The Valley Skywatcher

Official Publication of the Chagrin Valley Astronomical Society

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Contents

Officers for 2011

The Cygnus Wall in NGC 7000 **Image by CVAS Member Russ Swaney**

Where Have All The Dark Skies Gone?

By John Gorka

On August 10, 1971, Mars was in one of its most favorable oppositions to Earth in many years and made its closest approach the following day at a distance of only 34,931,000 miles. In Capricornus it dominated the southern sky at magnitude -2.6.

About an hour's drive southeast of Cleveland, Hiram College had announced an open house at the Stephens Observatory on the weekend following the Mars opposition where the public could view the red planet through the Cooley Telescope, a 9" Warner and Swasey refractor.

On Friday the 13th there was no bad luck with the weather. A cool Canadian air mass had moved in bringing clear and very transparent skies. The waning moon, seven days past full, was nowhere to be seen. Although there was a two-hour wait in line to get to the telescope, the large crowd outside the observatory did not seem to mind at all. We were all in awe at the skies overhead which were so dark that the Milky Way could be seen horizon to horizon.

For many it was probably the first experience observing the heavens with truly dark skies and one never to be forgotten. With the northeast Ohio skies we now have, it may be hard to imagine seeing so many stars that the constellations could only be discerned with great difficulty. All of the asterism known as the Little Dipper was easily visible without using averted vision. For those blessed with good eyes, stars were visible without optical aid to at least 7th magnitude.

Forty years later it seems nearly impossible to imagine that such skies were available to both astronomers and the general public so close to Cleveland. In 1971 areas in the suburbs only 15 miles from downtown had skies as dark or darker than those overhead at Indian Hill Observatory today. Now there is no location in Ohio that enjoys the type of skies seen in Hiram at the time of the Mars opposition.

What caused the loss of dark skies in northeast Ohio and elsewhere in America is no mystery. The culprit is light pollution from uncontrolled outdoor lighting.

When considering air and water pollution, the public can readily conjure up objectionable images of smokestacks belching dark noxious plumes or pictures of city streets filled with cars, trucks and buses with their telltale tailpipe exhaust. Likewise with water pollution one can visualize lakes or ponds filled with dead fish or oceans with slicks from ruptured oil tankers or from drilling rigs.

However, if anyone mentions the topic of light pollution, the common reaction is often: "Light pollution? What do you mean by that?"

There are different ways to define light pollution, but one of the best we've seen is this:

> **Light pollution is the sky glow produced by the scattering of artificial light in the gases and particles of the air caused mainly by the poor quality of outdoor lighting.**

What can astronomers do when they live in an area with bright skies?

Unfortunately, it is impractical for most amateurs to seek darker sky sites on a regular basis, and while light pollution filters are helpful with some nebulae, there is really no substitute for naturally dark skies.

Modern digital photography can work around skies that are not inherently dark by using short exposures with filters and the "stacking" of images by using special software, but where does that leave the low-budget casual observer? At an event commonly known as a star party, the public can only see what the telescope shows them on any given night, and astronomers know that starlight does not have a cumulative effect on the human retina.

The ideal situation would be to restore, at least to some degree, the skies we used to enjoy years ago. This solution is not impossible but is admittedly going to be difficult to attain.

Both professional and amateur astronomers have historically been most impacted by the effects of light pollution because of its adverse effect on celestial observations. Therefore, they have been in the forefront of most efforts to curtail it.

Sometimes it takes one horrendous example of poor quality outdoor lighting for the general public to notice that light pollution can be a problem. However, even when the public does get involved, arriving at a solution can take a concerted effort. The solution often makes the effort worthwhile.

The before and after photos (see below) of a fast food restaurant in Chesterland are a prime example. Only after considerable prodding did the owner change his light fixtures to those which are more dark-sky friendly. In so doing he saved a substantial amount of money annually in utility costs. The township citizens benefited by having reduced glare from the properly shielded lights (a safety issue) and also from the reduction in sky glow.

In the next issue of *The Valley Skywatcher* we will examine in more detail the effects of light pollution on humans and further examples of how bad lighting can be corrected. φ

Original outdoor lighting, photo by the author.

Improvements AFTER lighting fixtures were changed, photo by the author.

Astronomy Pictures of the Season #1

Supernova SN 2011dh in the Whirlpool Galaxy M51
By Russ Swaney

Whirlpool Galaxy M51 on May 4, 2011

Whirlpool Galaxy M51 on June 3, 2011 with SN

On average, a supernova occurs once every 100 years/galaxy. But for the third time in 17 years a star has exploded in the Whirlpool Galaxy, Messier 51. SN 2011dh was discovered on May 31st by French observers Tom Reiland, Amedee Riou, Thomas Griga, and Stephane Lamotte Bailey (with a brand-new 14-inch reflector).

Spectrums taken with the Keck I telescope reveal that it is a Type II supernova, that is, the explosion of a single massive star. In every active star, hydrogen and helium undergo fusion, producing successively heavier elements. But if the star is massive enough, when the fusion chain reaches iron, energy starts being absorbed rather than released, causing a ferrous core to build up. The star grows too dense to support itself and the outward explosive thrust of its internal fusion no longer counteracts the pull of gravity. The core collapses into degenerate matter (atomic nuclei crushed together in volume only twenty kilometers across but with a mass many times that of our Sun). When the in-falling hydrogen and helium from the outer layers suddenly hit this new, hard surface, they fuse instantly, releasing a deluge of radio noise, light, heat, x-rays, cosmic rays, and neutrinos. The result is a spherical shell shining brighter than all the other stars in the galaxy combined.

The images above were taken from Indian Hill with a 10” Schmidt-Newtonian telescope at F4 and a QHY9 CCD. Ten exposures, each 120 seconds in length, were recorded, calibrated, stacked and processed with Maxim DL. The final images were cropped and enlarged from the original 60 x 50 arc minute frames (the galaxy is only 10 x 6 arc minutes). The supernova is estimated to be roughly magnitude 14.5 on June 3. ♈

Astronomy Pictures of the Season #2

The Swan Nebula M17
By David Mihalic

The Milky Way is at its finest during the summer as we gaze inward towards the center of our galaxy with its bonus high density views of star clouds and gaseous nebulae. One of my favorites is the Swan Nebula also known as the Omega Nebula in some countries. The Messier designation is M17 or NGC 6618. It is most often seen "upside down" in many telescopes. Here I have flipped the image to "right side up" to more correctly depict the figure of a swan. But you still need to exercise some imagination! Some people see the number '2' instead of the swan.

Messier 17 is a classic example of an emission nebula. It lies somewhere around 5000 to 6000 light years distant in the constellation Sagittarius with a width of about 15 light years.

The image seen here was taken with a remotely controlled telescope of SLOOH, located on Mt. Teide on the island of Tenerife in the Canary Islands. It is a 20" Corrected Dall-Kirkham scope working at F6.8. The resulting image was processed with Photoshop Elements 9.0. The total exposure was approximately 10 minutes evenly divided among LRGB filters. φ

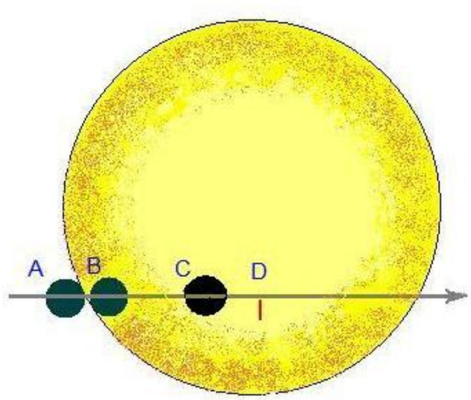
Exoplanet TrES-3b

By Ron Baker

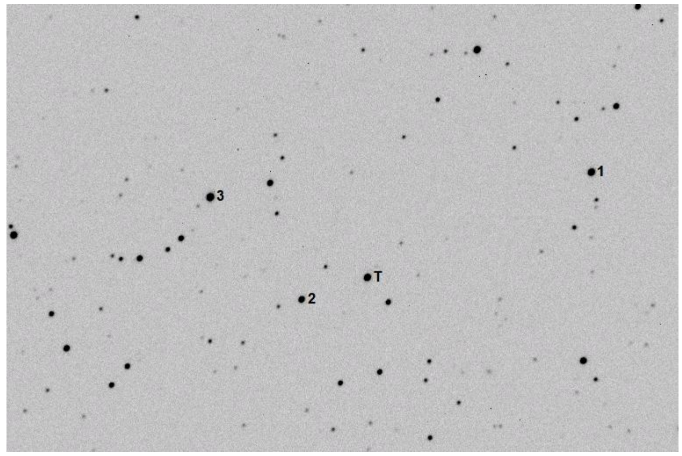
During the last few years many planets have been discovered orbiting other stars. Amazingly, many can be observed by astronomers using relatively modest instruments. The most common method involves observing the reduction in light from the star as the planet passes in front of it. These transit observations can be made when an exoplanet's orbital plane is roughly aligned toward Earth.

Several transit characteristics can be determined from just one observing session, including the times of ingress and egress, transit duration, mid-transit, and magnitude depth. When data from several observing sessions are combined the planet's orbital period can be determined. And when radial velocity data is available some physical characteristics of the planet and star can be calculated, including the distance separating the objects, and their relative sizes and masses.

The transit begins at ingress (A). The star fades quickly (but not very much) as the planet moves in front of the star's disk (from A to B). The star continues to fade slightly, but at a slower rate, as the planet moves toward the center (from B to C). When the planet reaches point (C) the overall magnitude is at minimum and will stay there until the planet moves through the midpoint (D) and into the star's darkened limb on the opposite side. The transit ends when the planet has moved completely away from the star's disk (egress).



Typical exoplanet transit. Graphic by the author.



TrES-3b is labeled T at RA 17 52 07 Dec +37 32 46. Stars used for reference are labeled 1,2,3. Image by the author.

Exoplanet TrES-3b is located in the constellation Hercules. It is known to be slightly larger than Jupiter, and the star it orbits is slightly smaller than the Sun. But while Jupiter's orbital period is 12 years, TrES-3b orbits its star in just 1.306 Earth days!

The techniques for observing exoplanets are similar to those used for observing classical eclipsing binary stars. During the predicted transit window, a series of images are recorded which can be measured photometrically. It is not necessary to accurately place the measurements onto a standard magnitude system. But since the overall reduction in brightness during a typical transit is less than three hundredths of a magnitude, it is critical that the measurements are precise and consistent. Otherwise the slight drop in magnitude during the transit will be lost in the background noise.

To record images which yield measurements of high precision the CCD exposures should be long enough to obtain very high signal to noise ratios. Quality flat field frames must be used to calibrate the images. And when measuring the stars in the images it is important to include as many reference stars as possible that are similar to the target star in brightness and in color (especially if the altitude of the field changed significantly during the observations). Photometric filters may be used in special circumstances, but are not normally required.

The image above was taken at Indian Hill Observatory with a 12-inch SCT and an ST-402ME CCD with a Bessel V filter. The image is the first in a series of 60 images, each 120 seconds in length, recorded during a 2 hour time period on June 8, 2011.

The differential photometry data from this observing session was entered into a spreadsheet program designed by Bruce L. Gary from Hereford Arizona. The plot below was generated by his program, and shows the individual data points from the observations in the form of a lightcurve.

The primary purpose of the program is to determine the observed times of ingress, egress, mid-transit and duration, as well as the magnitude depth of the transit. The program calculates these parameters by enabling the user to manually fit a model lightcurve (dark gray segments) to the data points. The parameter values are calculated from the final shape of the model lightcurve. Although the shape of the model can be adjusted to match the subtle changes in magnitude which occur due to limb darkening, the precision inherent in this dataset is not large enough to reveal that interesting phenomenon.

The plot includes predicted transit data from the Exoplanet Transit Database (ETD). This database is maintained by the Variable Star and Exoplanet Section of the Czech Astronomical Society.

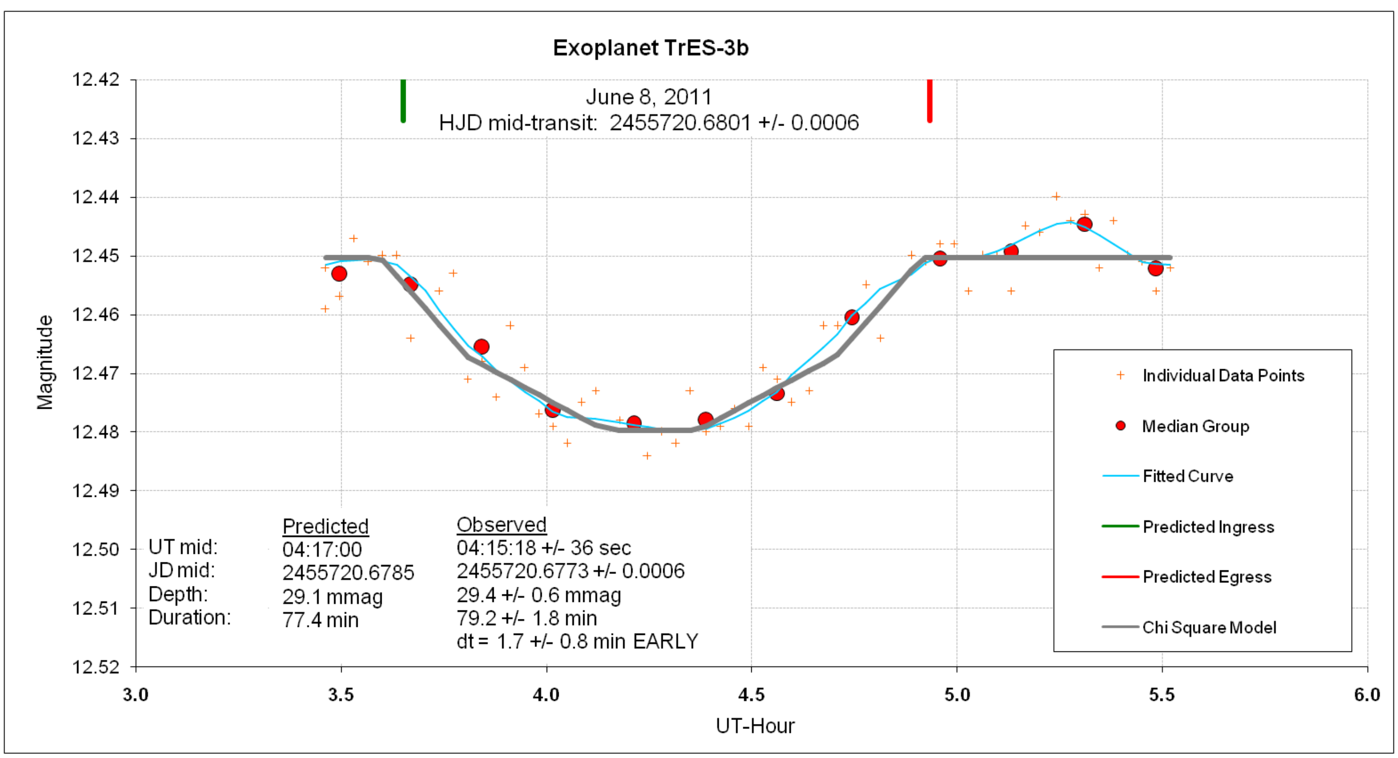
The ETD website accepts observed transit data from astronomers all over the world, and will calculate the times of mid-transit, duration, and magnitude depth using a robust algorithm of their own. The data from this observing session has been accepted by the ETD administrators, and the results can be accessed with the following link. Once at the website, lightcurves and transit parameter values can be viewed by selecting individual observing sessions.

http://var2.astro.cz/ETD/etd.php?STARNAME=TrES-3&PLANET=b

The ETD provides exoplanet researchers with efficient access to a large body of observations.

Clearly giant exoplanets are easier to observe than small ones because they block more light during transit. But a small body will sometimes weakly interact with a giant planet gravitationally which can cause the mid-transit value to change over time. The potential for detecting small planets this way suggests the importance of continued monitoring of even well observed giant exoplanets.

When we observe an exoplanet we of course do not see any polar caps, equatorial belts, rings, or great storms raging. But when you consider the enormous distance to the stars, it is amazing that exoplanets can be detected at all. ♈



Transit of exoplanet TrES-3b. Predicted data from the Exoplanet Transit Database (ETD). Observations by the author.

Web Site Review: Centauri Dreams

www.centauri-dreams.org

By Aaron Worley

The "Centauri Dreams" blog, written by writer/journalist Paul Gilster, is a rich source of news and information related to interstellar spaceflight. With the outer reaches of our own Solar System just now coming under the scrutiny of the Voyager robotic probes, it may come as a surprise that serious work is quietly and slowly progressing toward the goal of sending spacecraft much father - to other star systems. The technology for such an expedition is decades, or even centuries, away. That, however, does not deter the small cadre of scientists and engineers who are setting the groundwork for this undertaking.

"Centauri Dreams" was originally started by Gilster in 2004, the year his book by the same name was published. The site has since partnered with the Tau Zero Foundation (a nonprofit that promotes interstellar spaceflight research) and is now the official news outlet for the organization.

It covers a wide breadth of topics. On a given week, new articles might be posted on topics ranging from the 1970's Project Daedalus to the latest ideas in advanced propulsion sources. It's also a great source for news on exoplanet discoveries, a topic of great importance to the entire concept of interstellar flight. Future generations will naturally want to send their interstellar probes to systems where the most interesting exoplanets reside.

Recent blog articles of note include:

Asteroid Mining: A Marker for SETI?

http://www.centauri-dreams.org/?p=17357

The paper "Extrasolar Asteroid Mining as Forensic Evidence for Extraterrestrial Intelligence" from the International Journal of Astrobiology is discussed. Conventional wisdom believes that an advanced civilization would mine any local asteroid belt for resources. What would the effects of this mining look like to an outside observer? And would we be able to view these effects from Earth with our current technology?

A Dialogue on SETI

http://www.centauri-dreams.org/?p=16870

A detailed examination of radio SETI and METI (Messaging to Extra-Terrestrial Intelligence.)

Antimatter: The Conundrum of Storage

http://www.centauri-dreams.org/?p=17111

Research at CERN into the storage of antihydrogen may have applications for future spacecraft using antimatter propulsion. Antihydrogen poses an interesting challenge for long-term containment because it is neutrally charged, and is thus not as easily contained within a magnetic field. φ

REFLECTIONS

Lucy: *Do you think intelligent life exists on other worlds? Or is it possible that in this ancient universe, filled with billions of galaxies each with billions of stars, we are completely alone?*

CB: *Either way, it is awesome to contemplate.*

Charles Schultz, 1975

This is the first moment in human history when it's possible to search for the inhabitants of other worlds. If we fail, we've calibrated something of the rarity and preciousness of life on our planet – a fact, if it is one, very much worth knowing. And if we succeed, we'll have changed the history of our species, broken the shackles of provincialism.

Carl Sagan, 1985

Geometric Optics

By Dan Rothstein

This presentation was given at the February CVAS meeting using the Blackboard Optics equipment and lasers. It attempts to describe some of the theoretical principles behind what we know about telescopes. Here I have tried to work around the lack of demonstration equipment and figures, and I have used as few equations as possible. The first part of this article will describe reflection.

Limitations of Geometric Optics On the large scale, the particle model of light describes its propagation from one point to another in straight lines (rays of light), as if it had no wave characteristics. On the microscopic scale, Huygens' Principle is valid: that every portion of a wavefront may be considered the source of small secondary wavelets which spread out in all directions from the source. The resulting wavefront is then found by constructing a surface tangent to all the secondary wavelets at the same time, or as it is called, the envelope of the wavelets. For example, every point on a plane wave creates a wavelet, and because far from the source the surface of the wavelets are nearly flat, the envelope of all the tangents create a new plane parallel to the original one as the wave propagates through the medium. On the macroscopic scale, this results in the apparent propagation of the light in a straight line as if it were a particle. This is adequate to account for the reflection and refraction of waves. On a scale comparable to the wavelength of the light, this creates diffraction: that light tends to bend around an obstacle, as water bends around a rock in its path. This is what occurs with a reflector's spider vanes. Because a typical lens or mirror is much larger than the wavelength, far from the optical elements this diffraction behavior can be ignored. It is only within a few wavelengths of the optical surfaces that the wave nature of light must be included, for example the interference pattern created by a very narrow slit. Typical geometric optics operates within the range where the wave nature can be ignored and light can be considered to travel in a straight line.

Reflection from a plane surface   A reflective surface acts as a mirror because the wavelength of the light is much larger than the spacing between the atoms, so the light wave acts as if it has encountered a continuous surface which cannot transmit light through it. Technically, a static electric field cannot exist inside a conductor, and since light is composed of electric and magnetic fields, it is quickly damped out inside the reflective surface, penetrating only a few wavelengths (called the skin depth) instead of reflecting abruptly. For visible light the average wavelength is around 25 millionths of an inch, with red light having longer wavelength than blue light. The net energy flow across the interface is zero. This applies to visible light, but also for radio waves. In a radio telescope, the grid surface doesn't appear continuous to visible light, but to radio waves with wavelengths of centimeters or meters, a piece of chicken wire or of window screen behaves as if it was made of continuous matter and reflects those radio wavelengths. What determines the path of the light upon reflection is determined by the angle which the incoming light ray makes with the line perpendicular to the surface at the point where the incident ray strikes it (for an irregular surface this line is perpendicular to the tangent to the surface at that point). This line is referred to as the normal to the surface. If the incident ray makes an angle α to the normal (called the angle of incidence), the reflected ray will make an angle α on the other side of the normal (the angle of reflection). The two rays and the normal will all lie in a plane. All the properties of a reflective surface can be determined from this simple law of reflection: the angle of incidence is equal to the angle of reflection. This principle is valid no matter what the angle of incidence is, and does not depend on the color of the light: all colors will reflect at the same angle. If the surface is microscopically flat, all the normals at various points on the surface are parallel, so for parallel rays striking this surface, the angles of incidence of all the incident rays are equal. This requires that all the angles of reflection will be equal. So, parallel rays incident on the surface will be reflected as parallel rays, giving a bright (specular) reflected beam. If the surface is not flat, the normals will be in many directions, thus causing the reflected rays to go in many directions, giving a very diffuse reflection. On the surface of a smooth pond this creates a very sharp image of the shore, while a moving water surface reflects a poorly defined image. On a windy day, the rapidly changing shape of the surface reflects to you a changing pattern of bright patches where the refracted rays reach your eye, and dark patches where they don't, as the shape of the surface changes in the wind. This results in a continuously sparkling appearance of the water in the sun.

The characteristics of the image created by a flat mirror (or any other shaped mirror) are determined by the law of reflection. For a flat mirror, the ray of light we see coming from our feet strikes the mirror at a height which is half-way between our feet and our eye. Since our eye doesn't know there is a mirror in front of it, it interprets that ray as coming from a foot which is located behind the mirror. This will be true for the image of every point of the object. Light rays diverging from a point on the object and moving toward the mirror strike the mirror at different angles to the normal to the surface for that point, causing them to diverge from each other on reflection. The brain traces these diverging rays back behind the mirror to where they intersect. This results in an image at a distance behind the mirror equal to the distance the object is in front of it and the same size as the object. This type of image is described as a perverted image, that is, the image is reversed front to back. An arrow pointing toward the mirror is imaged as pointing toward the mirror (toward you), not in the same direction as the arrow points. An arrow pointing up images as one that is pointing up, so the image is erect. It is not reversed left-to-right, since the image of an arrow pointing left appears to be pointing left to you. The very common misconception that a plane mirror reverses left and right comes from the incorrect definition of the vantage point one is using: you must describe all the directions from the same place. Since the image is the same size as the object, it is not magnified. The law of reflection also tells us we do not need to buy a full-length mirror, since light from your feet strikes the mirror half-way between your feet and your eyes, so any part of the mirror below half-way between them is not needed to see your entire body, no matter how far from the mirror you stand.

Image formation for a spherical reflecting surface

Astronomical telescopes are designed to operate with objects at infinity. This insures that all the rays diverging from a point on the object that reach the optical elements (both mirrors and lenses) are essentially parallel, since the size of the objective is very small compared to the distance of the object. Anything greater than several hundred yards away meet this criterion. Part of a sphere, being used as a reflecting surface, will be symmetric about the deepest point. A line from the deepest point through the center of the sphere defines what is known as the optical axis of the spherical surface. Pointing the optical axis toward the center of an extended object allows us to demonstrate some conclusions about the images produced. Imagine a drawing where the optical axis is horizontal. Look at light from the top of the object which strikes the mirror above the optical axis. Since the normal to a spherical surface always passes through the center of the sphere, the incident ray is above the normal at that point. So, the reflected ray will be below the normal, and the reflected ray will cross the optical axis between the center of the sphere and the deepest point (in fact exactly half way) and then continues to propagate away from the objective unless some other optical component is in the light path. For a ray originating at the top of the object which strikes the mirror below the optical axis, the situation is reversed. The incident ray is below the normal and so the ray reflects upward toward the optical axis, crossing it at the same point that the other ray did, called the focal point, where the image is located. The distance from the focal point to the center of the mirror is defined as the focal length, which will be half the radius of curvature of the sphere. The bigger the area of the reflecting surface, the more light is concentrated at that point, so for a point source or an extended source, the brighter the image. For a spherical surface, as long as the radius of the sphere isn't too small, all rays entering parallel to the optical axis which strike the mirror will pass through this same point (or a small enough area so its size is not objectionable). If the radius is small (in terms of the f-number, which will be defined later) only the rays striking the mirror near the center pass through the focal point, while the ones striking the edge of the mirror still focus on the optical axis, but closer to the mirror, enlarging and blurring the image. This is the cause of spherical aberration. The longer the focal length the less severe this problem becomes. For off-axis rays there are other aberrations such as coma. Parallel rays from the top of the object (above the optical axis) intersect below the optical axis. Parallel rays from the bottom of the object intersect above the optical axis. This results in an inverted image. An object such as an arrow pointing upward will be imaged as an arrow pointing downward. For an object located at infinity, the rays will intersect at the focal point and then diverge. For an object closer than infinity, the image will be farther from the mirror. So, if you try to locate your focal point with an object which is too close, where the image focuses will not be the true value of the focal length, but will be too long. φ

Recurrent Nova T Pyx Outburst, Supernovae, & Meteorites from Vesta

By G.W. Gliba

The recurrent nova T Pyxidis is having an outburst after nearly 45 years. It has been steady at magnitude 15.5 or so until it was discovered on the rise by the noted Hawaiian variable star & meteor observer Mike Linnolt on April 14th. I first saw it a week later at 7.5 magnitude, and on May 1st when it was 7.2 magnitude. I estimated its brightness both times with 12x63 binoculars at the City of Greenbelt Observatory in Maryland.

It seems to be acting as it did after its last outburst in December 1966, reaching 6.5 magnitude in early May. According to the AAVSO website notice, the previous outbursts of this star system occurred in 1890, 1902, 1920, and 1944. There are nine other galactic recurrent novae known, according to the AAVSO.

The star T Pyxidis is also one of only two known white dwarfs in recurrent novae star systems whose mass is close to the Chandrasekhar limit (1.4 Solar Masses), making it a type-Ia supernova candidate. The other one is U Scorpii, which may also explode soon. At a distance of about 3,000 light years, if T Pyxidis should go supernova it will become -9 magnitude & be visible in the daytime! Don't worry about ill effects though if it does, as it is too far to cause any trouble. Also, the chance of this happening in our lifetime is very low.

When you observe a type-Ia supernova, you are seeing the creation of almost all of the heavy elements that are needed for planet formation and life, mostly iron, cobalt, & nickel by weight. This is where the iron in our meteorites & blood came from, along with the magnesium in the chlorophyll of green plants. So, when these type of stars die they help bring life forward! I think of this when I look at distant supernovae in other galaxies with a telescope. This happened recently when I saw SN 2011by in early May (my 37th SN seen). Of course it may be bad luck for any planet within 60 or so light years of it when it blows up. But, we really are made of stardust because of them.

When a type-II SN explodes, most of the heavy elements go into the neutron star or black hole created, so the type-Ia SN are special. These stars can be used as standard candles by astronomers to measure great cosmological distances, because each white dwarf star is the same mass when it reaches the Chandrasekhar limit and blows up. The acceleration of the universe was discovered nine years ago using these special exploding stars. Many of the other metallic elements created in the type-Ia SN are radioactive and are important for planet and asteroid formation. Among these, the radioisotope aluminum-26 is probably the most important. It has a half-life of about 700,000 years, which would allow more melting of planetesimals to form a greater variety of planets, dwarf planets, and asteroids.

In the early Solar System much accretion was going on after the collapse of the Solar Nebula, which, by the way, may have been caused by the stochastic process of compression waves from another nearby SN. The hot Al-26 allowed many more dwarf planets & asteroids to differentiate, producing more variety of complex planets and asteroids. Even relatively small minor planets like Vesta were differentiated, along with large ones like Ceres. Most of these were flung out of the Solar System by chaotic perturbations. The few that remain were protected in their resonant orbits with Jupiter. So, although there are still millions of asteroids, most of the ones that remain are small compared to Ceres & Vesta. The NASA Dawn mission launched in 2007 will visit both Vesta & Ceres. It is now catching up to Vesta, its first target, &

should arrive in July 2011 to orbit & study it.

It has been about a decade that the "Great Meteorite Rush" has been happening in the region of Northwest Africa (NWA) & thousands of meteorites, including some very rare types, have been found. Only Antarctica has produced more meteorite finds. This has allowed scientists to have access to many more rare meteorites than they would have, due to the economic incentive of the meteorite finders, because of the meteorite collection market. Many rare meteorites like Lunars & Martians have been found. Among these rare types are the HED group of meteorites thought to be from the asteroid Vesta. Previous to the meteorite rush haul, these types of meteorite were very rare & expensive. Because of the market created for these meteorites they are now less expensive and much more available for both collectors & scientists. This situation will not last forever though. The numbers of new meteorites coming out of NWA is starting to drop off. It is estimated that about 10,000 years of meteorite falls are being harvested from this area of the planet. When they are gone, prices will go up as supply & demand moves the market.

So, because of the upcoming exploration of Vesta, the HED group of meteorites, when proven to originate from Vesta or vestoid asteroids, will rise in price even more. Now is the time to get a piece of an HED type meteorite. Back before the NWA meteorite rush, a gram of the Howardite meteorite fall Kapoeta (of the HED group) cost about $500. Recently I saw a relatively fresh find (W1/W2) of the Howardite NWA 5959 go for only $10 per gram on ebay! So, get the real bargains now before the supply & demand of the meteorite market drives the price up after the NASA Dawn mission gets to Vesta. Then during the next favorable opposition of Vesta, when it can be seen with the naked-eye in skies with low light pollution in early August this year, you can hold your piece up to the sky & see them both at the same time. ♈

Talks & Presentations

April

CVAS member David Mihalic spoke about Remote Astrophotography at our April membership meeting. David described how robotic telescopes and cameras can be used by anyone with a computer and internet connection. Images recorded at robotic observatories provide an opportunity to process high quality images. Remote observatories are useful when time sensitive images for photometry or astrometry cannot be obtained locally due to cloudy skies. And objects, normally too far south for local observers, can be reached provided the remote observatory is located in a more southern latitude. At the end of the presentation, David projected a selection of his astrophotography for all to enjoy.

May

At our May membership meeting, CVAS member Aaron Worley spoke about the techniques he uses to acquire high resolution images of planets. One of his favorite methods involves using a video camera combined with various telescopes. The planetary targets are bright, the individual exposures are normally very short, and hundreds of individual frames are captured by the camera during a typical observation. Aaron demonstrated how he uses software to evaluate the quality of each frame, and how many (sometimes even most) of the frames are automatically discarded due to poor seeing present during a particular exposure. The surviving frames are stacked to build up the signal, and then processed further to arrive at the final image.

Images created by David, Aaron and other CVAS members regularly appear in *The Valley Skywatcher*, and can be viewed at our website: http://cvas.cvas-north.com/member_images.html

President's Corner

By Ian Cooper

I would like to start off with thanking Tom Puklavec, Mike Prochaska, and our awesome Observatory Director Ken Fisher for all of the hard work they have done removing the overgrown trees and brush at Indian Hill Observatory. This summer we will still need extra hands to replace wood on the shed, outhouse, and sinking pipe and placing a chain with a lock across the driveways though the fields up to IHO. Sorry, all it takes is someone not checking the ground before they drive up to IHO and not repairing the ruts they made. This poses a liability to both CVAS and Mrs. Richards. The Observatory Director will make the call on when the chain can come down.

The society has FINALLY passed the changes to our Constitution so we can move forward with a new membership package and updated constitution posted on the Members Page of the web site.

CVAS members have been busy assisting Geauga Park District in the evenings with getting the Oberle 25.5" ready for the grand opening on August 20, 2011. If anyone wants to volunteer some time please contact either myself or Russ Swaney. ♈

Constellation Quiz

By Dan Rothstein

1. One for modern appetites from the pages of S&T: This grouping has been described by an Illinois amateur as Crustum Deorum, the Pizza of the Gods.
2. Bayer described the southeast region of this kneeling figure as Ramus Pomifer. In old drawings it is the figure of a man trampling a huge monster with both feet. Hevelius described it as Cerberus.
3. The Arabs recognized two stars as the "props of heaven." Spica was the unarmed prop. What star was the armed prop, also known as the "bear guard"?
4. Where is the never-recognized constellation of Bufo the toad, a cluster of about 15 fairly bright stars, south of a zodiacal constellation?

Answers to last issue's questions:

1. This flightless bird, made up of 22 faint stars above the tail of Hydra, dates back to 1761 and a French expedition to observe a transit of Venus. This bird, called the solitaire, found only on Rodrigues Island in the Indian Ocean, was like the now-extinct dodo: somewhat taller than a turkey, flightless, with short, knobby wings. Rodrigues was the site of a 1760 expedition to time the transit, which because of its far southern location, was clouded out, so the scientists spent their time cataloging the wildlife. At the suggestion of Pierre-Charles La Monnier, the figure of the solitaire was added to the heavens by the French Academy to honor the 1760 expedition, but the drawing bore absolutely no resemblance to the real bird. A drawing of a female blue rock thrush, which was called the Philippine solitaire was used by the publisher instead, probably because it looked better. The constellation appeared on major charts for only about 50 years. This story was taken from the September, 1986 issue of S&T.
2. These 3 stars, which form a nearly equilateral triangle, comprise the obsolete constellation of Musca Borealis (the Northern Fly): γ Triangulum, α Arietis, and 41 Arietis.
3. There are at least four stars known by the term Deneb other than the familiar one in Cygnus. Capricorn, Orion, Aquila, and Cetus all have tails denoted by the word Deneb. Another prominent star whose name is a corrupted version of Deneb is Denebola.
4. This star was given its modern name by Copernicus. Previously it had been known as Rex, or the Royal star. Its modern name is that of a (famous?) Roman Counsul: Marcus Atilius Regulus. ♈

2011 Summer Skies

July

1	Fri	Partial eclipse of sun, Antarctic region
4	Mon	Earth at aphelion (15 UT)
12	Tue	Uranus completes its first orbit since discovery
20	Wed	Mercury at greatest elongation east (5 UT)
26	Tue	Mercury at aphelion (7 UT)

August

5	Fri	Vesta at opposition (4 UT)
9	Tue	Venus at perihelion (9 UT)
11	Thu	Moon occults mag 2.9 Pi Sagittarii
13	Sat	Perseid meteor shower
22	Mon	Neptune at opposition (23 UT)

September

8	Thu	Mercury at perihelion (7 UT)
9	Fri	Mercury 0.67° N of Regulus (3 UT)
16	Fri	Ceres at opposition (11 UT)
23	Fri	Autumn equinox (9:06 UT)
26	Mon	Uranus at opposition (0 UT)
29	Thu	Venus 1.3° SSW of Saturn (23 UT)

Notes & News

Congratulations to CVAS member Mariah Pasternak who was recently accepted into the National Honors Society at Riverside High School. Mariah is an active participant in the star parties offered to the public by CVAS, and among her many other interests particularly enjoys playing the piano and playing board games with her family.

The Cleveland Museum of Natural History celebrated Astronomy Day on May 7. CVAS members helped with the event by greeting the public at the museum and providing astronomy related material for the public to see and discuss.

The CVAS website is a great place to go for information about upcoming events and activities. In addition to a special member's login, there is a host of astronomy related information, and links to interesting and useful sites. Send suggestions to webmaster, Russ Swaney, russ_swaney@ameritech.net.

The Valley Skywatcher has a long tradition as the official publication of the Chagrin Valley Astronomical Society. All material in this issue has been written and provided by individuals within our membership community. CVAS welcomes astronomy related contributions from all members and friends, and this journal provides a unique opportunity for us to share interests. Published quarterly, the next issue will be available near the end of September. If you would like to contribute material to the publication, please contact the editor, Ron Baker, rbaker52@gmail.com.