the Phoenix Astronomical Society

Stu's Views

- Stu Brackney, President PAS



Greetings to all members of the Phoenix Astronomical Society (PAS)! We are thrilled to share a series of exciting updates and initiatives designed to enrich our community and advance our mission:

- Board Appointment: We are pleased to announce the appointment of Mr. Christopher Ford as our new Secretary, effective August 1st. Chris is a distinguished member of PAS with a profound passion for astronomy. His extensive experience and commitment will undoubtedly strengthen our board.
- Telescope Loan Program: PAS takes pride in launching our Telescope Loan Program, aimed at making astronomy accessible to all. We loan telescopes that have been donated to PAS over the years, however our inventory of scopes needs thinning out. We will be offering telescopes generously donated to PAS over the years at reduced prices to our members. The funds generated from these sales will contribute directly to our annual student scholarship fund, reinforcing our dedication to supporting the next generation of astronomers.
- Member Equipment Sales: In an effort to further engage our members, PAS has approved a new process for selling astronomy equipment through our PAStimes Newsletter. This initiative not only fosters a sense of community among our members but also provides a convenient platform for resource exchange within our society.
- Brand Refresh: As part of our ongoing efforts to enhance our identity, PAS is excited to introduce new name tags and logo patches featuring our updated logo. These items will be available for purchase on our website, www.pasaz.org, within the next two to three weeks. We encourage all members to proudly display their affiliation with PAS through these new accessories.
- Summer Activities: As the summer season unfolds, PAS acknowledges the challenges posed by busy schedules and soaring temperatures in Arizona. Consequently, we have adjusted our programming and will not host lectures or outdoor workshops during June and July. However, we invite our members to explore the latest edition of the PAStimes newsletter, which continues to offer insightful articles and updates, both via direct mail and on our website.
- Volunteer Opportunity: PAS is seeking a dedicated individual to join our volunteer team as an Events Manager. This pivotal role involves coordinating and managing our events calendar, ensuring that our programs run smoothly and effectively. Interested candidates are encouraged to reach out to us for more details on how to get involved.
- Safety Advisory: With the onset of record-breaking heat in Arizona, PAS emphasizes the importance of safety during astronomical observations. We urge all members to stay hydrated, take necessary precautions, and inform others of their whereabouts when venturing out into the Arizona sun or warm nights with their telescopes.

These updates underscore PAS's unwavering commitment to fostering a vibrant community of amateur astronomers while promoting accessibility, engagement, and safety. We look forward to continuing our journey together under clear skies and shared passion for the wonders of the universe.

In This Issue

July Upcoming Events

During the summer months we generally do not hold lectures or our telescope workshops. We do, however, schedule one star party each month that is held at a dark sky site generally north of Phoenix (also somewhat cooler).

July 6th – Dark Site Star Party-Bronco Trailhead

For more information and to register for these events, go to the PAS Event Calendar and Registration Site
It is important to register for all events. In case of an event change or cancellation, you will be notified via email.

June, July, August Lecture Series-Cancelled

June Outreach Events

The PAS outreach program had two events scheduled for the month:

Star Party – Dark Site

We had a very large group registered for the June star party that was scheduled to be held at one of the dark sky sites north of Phoenix. However, the weather on the 8th did not cooperate at the Bloody Basin site and we had to cancel the event. Luckily, those that had registered were provided with a cancellation notice in time to save them a needless drive of almost two hours, round trip.

Star Tours – Boulders Resort

The Star Tours outreach program worked an event planned by the Boulders Resort in Carefree on Thursday, June26th. This event was offered to a group of approximately 60 young adults attending a science related convention at the hotel. Andrew Stone, Ted Blank, and Richard Sauerbrun served as telescope operators and provided many exciting views of the night sky to the group. The event was held at the Boulders' "Promise Rock" which offered a sheltered area with excellent views and very dark skies.

Trip Report: Astro site in Namibia
By Mark Savan

In early June, Mark Johnston and I traveled to the Kiripotib Astro Farm in Namibia for 4 nights of New Moon, mid-winter observing and astrophotography.

Our location in central Namibia is one of the darkest locations on Earth - Mark J measured an SQM of 21.7 despite the illumination of the Milky Way - and being on the fringes of the Kalahari Desert provides dry, crisp, and clear nights. Astronomical darkness lasted for about 12 hours, and we didn't see a cloud the entire time … so there was plenty of opportunity each night for imaging.

As one can imagine, the night sky was spectacular. The Milky Way was brilliant, and the zodiacal light allowed one to use the white-trimmed walkways without any red lamp illumination. The Astro Farm is located at 23 degrees south so both the Large and Small Magellenic Clouds were visible - and an upside-down Big Dipper made brief appearances early in the evenings!

Kiripotib specializes in astronomy and has equipment available for rental. For our stay we rented a Meade 10" ACF on a Fornax 55 mount as well as an APM 107mm APO refractor on a Fornax 51 mount. The connections to the mounts were a bit "old school" but once we got it figured out the mounts tracked beautifully. Mark and I each brought ASI2600MCDuo cameras as well as ASIAirPlus - all of which worked well with the rented equipment. In addition, we brought along a star tracker and a Sony a7iii with a 150mm f/1.8 lens. It was a bit of a challenge to align the star tracker in the southern hemisphere, but we were able to get some good tracked shots with this wide-field setup. We also rented a 24" Dob for visual.

The accommodations at Kiripitob are good - if somewhat rustic. The rooms are basic but clean. They do not have heat and the winter temps dipped into the 40s at night - so we all got familiar with the comforts of a hot water bottle in bed! It is a working farm so the food was good and fresh - this was my first time eating Springbok and it is quite good! The staff was very friendly and helpful. Our route to Kiripotib had us flying into the capital city of Windhoek and then being driven approx. 90 minutes to the farm - not too bad considering the benefits of being remotely located.

Overall this was a fantastic experience - the viewing and astrophotography opportunities were clearly the best that I have ever experienced.

The Renaissance of Astronomy and the Birth of Modern Science
By Vince Marzell

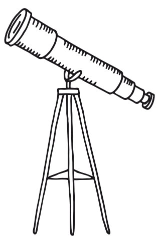
It's easy to forget that Astronomy had its proper beginnings (apart from Astrology) in the 16th century through the contributions of many scientists and mathematicians of the day. However, four men stand apart as true fathers of Astronomy: Nicolas Copernicus, Tycho Brahe, Johannes Kepler, and Galileo Galilei. They were very much like us, either noblemen, or born to wealthy families which could afford them a high education, lots of free time, and monetary resources for equipment to indulge in their inquisitive pastime.

Nicolas Copernicus proposed that the Sun, rather than the Earth, was at the center of the solar system, with the planets, including Earth, orbiting around it. This challenged the prevailing geocentric model, which had Earth at the center of the universe. His model provided a more accurate explanation for the observed movements of celestial bodies and paved the way for later astronomers, such as Johannes Kepler and Galileo Galilei, to further develop the heliocentric theory. Copernicus's heliocentric model marked a significant shift in humanity's perception of the universe and sparked a scientific revolution.

Copernicus was a physician and nephew of a very powerful bishop in Turun, Poland. He was a quiet unassuming man, whose penchant for astronomical observations were pretty much a lifetime hobby (like so many of us).

Tycho Brahe was a Danish nobleman who built and operated some of the most precise astronomical instruments of his time and made extensive and accurate observations of the positions of stars and planets. Legend has it that he lost part of his nose in a duel over a mathematical formula. To conceal this injury, he made himself a prosthetic nose out of gold, silver, and wax. He recorded the appearance of a new bright star in Cassiopea on November 11, 1572, now known as Tycho's star (a supernova). As the new star faded in brightness, it also changed in color and Tycho was not slow to point out the astrological implications: "The star was at first like Venus and Jupiter, giving pleasing effects; but as it then became like Mars, there will next come a period of wars, seditions, captivity and death of princes, and destruction of cities, together with dryness and fiery meteors in the air, pestilence, and venomous snakes". If these ideas seem curious, then never mind a certain Georg Busch, a German who wrote two pamphlets about the star. He regarded it as a comet "…formed by the ascension from Earth of human sins and wickedness, making sort of a gas which was then set on fire by the anger of God. This poisonous stuff falls down on people's heads and causes all kinds of unpleasant phenomena such as diseases, sudden death, bad weather, and Frenchmen".

Brahe's observational data was crucial for the advancement of astronomy, and his observations served as the basis for Johannes Kepler's laws of planetary motion. Kepler, who worked as Brahe's assistant, inherited Brahe's extensive collection of observational data after his death and used it to formulate his groundbreaking theories.



One of the most fascinating aspects of Johannes Kepler is his discovery of the three laws of planetary motion, which revolutionized our understanding of the solar system and laid the foundation for modern celestial mechanics.

Kepler's first law, known as the law of elliptical orbits, states that the planets move around the Sun in elliptical paths with the Sun located at one of the two foci of the ellipse. This replaced the earlier notion of circular orbits, proposed by ancient astronomers, and provided a more accurate description of planetary motion. His second law, the law of equal areas, states that a line segment joining a planet and the Sun sweeps out equal areas in equal intervals of time. This implies that planets move faster when they are closer to the Sun and slower when they are farther away, explaining the variation in planetary speed throughout their orbits. Kepler's third law, the harmonic law, relates the orbital period of a planet to its distance from the Sun. It states that the square of the orbital period of a planet is proportional to the cube of the semi-major axis of its orbit. This law provided a mathematical relationship between the periods and distances of planets, allowing astronomers to calculate the relative sizes of their orbits.

Kepler's laws not only transformed our understanding of planetary motion but also paved the way for Isaac Newton's law of universal gravitation, which explained the underlying mechanism governing the motion of celestial bodies. Kepler's contributions to astronomy and physics mark him as one of the most significant figures in the scientific revolution of the 17th century.

In 1609, Galileo Galilei heard about the invention of the telescope in the Netherlands (Hans Lippershey) and immediately set to work building his own. Galileo made several groundbreaking discoveries. One of the most significant was his observation of the moons of Jupiter. In 1610, he discovered the four largest moons of Jupiter, now known as the Galilean moons (Io, Europa, Ganymede, and Callisto). This discovery provided strong evidence for the Copernican heliocentric model of the solar system, as it showed that not all celestial bodies orbit the Earth. Another remarkable discovery made by Galileo was his observation of the phases of Venus. By observing Venus through his telescope, he observed that Venus exhibited phases similar to those of the Moon, which supported the heliocentric model proposed by Copernicus. However, Galileo's telescope was not big enough to define Saturn's ring and he reported Saturn as having three bodies, one large one with two small ones attached at each side.

Galileo's experiments of dropping different sized cannon balls onto people's heads from the top of the Leaning Tower of Pisa (not really) was vindicated by the Apollo 15 mission on the Moon. During this mission, astronaut David Scott performed a demonstration in which he dropped a hammer and a feather simultaneously on the lunar surface. The result was consistent with Galileo's findings: the hammer and the feather fell at the same rate and hit the lunar surface simultaneously.

However, Galileo's support for the heliocentric model and his conflicts with the Catholic Church over his views led to his trial and condemnation by the Roman Inquisition in 1633 and eventually to his house arrest. Despite this, Galileo's work paved the way for the advancement of astronomy and physics, and he is remembered as one of the greatest scientists in history.

Is Pluto a Planet?
By Mark Johnston

According to the IAU (International Astronomical Union) which is responsible for nomenclature, Pluto is a dwarf planet, not a planet. But the true answer is much more complex.

When Pluto was discovered in 1930 it was deemed a planet. But in the 1990's, astronomers began to discover large bodies past Pluto, such as Eris, Sedna, Quaoar, and Makemake. Potentially hundreds of such objects could hide in the far limits of our solar system. Are these all planets? In 2006 the IAU decided that a "planet" had to meet 3 criteria:

1. It must be a celestial body in orbit around the Sun.
2. It must have sufficient mass to have reached "hydrostatic equilibrium" (nearly round shape).
3. It must have "cleared the neighborhood" around its orbit.

Based on Pluto not meeting criterion #3, it was demoted to "dwarf planet" status. But a strict interpretation of these criteria leads an impartial observer to conclude our solar system has just 1 planet:

- Mercury fails because it does not pass criterion #2. Being made mostly of metal, it is not massive enough to have completely collapsed into a spherical shape and has not met hydrostatic equilibrium
- Venus fails criterion #3 because it has at least one trojan asteroid traveling in the same orbit
- Earth fails criterion #3 because it has at least two trojan asteroids traveling in the same orbit. Earth also co-orbits with over 34,000 near-Earth asteroids
- Mars fails criterion #3 because it has at least 14 trojan asteroids traveling in the same orbit
- Jupiter fails criterion #3 because it has at least 11,000 trojan asteroids traveling in the same orbit
- Saturn meets all 3 criteria! Go Saturn!
- Uranus fails criterion #3 because it has at least two trojan asteroids traveling in the same orbit.
- Neptune fails criterion #3 because it has at least 28 trojan asteroids traveling in the same orbit. Practically speaking, if Neptune had 'cleared its orbit', Pluto would not be there either, because their orbits intersect.
- Pluto fails criterion #3 because of the many celestial bodies in the Kuiper belt

Supporters of the IAU definition might argue that "clearing the neighborhood" was intended to exclude trojan asteroids and other objects in gravitational resonance with the main body. But the definition is vague and does not even exclude spacecraft. Even if you allowed trojan asteroids, Mercury unquestionably fails hydrostatic equilibrium and Neptune sure didn't clear out Pluto which sometimes orbits inside Neptune's orbit. And what about the 34,000 near-Earth asteroids which are not gravitationally resonant with Earth?

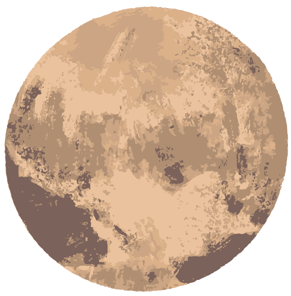
We have discovered hundreds of "rogue planets" that travel in deep space unassociated with any one star. These are believed to be planets that were ejected from their solar systems early in the system's formation. According to the IAU these are not planets because they don't orbit our Sun.

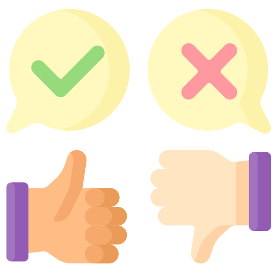
Arguably the people most expert on this topic are planetary astrophysicists, such as Alan Stern, who has been the principal investigator on the New Horizons and 7 NASA missions. He was quoted as saying regarding the IAU proposal: "It's an awful definition; it's sloppy science and it would never pass peer review".

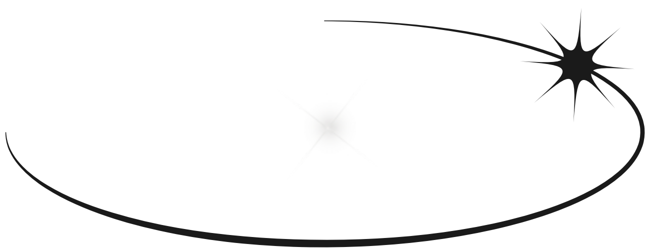
Some stars have "white dwarf" companion stars, where the primary star far out-masses the companion. The white dwarf orbits the primary star. If you applied the IAU definition to such a solar system, the white dwarf is really a planet because the definition doesn't differentiate between planetary mass and stellar mass objects.

So- is Pluto a planet? Officially, the answer is no, it's a dwarf planet. But the IAU definition is severely flawed and should be thrown out. The IAU says that Mercury, Venus, Earth, Mars, Jupiter, Uranus and Neptune are planets when each one independently fails the IAU's own definition. And many planetary science experts like Alan Stern refuse to accept the IAU definition and maintain Pluto is still a planet.

You might think, "who cares?" and you'd be in good company with that opinion. But it's a challenge for those of us involved with astronomy education. I can think of no other definition in astronomy that that so vague and inconsistently applied. I'd be open to a reclassification if a new definition was well thought-through and made sense. Until then, choose the experts you want to agree with!

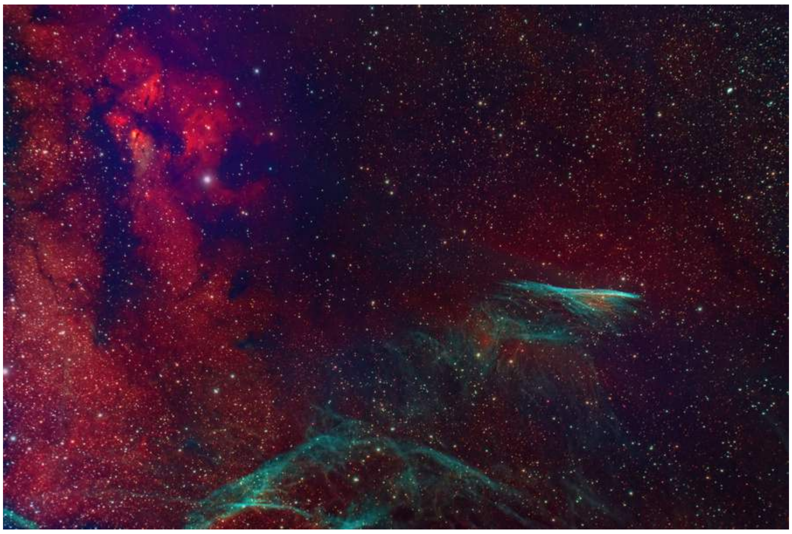






Member Astro Images-Namibia

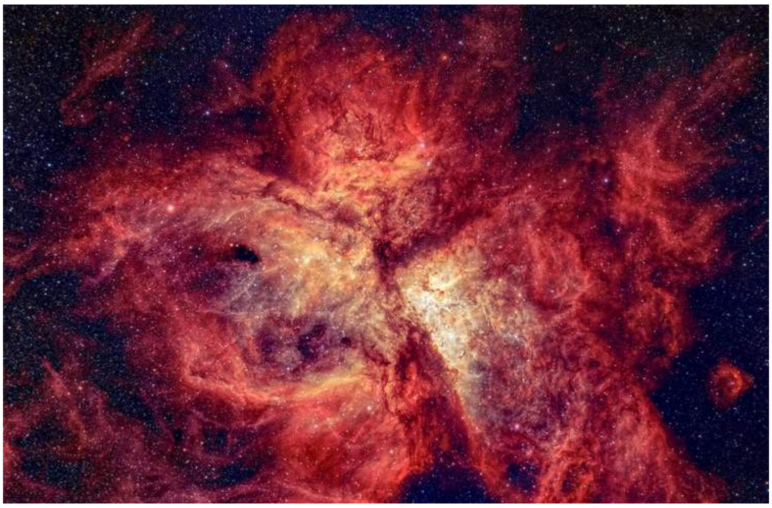
-mark johnston



pencil snr and nebula b1

jewel box star cluster

large magellanic cloud galaxy



eta carina nebula

- mark savan

centaurus a galaxy

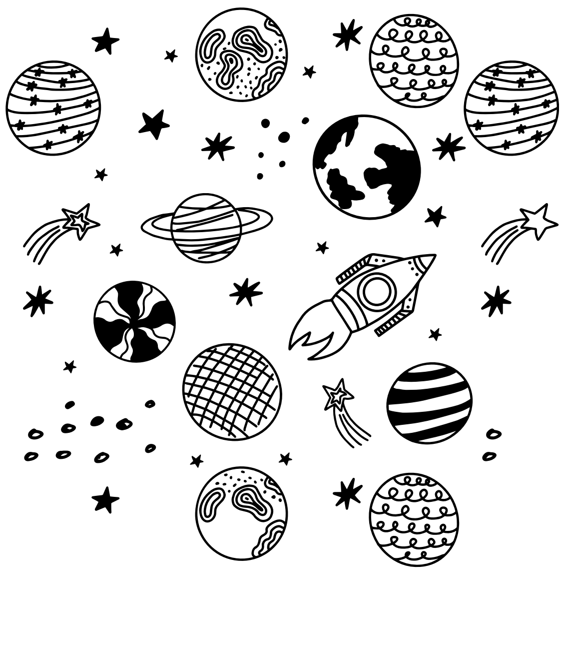
eta carinae -
mark savan

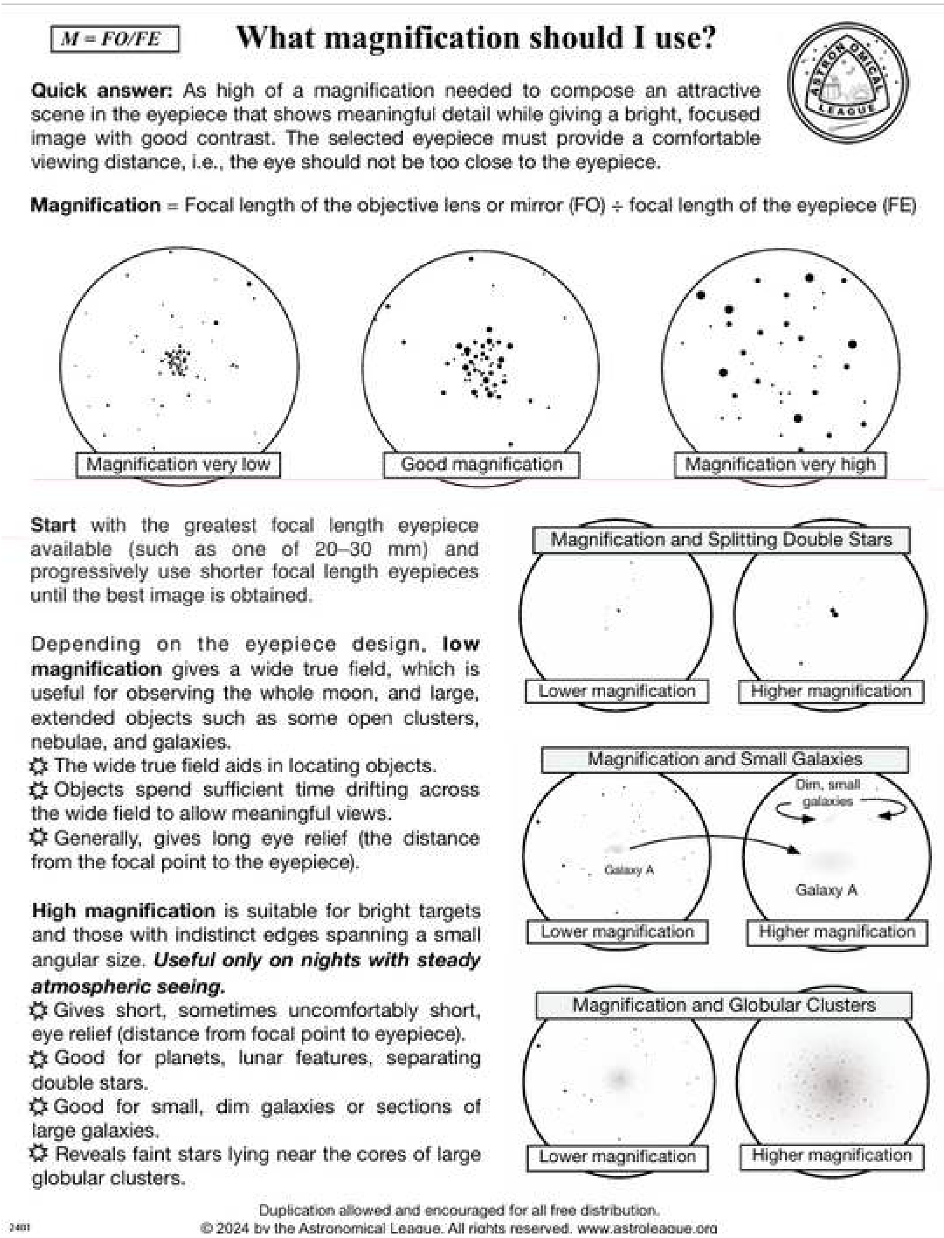
7 Telescope Targets for July

Each month we feature 7 good targets for small telescopes that should be visible in the evening

1. **M13**: The Great Hercules globular cluster is the brightest GC visible in northern skies. Look for the faint dark ‘propeller’!
2. **Rasalgethi Alpha Hercules**: A blue/yellow binary star.
3. **Draco W Cluster Asterism**: in Draco that looks like a big W
4. **M27:** The Dumbbell Nebula is one of the brightest large planetary nebulae in the sky
5. **Omicron Ophiuchus Binary Star**: in Ophiuchus
6. **NGC6231 Open Cluster**: called the “Northern Jewelbox” in Scorpius
7. **M92**: Bright globular cluster in Hercules, often overlooked because of its proximity to M13

Cosmic Classroom (CC)





M = FO/FE

What magnification should I use?

Quick answer: As high of a magnification needed to compose an attractive scene in the eyepiece that shows meaningful detail while giving a bright, focused image with good contrast. The selected eyepiece must provide a comfortable viewing distance, i.e., the eye should not be too close to the eyepiece.

Magnification = Focal length of the objective lens or mirror (FO) ÷ focal length of the eyepiece (FE)

Start with the greatest focal length eyepiece available (such as one of 20–30 mm) and progressively use shorter focal length eyepieces until the best image is obtained.

Depending on the eyepiece design, **low magnification** gives a wide true field, which is useful for observing the whole moon, and large, extended objects such as some open clusters, nebulae, and galaxies.
- The wide true field aids in locating objects.
- Objects spend sufficient time drifting across the wide field to allow meaningful views.
- Generally, gives long eye relief (the distance from the focal point to the eyepiece).

High magnification is suitable for bright targets and those with indistinct edges spanning a small angular size. ***Useful only on nights with steady atmospheric seeing.***
- Gives short, sometimes uncomfortably short, eye relief (distance from focal point to eyepiece).
- Good for planets, lunar features, separating double stars.
- Good for small, dim galaxies or sections of large galaxies.
- Reveals faint stars lying near the cores of large globular clusters.

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Helpful Astronomy Websites

by Mark Johnston

The following websites are great free resources to help you plan and enjoy your astronomy adventures

Astromart: **astromart.com/**
This is one of the top two sites for buying and selling used astronomy gear, product reviews, and forums where you can discuss any aspect of astronomy with other enthusiasts. A small fee is required.

Astrometry.net: **https://nova.astrometry.net/**
This site will take any astronomy image you send it (galaxy, starfield, nebula, etc) and then tell you what it is and where it is in the sky.

Astronomy Tools: **astronomy.tools/calculators/field_of_view/**
This site has a lot of capabilities but I use it primarily to figure out how a target (e.g. the Helix nebula) will look in my eyepiece or astronomy camera. You pick your scope, camera, eyepiece and target and the site does the rest.

Astrospheric: **www.astrospheric.com/**
Probably the best short term astronomy weather forecasting tool, providing predictions of clouds, transparency and seeing.

Clear Sky Charts: **www.cleardarksky.com/**
Excellent source of astronomy seeing conditions forecast. Also a great tool for finding observing sites with lower light pollution.

Cloudynights: **www.cloudynights.com/**
This is one of the top two sites for buying and selling used astronomy gear, product reviews, and forums where you can discuss any aspect of astronomy with other enthusiasts. Free.

Dark site finder: **darksitefinder.com/map/**
Great website for finding a dark observing location.

Heavens above: **heavens-above.com/**
Top site for predicting naked eye observations of satellites. See when the ISS is visible in your neighborhood!

Jupiter transits **shallowsky.com/jupiter/**
For anyone with a small telescope, this is a great site. You can find out when the Great Red Spot and Jupiter's satellite transits are visible.

Solar Dynamic Observatory (SDO) **https://sdo.gsfc.nasa.gov/data/**
Find out how the Sun looks right now, at various wavelengths. If you own a solar telescope, this site coupled with Astrospheric is all you need to plan fabulous solar observing!

Telescopius **telescopius.com/**
This site is very helpful in planning an observing evening. It will tell you when any particular target is rising and setting and when is the best time to observe it. This allows you to sequence your observing in a planned manner.