The Spectrogram

Newsletter for the Society of Telescopy, Astronomy, and Radio

December 2003

Inside this Issue

S*T*A*R
P.O. Box 863
Red Bank, NJ 07701
On the web at:
http://www.starastronomy.org

December's Meeting

The next meeting of S*T*A*R will be Thursday, December 4th.

The meeting will begin promptly at 8:00 PM at the King of Kings Lutheran Church, 250 Harmony Road, Middletown.

Our featured speaker will be Dr. Jerry Sellwood of Rutgers University Department of Physics and Astronomy who will talk on the Spiral Structure of Galaxies.

Dues are *Really* Due!

Membership fees for 2003-4 of $25 per individual and $35 per family are overdue. You may make payments to Paul Nadolny at the December meeting or by mail to:

STAR Astronomy Society
P.O. Box 863
Red Bank, NJ 07701

Please make checks payable to STAR Astronomy Society, Inc.

Calendar

September 4, 2003
Telescope Optics
Ed Collett

October 2, 2003
Tuning in to the Sun
Dr. Dale Gary, NJIT

November 6, 2003
Amateur Spectroscopy
Dr. Joseph Sivo

December 4, 2003
Spiral Structure of Galaxies
Dr. Jerry Sellwood, Rutgers

January 8, 2004
Imaging with the STARs

February 5, 2004
Making & Testing Mirrors

March 4, 2004

April 1, 2004
Constellation Myths – Story Telling with the Stars
Dr Hank Bartol, Newark Academy

May 6, 2004

June 3, 2004
AGM

Sign 'Em Up!

By Gavin Warnes

Well folks, this month's *Spectrogram* is another bumper edition! It's great to be in a club that has so many knowledge members that are keen to contribute. Thanks to everybody who contributed – Greg Cantrell, Ernie Rossi, Peter Appo, Frank Loso, Ed Collett, Chris Olzsewski, Mike Lindner, Neil Wendt, (NJAA) Dan Pontone, David Butler (Charlotte Amateur Astronomers) & JPL.

To help the club attract new members, I've put together an updated flyer and poster (available for download under the Club section of www.starastronomy.org). Please use these at star parties and put up a poster or two! **The deadline for the next edition of the *Spectrogram* is Friday January 2nd.** Please email any contributions to gwarnes1@comcast.net. Thanks very much and Happy Holidays!

President's Corner

By Ed Collett

In the September issue of Sky and Telescope is a wonderful article celebrating the 400th anniversary of the appearance of Johann Bayer's star catalog that he named the Uranometria. This catalog consisted of 51 star charts describing the major constellations. The charts are in themselves absolutely beautiful. If my memory serves me correctly, one of the gems of the former Hayden Planetarium in New York City were paintings of some of the constellation figures taken from Bayer's catalog. On the first floor of the Hayden Planetarium was a planetary orrery in which constellations from Bayer's catalog were painted on a deep sky blue circular wall. I was so taken with this wall and Bayer's work that when my apartment in New York had to be repainted I actually demanded that my parents paint my room in a flat deep sky blue. My parents were somewhat aghast at this. In those days, in the late forties, no apartment room "in the world" was painted a flat deep sky blue. My mother tried to get me to have it painted in a more "acceptable" color. Normally, I never made any demands on my parents but I would not budge – and it was finally painted in a flat dark blue. While I had no chance of reproducing Bayer's figures, I did proceed to paint in the major bright stars of the constellation Orion on the wall over my desk. White stars on a dark blue background. Just perfect! In fact, I was so pleased with all this that I kept my room like this throughout high school and even when I went to college in New York City. I really loved it.

At the time, I did not really know the significance of Bayer's catalog. His catalog appeared in 1603. It was remarkable not only for its beauty but because it was based on star positions listed in a catalog published by Tycho Brahe in 1598. Brahe's catalog of star positions was nearly 10 times more accurate than those listed in Ptolemy's Almagest that in appeared in the 1st century AD. Within five years of Brahe's work Bayer had produced what is still considered one of the most beautiful catalog of sky charts ever made. That itself was an extraordinary accomplishment. But an even more astounding result was to follow based on Brahe's catalog. Johannes Kepler who had assisted Brahe in the last years of his life proceeded to take the same planetary data and over a course of nearly twenty years discovered three laws of planetary motion. The last of these laws published in 1618 showed that the square of the period of a planet was proportional to the cube of its distance $\left(T^2 = kR^3\right)$ where k was a constant of the solar system. From this law Kepler was then able to determine the relative distance of each of the planets from the sun, a spectacular achievement. Another point in all of this that is sometimes overlooked is that Kepler had discovered the first ever mathematical law in the universe! Before Kepler, no one knew that there was a simple mathematical relationship between the planet's period and its distance from the sun. Looking at Kepler's law people really began to believe that God was also a mathematician! Added to this mix were the telescopic observations being made around the same time by Galileo. The result was that in a space of only twenty years, 1598 to 1618, astronomy was revolutionized.

Ironically, Bayer's charts were the end of the line for including constellation figures. After him the pace of astronomy changed dramatically and untold numbers of stars beyond 6th magnitude were discovered so it was no longer practical to include figures. Today, we have another Uranometria. It is certainly very accurate but, alas, I do not believe that it will never become an item for anyone's coffee table. However, according to the Sky and Telescope article a few copies of Bayer's catalog are around and fetch prices of $50,000 or so. Since this may be out of reach for some of us let me end by giving you a website where you can see and print out the catalog for your coffee table - http://aer.noao.edu.

November Meeting Minutes

By Chris Olzsewksi

STAR held its third meeting of the 2003/2004 year at the King of Kings Lutheran Church. About 32 people attended the meeting. Ed Collett brought the meeting to order at about 8:04 PM.

Short announcements and discussions

1. New people attending the meeting introduced themselves and were welcomed.
2. Gavin Warnes and Steve Walters will have a star party for the lunar eclipse on Saturday November 8th. Others interested in helping out were encouraged to attend, with scopes (especially simple Dobs).
3. Ed indicated that we may get some notice of this event in Asbury Park Press.
4. Randy Walton mentioned that he has some Meade eyepieces available for ½ price with focal lengths from 6.9 mm to 20 mm. Interested people should contact him.
5. Nick Lordi mentioned that a coordinated search for planets transiting other stars by amateur astronomers is being organized. All that is needed is a stable CCD imaging setup and observation time. Possible planetary transits will be confirmed by professional astronomers (probably at the Lick Observatory), with credit for a find being given to the amateur. More information is available at www.transitsearch.org,
6. Jordan Feder gave out a star chart and gave us the November "Objects of the Month". This month he suggested Comet Enke (est. magnitude 8 on 11/22, close to the Coathanger Nebula). Also, he suggested nebula (?) NGC 7789 in Cassiopeia. He also gave out the challenge of the month, galaxy NGC 891, in

Andromeda. Along the way, he also suggested NGC 404, and NGC 1501/1502.

7. Frank Loso suggested that people may also be interested in a couple stellar occulations by Saturn, on the 14/15th, and on the 24th.
8. Steve Walters talked about the imaging interest group meeting they held in October, where they processed some of Jordan's images of Saturn. They'll have their next meeting on November 20th, and interested people are welcome to join (even those who do not do imaging).

Main Program

The main program of the evening was a talk by Dr. Joseph Sivo, of Union City, on spectroscopy for amateurs. Dr. Sivo is a mechanical engineer, an amateur astronomer and an astro-photographer. And a philanthropist. He explained in a very engaging way how these were all related (and courtesy of our legal system!). He now makes (at Sivo Scientific) spectroscopic equipment for amateurs and educational institutions.

Dr. Sivo gave an extremely understandable introduction to astronomical spectroscopy, and suggested areas where amateur astronomers could do original spectroscopic research.

Astronomical spectroscopy first began with Frauenhofer (~1820s), when he passed light from the sun and other stars through prisms. He observed dark bands in these otherwise continuous spectra. Colors of stars were used to classify them.

The discrete nature of the lines is due to the allowed transitions between energy levels of electrons of different elements. Identifying the lines of the spectra give information regarding what is emitting (or absorbing) the radiation, and some of the nearby conditions.

Absorption spectra (the dark lines) are caused by light passing through a gas. The gas will absorb energy at specific wavelengths, creating the dark bands. Stars typically show absorption spectra caused by the light they generate passing through their gaseous atmosphere.

Emission spectra (specific bright lines in a spectrum) are caused by light emitted by a substance (a gas), which will emit radiation at specific wavelengths. Nebula will typically show emission spectra, since they are emitting radiation characteristic of their composition. Stars show (rarely) emission spectra.

Stellar spectra are used to:

- Classify stars
- Determine chemical composition of stars and nebula
- Determine the temperature of stars
- Measure radial velocity of stars (and thus find planets)
- Determine the rotation rate of stars
- Find binary stars
- Investigate variable (and spectroscopically variable) stars.

The classification of stars uses their chemical composition, temperature, and size. This information can then determine where on the Hertzsprung-Russell diagram a star is, usually along the main sequence. At some point, stars leave the main sequence. M stars may take 10^{15} years or more to leave, a G star on the order of 10^{10} years.

Dr. Sivo has designed a small device to do spectroscopy with a telescope: an optical fiber that takes the images from the telescope, and brings it to a diffraction grating. There, the spectrum from the image is split, and can be sent to fall on a CCD plate. In this way, the CCD image is turned into a spectrogram.

If amateurs are interested in doing original research, Dr. Sivo thinks that their efforts would be best directed at observing comet spectra, and in looking at (and for) variable (and spectroscopically-variable) stars. Spectroscopically-variable stars are stars that change their spectra, not just their intensity. Looking for planets is probably just possible by amateurs, but is quite exacting.

Dr. Sivo gave an example of an observation of a P-Cygni feature (I think that's what it's called) in which a star explodes, and throws off a shell of gas. Some of the gas, coming directly towards us, will result in an absorption spectrum (a dip in intensity), slightly shifted towards the blue (since it's coming at us). Other parts of the gas, going out in other directions, result in a very broad emission spectrum (a broad peak). One lucky observer was able to catch Deneb blowing off such a gas shell. Also, rho Cassiopeia showed a change from an F to an M class. Such events may be fruitfully found by amateurs.

Dr. Sivo also gave the example of a rather dedicated amateur able to detect (an already known) planet by measuring the speed changes of a star. However, such accuracy will require a very stable (and probably cold) CCD environment, which may be very difficult with amateur setups.

For further reading, Dr. Sivo recommended a couple books:

"Stars and their Spectra", by James Kaler

"Optical Astronomical Spectroscopy", by Chris Kitchen

He also suggested a web site, at http://users.erols.com/njastro/faas/.

The meeting ended about 9:30 PM, or thereabouts.

Ernie's Telescope Corner

By Ernie Rossi

Last month I wrote about my first telescope, a 3 ½" reflector called the Skyscope. I had this telescope since 1952, and now finished with school and working at a full time job, the year was 1959 and I decided it was time to move up to a larger telescope. I found an advertisement in Sky and Telescope for a 6" telescope manufactured by Criterion Scientific Instruments located in West Hartford Conn. called the RV-6 Dynascope. The scope had a 6" F/8 mirror, equatorial mount, electric clock drive, mechanical setting circles, 6x30 finder, 1 ¼" rack and pinion focuser, and 3 eyepieces, 18 MM, 9 MM, and 4 MM giving magnifications or 70, 140, and 320 respectively. The telescope sold for $194.75 which was quite a lot of money in those days, but less than other manufacturers were asking for the same size instrument. During the coming years the price of the telescope climbed to $359.95 with less standard options.

The telescope had quality throughout where it really counted. The mirror was rated at 1/10 wave or better, heavy duty equatorial mount, precision casting to better than .001, solid 1" stainless steel shaft so it can't rust, accurate electric drive motor for photography. The tube was made of Bakelite and rotating chrome rings held it securely to the mount. Criterions claim was that you couldn't buy a better 6" telescope even if you spent a lot more money, plus a 60-day money back guarantee.

This telescope can be called a planetary telescope because of it's great contrast, and pinpoint images. This was the first scope where I was first able to resolve M13, whereas with the 3 ½" Skyscope it looked like a blob. I have put this telescope through many tests, comparing it to other telescopes aperture for aperture, as well as larger telescopes. The RV-6 is everything the manufacturers said it was, and the only other 6" that compared with it was my other 6" Park's f/8. I even tested it against my 4" Televue Genesis refractor, and the RV-6 beat it. The images were just as sharp in splitting double stars, and its 1 1/2x resolution and more than twice the light gathering power brought more detail out on the planets. I have seen all 6 stars in the trapezium, and as many as 5 moons of Saturn. I have also seen Saturn's Crepe ring which take excellent optics, and great contrast in any scope of any size, in order to detect it.

The Criterion Company manufactured this telescope from the late 1950's to approximately the late 1980's. In 1982 the company was sold to Bausch and Lomb and the quality of the scopes suffered. Reading excerpts from the RV-6 website (http://home.wmis.net/~rv6/) mention by its owners about what a great telescope RV-6 is, and their experiences with it. This telescope is a collectors item, and now difficult to find in good working shape. Everyone who ever owned this telescope raved about the great optics and the telescopes that they were tested against, including larger reflectors, and 4" to 6" high quality refractors. Personally I don't know anyone else that has a RV-6 except NJAA who has 2. Phil Harrington author, astronomer has the larger RV-8, which came later on, and he just loves the performance of this telescope. Many of the commercial 6" telescopes that are made today except for the custom optic shops like Zambuto, R.F. Royce, Swayze, Pegasus, Galaxy, and Nova to name a few, make mirrors of this quality. These are custom mirror makers who get top dollar for their mirrors. I have had this scope up against Schmidt-Cassegrains, Maksutov-Cassegrains, and this telescope gave sharper images. I have to say I am truly privileged to own such a great telescope.

Constellations

By Greg Cantrell

Last month we visited that part of the sky occupied by Orion, the Hunter and his faithful companions, Canis Manor and Canis Minor, the Big and Little Dogs. This month we'll move north of Orion to a part of the sky known as the zodiac. Before talking about a couple of the constellations that can be found there, it might be helpful to first consider what the zodiac is and how it was named.

You may recall that last month we learned that Orion's belt happens to lie roughly along the celestial equator, a line formed by the projection of the Earth's equator into the night sky. The zodiac lies along another line, the apparent annual path that the Sun, Moon, and other planets trace through the sky, called the ecliptic. The ecliptic is actually the path, or plane, of the Earth's orbit projected into the sky. However, fooled by our senses, we often attribute motion to the Sun and planets rather than to ourselves.

The zodiac is comprised of the twelve constellations that lie centered about the ecliptic. Each of these ancient constellations, except Libra, the Scales, represents a real or imaginary animal. Hence the name zodiac, a word derived from the Greek term for ``circle of animals."
Taurus, the Bull, is often represented in star charts as charging down on Orion from the northwest. However, the legends of Taurus center more on the bull as a symbol of strength and fertility. Between 4000 to 6000 years ago, the Sun appeared in Taurus at the beginning of spring, corresponding with the beginning of the New Year for many ancient Middle Eastern civilizations. In Assyria, Taurus was seen as the winged bull that stood guard over many palaces. In ancient Egypt, Taurus represented Apis, the Bull of Memphis, who served as the earthly vessel for the soul of Osiris, god of the Sun and the Nile. Taurus may have given rise to the Cretan Minotaur (a creature with the body of a bull and the head of a man), and perhaps even the Golden Calf, idol of the Israelites. The Druids held spring festivals that revolved around worship of the bull. Greco-Roman mythology depicts Taurus as a white bull with golden horns, the shape Zeus assumed when he abducted and seduced the beautiful Europa.

The Hyades and the Pleiades are each star clusters that lie within the constellation that may be seen with the naked eye. The Hyades were sisters of Hyas, a great hunter whose death they mourned. They had been chosen by Zeus to care for his child Dionysus after the infant's mother was killed. Zeus took pity on them for their grief and placed the Hyades in the sky, where they continued to weep for their brother. Their tears were said to bring on the rainy season that occurred each autumn. The Hyades consist of about 200 stars and make up Taurus' V-shaped face. Aldebaran, a bright orange-red star often shown as eye of the bull, is not actually associated with the Hyades. Aldebaran just happens to lie in front of the cluster, as seen from our point of view. The Pleiades were the beautiful half-sisters of the Hyades and were placed in the night sky by Zeus to help them escape the unwanted affections of Orion. The brightest of the Pleiades is Alcyone, though you should be able to make out a cluster of six stars on dark, clear nights.
Moving east along the ecliptic east we come to Gemini, the Twins, a constellation marked by the bright stars Castor and Pollux. According to certain Greek myths, the twins were hatched from an egg borne to Leda after her seduction by Zeus, who was at the time in the form of a swan. Brothers to Helen of Troy, they were raised by Chiron, the wise centaur depicted by the constellation Centaurus, and accompanied Jason in search for the Golden Fleece. Ancient Chinese saw these bright stars as yin and yang, representing the dual forces of nature, while the Romans often associated the twins with Romulus and Remus, legendary founders of Rome.

Another version of the Greek myth depicted the twins as having separate fathers, one mortal, and the other immortal. When Castor (the mortal twin) was killed in battle, Pollux (the immortal twin) was overcome by grief. Zeus then allowed Pollux to give half of his life (his immortality) to Castor and placed them both in the night sky as a testament to their brotherly devotion. An easy way to remember the location of each star is to associate them with stars in neighboring constellations. Pollux, then, is the star nearest Procyon in Canis Minor, while Castor is found nearest Capella, the yellow giant star located in Auriga, the Charioteer.

Auriga lies northeast of Taurus and is usually drawn roughly in the shape of hexagon. While it's exact origins are unknown, Auriga is frequently associated with the Roman god Vulcan, known to the Greeks as Hephaestus and credited with inventing the chariot. The star Capella was, to the Greeks, depicted as Amalthea, the goat that nursed the infant Zeus. While playing with the goat, the baby Zeus broke off one of her horns. He later gave the horn magical qualities that allowed it to spill forth food and water to anyone who desired them – the cornucopia.

In ancient India, Capella was thought to be the ``heart of Brahma," while Peruvians called it Colca and associated it with a herder of flocks. The Greeks also depicted Auriga as a goat herder. He was sometimes shown carrying the goat Capella over his shoulder and three kids (baby goats) on his arm. The kids are represented by a small triangle of dim stars located just southwest of Capella.

Sojourn to a Dark Sky with the VLA

By Neil Wendt

It was a while since I had been to a dark sky site to do some visual observing, so when Ernie Rossi invited me to his home in the Catskills, I jumped at the opportunity. The weather up in the Catskill mountains of upstate New York is not the same as in New Jersey, even though the mountains are less than 50 miles due north of my home in central NJ. The prediction I saw on the internet was for partly cloudy skies in Binghamton, NY. This is the largest city near Ernie's dark sky site, about 25-30 miles away. We didn't have great expectations for crystal clear skies, but we would be happy if we got to observe thru some large "sucker holes" or large patches of clear sky in between the clouds. Ernie reported that snow flurries were occurring up in the mountains, so we prepared accordingly with plenty of warm clothing. Ernie was bringing "the Monster"; what I like to call the VLA, or Very Large Aperture. It is a 25" Obsession Newtonian, a real monster! I was bringing my Burgess Optical 25x100mm binoculars mounted on a parallelogram mount I built.

We left from Ernie's home on Schooleys Mountain around 11:15 am on Friday 10/24/03. The ride up was smooth and fast on the interstate highways. In the Endless Mountains in

northeastern PA, I noticed that spring water coming out of the cliff faces along the freeway was frozen. It was going to be cold. When we crossed into New York, light snow flurries were falling. Leaving I-81N before Binghamton, we started climbing into the western Catskill Mountains on Rte 17. Ernie pointed out the side of a mountain that was hit with a tornado. It looked like a patch of forest was logged over but the trees were left behind. Large trees were strewn about like wooden matchsticks. As we gained elevation, I could see patches of "white stuff" on the ground in the upper elevations. We finally pulled into Ernie's place to find the grounds covered in 1-2 inches of snow! We took some shovels from the garage and cleared the deck and some walkways around the home. The sky was completely clouded over at the time, with a snowflake falling here and there and light to moderate winds. Not good. After opening up the house and turning on the heat and water, we hopped into the car and drove to the nearest town, called Deposit, about 8 or so miles away. A big "Agway" smoke stack with no building attached greeted us upon entering Deposit. There was a railroad thru town also. I kept wondering what "deposit" was in Deposit. Clearly a small "boomtown" of the past, we picked up lunch and supplies at the "Big M" grocery store and headed back to our dark sky site in the mountains.

Upon our return, there were some patches of blue between the clouds and spurts of sunshine were helping to melt the snow. The ground was very soggy, so we pulled a 4x8 sheet of wafer board out from the garage and laid it on the ground as a platform for the VLA. I set my binocular mount up on the deck in front of the house. Ernie and I started to assemble the 25" monster. Surprisingly, the 25" is not too difficult to remove from Ernie's minivan. I pulled it out with Ernie guiding me. The fulcrum advantage of the wheelbarrow handles was clearly evident. In about 20 minutes we had the scope all set-up. Patches of blue sky were getting larger. Great! Large "sucker holes", I thought. Little did I know what was in store for us. Slowly, gradually, teasing us minute by minute, the sky was getting better. To the west were large patches of blue, deep blue, the kind of blue that tells you that transparency in that clear patch would be excellent in the dark. Ernie's place has a very large sky, with very few obstructions all the way around. The property is mostly meadows, with trails that lead to the top of the property. We hiked up there in the afternoon, and I told Ernie that the top crest of his property would be an excellent site for an observatory. You just need 4 wheel drive to get there!

Around 6pm the sun was setting and there was nary a cloud in the sky! The sky above was crystal clear, and any clouds left were rapidly disappearing. In the west after sunset, the orange and red colors one sees were intense but low to the horizon. This indicates low humidity in the air mass that was clearing the sky. The wind was dying down too. Radiant cooling would make it even colder as the night wears on, I thought. We were waiting for a friend of Ernie's, Gavin from STAR Astronomy in South Jersey, to arrive. By 7pm I fired up the oven to cook our pizza with all the toppings. Ernie, being the concerned host, waited outside for Gavin to arrive. He pulled in around 7:30pm. We slugged down some slices of pizza, and immediately got busy assembling Gavin's 15" Obsession Dobsonian. Then the real fun began. Let me first say that, in my opinion, nothing is more important than a truly dark sky , no matter what size telescope you have. Whether you have a 2" Tasco or 25" VLA, I have found that a truly dark sky is the single most important factor for visual observing. You can see so much more detail, contrast is far superior, and best of all, the naked eye view of the heavens above will blow you away! Sadly, I have not found a truly dark sky in New Jersey. I have found good skies, such as we have at NJAA, but to get really dark skies with little or no light pollution, you must leave our state - the most densely populated in the nation. Having said that, let me say that Ernie's place is really dark. There is some minor light pollution from Binghamton in the southwest, but the rest of the sky is dark to the horizon.

Naked Eye Observations

Milky Way: awesome, incredible detail and beauty. Isophotes are discernible. These are subtle changes or gradations in the magnitude of the star glow from different regions of the Milky Way. Star charts often depict these gradations. The Small Sagittarius Star Cloud, Scutum Star Cloud, the Great Rift were plainly apparent and well defined. The Milky Way ran from horizon to horizon. Later in the night, I could see the much more subtle winter Milky Way flowing from Perseus thru Monoceros. Truly amazing and beautiful. One gains a sense of perspective of our stature on this mote of dust called "Earth" in the grand scheme of the universe!

M13: The great globular cluster in Hercules was visible in the far west as a small patch of light, slightly brighter than the background sky. Certainly the two 7th magnitude adjacent stars to the cluster contributed to this observation.

M31: The Great Andromeda galaxy was large and bright, like a streak of light next to some stars. The full extent of its' size was visible, about 3 degrees across.

M33: I had heard one can see this very dim galaxy in truly dark skies. I was able to detect its light using averted vision. This is only the second time I have done this. The excellent transparency of the night was allowing us to detect these subtle changes in contrast between light and dark.

Double Cluster in Perseus: This object had a surprise. I could visually separate the two clusters! I checked on my planetarium program (Skymap) and found the brightest region of NGC 869 and 884 to be separated by about 1/3 degrees, so it was real. Furthermore, individual stars in the region would wink in and out at me. Ernie and Gavin saw

this also. Again, Skymap showed stars in the region to be as bright as 6th magnitude, so this was possible too.

100mm Binocular Observations

Double Cluster in Perseus: Amazing, dazzling , with hundreds of stars. At 25x I could scan the region and pick-up Stock 2, a large open cluster 1 degree across, NGC 957 open cluster, and the neat asterism next to the double cluster that reminds me of a "stick man". The binoculars claim a 3.5 degree field of view (FOV) so the view is pretty large.

M33: After detecting this huge galaxy naked eye, I trained the binoculars on it. It was so bright and easy I was surprised. I observed carefully for a minute, and voila! I could see the spiral arms. Splendid! I only wish M51- the Whirlpool, or M101, a dim face on galaxy in Ursa Major, was available in the high sky.

M31: The Great Andromeda galaxy was a sight to behold. Although listed as 3 degrees across in size, the galaxy seemed to stretch across the entire FOV of the binoculars. The dust lane appeared as a dark streak, splitting the galaxy on one side of the nucleus. The nucleus appeared to have that stellar pinpoint that one observes in larger instruments. M32 and M110 were also in the FOV at the edge of field, bright and easy.

M36, M37, M38 in Auriga: M36 and M38 were easily resolved in the binoculars and were just beautiful open clusters. M37 is a little dimmer but much denser in its' concentration of stars. I was easily able to resolve the clusters' individual stars in the binoculars. Skymap indicates that the brightest stars in the cluster are 9.2 magnitude and up. Certainly within reach of the binoculars. The cluster looked like a globular cluster jewel floating in space.

Veil Nebula in Cygnus: I searched but could not find it. Ernie gave it a shot and located the Eastern Veil - the arc that does not include star 52 Cygni. It was unimpressive as it was very dim. I had seen this object at another dark sky site through these binoculars and it was much brighter. I suspected something was wrong. Inspection of the objectives showed they were covered in frost! Time to bring them in the house for defrosting.

M35 in Gemini: This cluster was just gorgeous in the "reheated" binoculars. The dim glow of NGC 2158 was clearly visible next to this star spangled cluster.

M42 in Orion: Everyone's favorite wintertime nebula was just outstanding! It was the best wide field view I'd ever seen. The whole sword was visible, including M43 and nearby reflection nebula. M42 was a beautiful wispy bright glow with extensions (I call "wings") above and below the Trapezium, since it was laying on it's "side" as Orion rose in the southeast. The four main stars in the "Trap" itself were partially resolved as three stars.

Telescopic Observations in the 25"VLA and 15" Obsession

Globular clusters M2 and M13: Easily resolved and bright in Gavin's 15". The clusters had oodles of sharp pinpoints of starlight. In the VLA they were just "in your face". Higher magnifications just pulled out more and more stars in the nucleus of the clusters.

M27 in Cygnus: The VLA was operating at about 100x with a 48 minute FOV using a 31mm Nagler "tank eyepiece". What a view! The planetary nebula was huge, with nebulous extensions one does not see in smaller instruments. About 6 stars were visible in the nebula, including the central star.

M57 in Lyra: The famous Ring Nebula was very bright with subtle changes in brightness clearly visible in the Ring itself. At higher magnifications with the VLA (I think we were around +600x), the central star and the second field star within the Ring were visible and winking in and out at us.

M33 in Triangulum: Unbelievable! This object actually looked like the pictures in magazines! Spiral structure was easy, starburst regions (or possibly dim foreground stars) were visible as points of light. The large glowing H-II regions in the galaxy were bright, so bright that I thought NGC 604 - the largest H-II region - was a different, separate galaxy similar to the way M32 appears inside M31. I checked with Skymap and confirmed my error.

M31: At 100x , the galactic nucleus was a stellar point. Dim points of light within the galaxy might have been globular clusters. Following one "arm" of the galaxy past M32 I was able to easily pick out NGC206, a dim and large star cloud within the galaxy. The dust lane plainly darkened the M110 side of the galaxy. M110 itself was a large wispy object with a larger apparent size than visible in smaller instruments.

NGC891: This dim galaxy is "edge on" to our line of sight from Earth. I have seen it many times from our observatory, but was not prepared for what I would see in the VLA. I climbed the ladder, peered through the eyepiece, and wow! The galaxy was huge, spanning the whole field of view. The dust lane running the length of the galaxy was most remarkable. It looked like someone had taken a magic marker and drew a black line down the length of the galaxy, splitting it in two. Such detail is not visible in smaller instruments.

NGC147 & 185: These are two very dim galaxies that are often used as a test for sky transparency. You can often see 185 at NJAA, but 147 is very difficult, even with larger instruments. I have "suspected" 147 at NJAA using apertures 13" and up. In the 25"VLA, NGC185 was bright and had structure to it. At first I questioned if we even had the right galaxy. NGC147 was obvious, but much dimmer than 185. Clearly, sky transparency tonight was probably a "9" on a scale of 1-10. It doesn't get much better than this.

NGC507 cluster: This object is a collection of 10-12 galaxies in northern Pisces that was described in a recent Sky & Telescope article (Deep Sky Notebook, I believe). In the VLA at about 102x using a 31mm Nagler eyepiece, the whole cluster was visible. Some galaxies appeared edge on while others were more face on. Still very tiny others popped in and out of view. Higher magnification made these tiny ones more visible.

NGC7331 & family: This edge on galaxy is the final star hop object before going to popular Stefan's Quintet of galaxies. The reason I associate "family" with this galaxy is because several faint and not so faint galaxies were visible adjacent to 7331. This was also confirmed in the 15" Obsession, but more galaxies were visible in the 25" VLA.

Stefan's Quintet: this popular DSO target for galaxy enthusiasts is always a challenge, but with digital setting circles and the VLA, the target was easy. All five were visible, but the trick is to separate NGC7318A and 7318B, which overlap each other and usually appear as one galaxy. I was able to separate the two at higher magnification in the VLA, plus the "sixth" component, NGC7320C appeared to wink in and out of detection off to one side of the field of view. I could be wrong, I was getting a little tired! Furthermore, the magnitude of 7320C is 15.5 , with a surface magnitude of 14.7 per square arc minute of apparent size. Having a diameter of 24", this "sixth member" is a real challenge. In the 15" the Quintet was clearly visible (quite easy, in fact), but 7320C was nowhere to be found. Aperture wins again.

Gylubadhagians Nebula: Don't try to pronounce this, I'm not sure I even spelled it right! Towards the end of the night I wanted to observe this variable nebula that was reported in Sky & Telescope, but was having a hard time finding the galaxy and star fields next to it. Suddenly I realized that we might be having dew problems and checked the secondary mirror. It was totally frosted up like the frost on your car windshield on a cold winter's morning! It was the end of the night for the VLA. I kept wondering how many DSO views would have been even brighter, since we probably were observing as the mirror slowly frosted over.

M42: We finished up the night observing the Orion Nebula in Gavin's 15". Gavin had a dew heater on his secondary mirror so we could still observe. The structure in M42 was marvelous. Although viewing through only one eye, the view appeared three dimensional to me as I wondered thru the depth and structure of the nebula.

We were getting tired so we started to pack up the scopes and put away the frozen ladders we used for the VLA. I noticed that the layer of ice on the ladder steps (treads) was a good ¼" thick! This was from carrying water on our boots from the soggy ground and depositing it on the aluminum treads where it would rapidly freeze and build up. At one point late in the night we would climb the steps and slide our boots to the corners of the tread so our feet would not slip out from under us. It was definitely time for some brandy that Gavin brought and a warm up in the kitchen before we retired for the night. We hit the sack around 2:30am. What a night it was!

Next morning the clouds had started to roll back in as we headed back home. Providence smiled on us that night. We were very fortunate to have such a pristine night of observing. If you ever get the opportunity to go to a really dark sky sight, don't hesitate. Just do it! It will be an adventure and an experience you will never forget. I will certainly remember this wonderful night of observing and look forward to going to dark skies again in the near future. Once you've seen the night sky the way it looked to our ancestors, *the way it is supposed to look*, before light pollution, you can appreciate their reverence for it.

Deep Sky Observing Tips

By Ernie Rossi

No matter what instrument you use, dark, clear skies are essential for deep-sky astronomy. Some galaxies are only slightly brighter than the normal background sky glow, so you need all the contrast you can get from your instrument and your eyes. So no matter where your observing from here are some tips that can help you.

1. Before you begin observing, give your eyes 15-20 minutes to become dark-adapted.
2. Use a red filtered flash light to study star charts without ruining your night vision.
3. If you live in or around a city, you can effectively boost the contrast by using light pollution filters. They are especially useful for nebulas, many of which are invisible from cities, or light polluted areas.
4. For low contrast objects use averted vision and the jiggle method. Simply give the telescope tube a light tap when you think a nebula or galaxy is in the field. The eye can detect contrast differences more easily if the image moves slightly.
5. If you have a problem closing one eye use an eyepiece patch, or drape a black cloth over your head but keep your breath away from fogging up the eyepiece.
6. Try observing from a grassy area, wood floor is probably OK. Hard surfaces tend to hold heat in and release it at night creating air turbulence.

Star Names and the Greek Alphabet

By Greg Cantrell

While a few prominent stars, such as Polaris and Sirius, have common names that date back centuries, the great majority of stars remain unnamed. However, in 1603, German astronomer Johann Bayer (1572-1625) instituted a system of assigning Greek letters to stars in his famous star atlas Uranometria.

In most cases, this so-called *Bayer designation* consists of a lower-case Greek letter followed by the genitive (possessive) form of the constellation's name. So, for example, Sirius is designated α Canis Majoris. The letters are usually, but not always, assigned to stars in the order of their brightness within a given constellation, with the α (alpha) star being the brightest.

Some of the Greek alphabet may already be familiar from terms such as gamma ray or the names of Greek letter college organizations. If you take a few moments to start learning these symbols, you may find stargazing to be more rewarding.

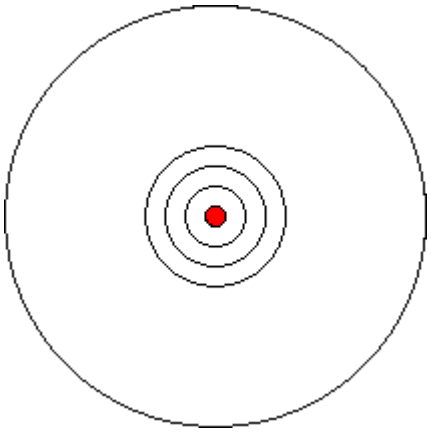
α – Alpha, β – Beta, γ – Gamma, δ – Delta,
ε – Epsilon, ζ – Zeta, η – Eta, θ – Theta ι – Iota,
κ – Kappa, λ – Lambda, μ – Mu, ν – Nu, ξ – Xi,
ο – Omicron, π – Pi, ρ – Rho, σ – Sigma,
τ – Tau, υ – Upsilon, φ – Phi, χ – Chi, ψ – Psi,
ω - Omega

Telescope Optics: Why a Parabola? The Airy Disk

By Michael Lindner

Drop a tiny, perfectly round stone into the exact center of a pool of water. The result is a circular wave expanding in all directions. This is the model I'm going to use for light being emitted by a star. In the vastness of the universe, a star *is* the moral equivalent of a speck. Of course, the star is emitting an expanding *sphere* of light, but until the *Spectrogram* is published in three dimensions, it's easier to draw a two dimensional analogue and let the reader imagine the third dimension.

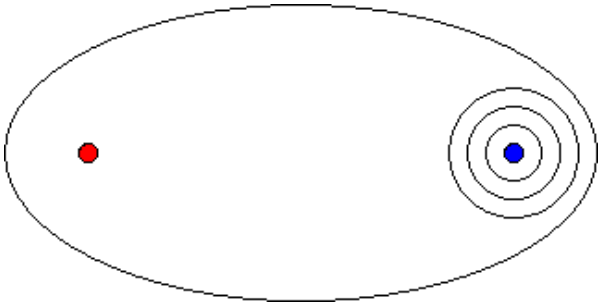
Now, let's make believe this pool of water is perfectly circular and has walls that reflect the waves. I think it's pretty easy to convince yourself that the waves will converge to a point (and if nothing stops them expand again in the other direction). This would be analogous to the case of a spherical mirror that completely encircled a star from a great distance. The light would be reflected back to the star itself. Of course, most telescope mirrors are smaller than stars (except maybe Ernie's big scope).



Here in figure 1, we see the speck (or star) drawn in red, and the waves (light) expanding towards the enclosing wall (mirror).

Why do the waves come back to the same place? Because the wall is the same distance from the red dot in every direction, so it takes all parts of the wave the same exact amount of time to reach the wall and come back from every side.

Now, let's make the circular pool into an oval. Who remembers their elementary school geometry? An oval has two *foci*, and if we place the star at one focus, the waves converge to a point at the other one. Here we see the red dot emitting waves, which will bounce off the walls and converge at the blue dot.



This works, once again, because if you remember the definition of an oval it is that the sum of the distance from any point on the oval to each of the foci is constant. In other words, the distance from one focus to any point on the oval and then to the second focus is the same, for all points on the oval.

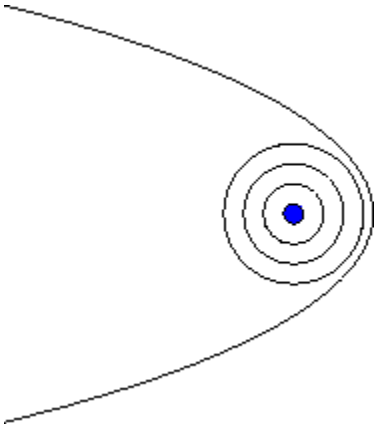
In fact, one method for drawing an ellipse is to place two tacks into a piece of paper, and loop a string around them, then put a pencil in the loop of string and move it around, keeping the string taught. Since the string length is constant,

so is the path from one focus to the pencil to the second focus.

So once again, the (light) waves emerges from the red focus (star) and converge at the blue focus because it reaches that focus at the same time from all directions.

If you keep moving the foci apart, the ellipse stretches and stretches, and eventually, when one focus is infinitely far away from the other, the ellipse has become a parabola. Circular waves coming from a point infinitely far away will have an infinitely large radius of curvature. In other words, they will look like straight lines coming at the focus of the parabola.

Again if you recall your geometry a parabola is the set of points such that the sum of the distance from the focus to any point on the parabola and from that point to a line (called the *directrix*, which would also be a cool name for a sequel to *The Matrix*) is constant. Once again, the waves (light) from the speck (star) infinitely (very very) far away converge to a point.



In a telescope, we consider stars (and other objects) to be effectively infinitely far away, so the only surface that can form an image of a star all by itself is the parabola. That's why the mirror on a Newtonian telescope is parabolic, and that's why every other telescope needs more than one optical surface to do its thing.

There's only one problem. In order for it to really converge to a perfect point, the waves have to be coming in from all directions, so our parabola needs to be infinitely large (even Ernie's telescope is smaller than that). If we take a piece of a parabola, as shown above, some parts of the wave don't reach the focus and there's some slop. This "slop" means that instead of forming a perfect point at the focus, it will form a smear of standing waves.

In three dimensions, this smear of waves is what we call the airy disk. It is named for its discoverer, Sir George Biddell Airy.

George Biddell Airy was born in 1801. Airy was an interesting character. He was a member of the Board of Longitude. This was a board set up by the English government to find a way to determine longitude of ships at sea (and the subject of a book and PBS special *Longitude*). He set the world of computing back by blocking all government funding of Charles Babbage's calculating engine (arguably the first computer) in 1832, calling it "worthless".

Airy became Astronomer Royal in 1835, and established himself at Greenwich, where he successfully lobbied to have the prime meridian established at that spot. He could not tolerate his staff thinking for themselves; and therefore no young scientists were trained at the Observatory during his period as Astronomer Royal (1835-1881). However, he did improve and repair the instruments at the observatory.

In 1841, John Couch Adams had an idea that disturbances in the computed position of Uranus were due to another planet beyond it. Airy discouraged him from attempting to search for the planet Neptune, as Airy believed that the differences were due to a breakdown in Newton's law of gravity over large distances. Adams eventually obtained permission to search for the planet (Neptune) but ultimately England was beaten to that honor by a Frenchman, Urbain Le Verrier.

In all fairness, he did make some significant contributions to science. The airy disk is a measure of the theoretical resolution of any optical system. He measured the density of the Earth with a pendulum, and was first to correct astigmatism of the human eye with cylindrical lenses.

Airy was knighted in 1872, and died 20 years later in Greenwich. He is buried at Playford church in Suffolk.

My Journal - The Journey Begins….

By Peter Appo

I was tormented reading all those reviews of telescopes and people talking about the objects they had viewed or photographed. I must get a scope. Before getting on the list for an AP 130 apo 2 months ago, I thought about the Tak FS 102 (too small), FS 128 (would end up spending $12000; way too expensive for a first scope) apos. Ok, maybe the Portaball 10" (didn't like the idea of polishing the ball and balance issues with heavy eyepieces). The JMI NGT 12.5" must be good (Too big for 1st scope). Then I thought about a truly portable scope that I would keep when I get my main scope. So I considered the TeleVue Pronto. I did more research and thought I would like a little bigger aperture. The TV 76 or Tak FS 78 would be better. I chose the Tak.

10.20.03 – Tak FS 78 OTA delivered
10.21.03 – Missed delivery of the mount and accessories
10.22.03 – Tak Teegul Lapides mount, Bogen 3068 tripod, Tak 2" star diagonal, Tak 5mm LE and Tak 18mm LE arrive. I carefully set up. I was impressed with the mechanical smoothness of the Tak focuser, mount and tripod. Everything was a little bigger and heavier than I expected but still reasonably portable.

First light - checked the autumn section in "Turn Left at Orion" for objects to view. M15 and M2 should be good. Without a magnifying finder scope or 1x finder, I couldn't Enif in the eyepiece. So I figured Mars should be easy to locate. It took a while but I located it. It was just small round circle in the 18mm. I was not very impressed. Didn't see anything else. My neighbor, Charles turned on his security lights to let out his dog. Now I couldn't see anything. He kept it on for a long time, so I went inside.

10.23.03 – Too many clouds. Played Madden 2004 with my 13 year old, Ian. He, the Steelers, creamed me, the Rams.

10.24.03 – Nice clear skies. Attempted Mars again. Again it was very difficult to locate in the eyepiece. But, I was in for a pleasant surprise, I saw beautiful, sharp star fields not visible to the naked eye. The views were breathtaking. I found myself just wandering aimlessly, taking in the views. I found Mars. Again it was just a tiny red ball. I switched to the 5 mm and now I saw slightly bigger red ball. I called it quits. But this time I was quite happy.

I've been thinking about the Tak 6x30 finder scope but I think I'll get confused with the upside down image. The Telrad and Rigel are too big for such a small scope. I've narrowed it down to either Howie Glatter's cool SkyPointer (green laser) or no finder at all, using a wide field 35mm Panoptic instead. I'll see how it goes

10.29.03 – It rained or it was too cloudy every night until tonight. It was too muddy to go out on the grass. So, I set up on the patio. This is not ideal because the house blocks a big part of the sky. Still I found Deneb, Vega and the Pleiades cluster. I am getting more familiar with the scope and mount. I didn't realize that the big knobs on the mount were for slow motion in the altitude and azimuth directions (I didn't get an instruction manual). They work great, just like the buttery smooth Tak focuser. I sent email to Howie asking how I could mount the laser to the Tak. I also posted a note about my intentions to my club, STAR Astronomy.

The 5 mm eyepiece wasn't very useful today. It made everything very dim.

10.30.03 My posting caused quite a controversy. Club members were for the most part very much against the Skypointer. They do not like any form of light pollution. I ordered a Rigel red flash light, a planisphere, a 27mm Panoptic, a 6x30 Tak finder and bracket, and a Schneider moon filter.

11.1.03 The moon was out. I've learned to point the scope much further south than where the object appears. What an incredible sight. It was so sharp and had great contrast. With the 5mm, the surface features just popped out. Now I understand why Tak refractors get such great reviews. My daughter and wife were as excited as I was and I could see them getting into this. However my son thinks astronomy is too nerdy.

11.2.03 I invited the neighbors' kids over. They were in awe.

11.6.03 I turned down an invitation for a dinner cruise in the NY harbor because I wanted to go the club meeting. The talk about spectroscopy was very engaging. I met Gavin for the first time. We had a little chat about scopes, unbridled enthusiasm and bankruptcy.

11.13.03 My goodies arrived. It is way too windy and cloudy to play.

11.15.03 The finder scope is very sharp. I need to align it properly. The object in the eye piece is quite a bit off. The 27mm Pan is quite intriguing. The field of view is so wide I find myself looking into the sides of the eye piece to see more. With a bit of adjustments to where I see Baham in the finder, I think I was able to see M2 for the first time. My hands were getting very cold and I decided to call it a night. It is very hard to describe the wonderful feeling the night skies evoke, it is like nothing else.

11.16.03 I aligned the finder scope on a distant chimney during the day.

11.20.03 A clear night at last. I set up on my patio because my backyard is swampy after a couple days of rain. Armed with my new toys in my laptop case, I laid out "Turn Left at Orion" by Consolmagno and Davis and Sky & Telescope's "Skywatch '04". I located Orion. I followed the TLO instructions looking for M42. Lo & behold, the image in my finder scope is exactly like the book says.. Next I took a look with the 27mm Pan. I can see the points of light in the cloud. I'm now getting goose bumps. I switched to the 18mm and I'm seeing more detail in the cloud. I switched to the 5mm and can see the trapezium clearly defined. North of the trapezium is a bright star enveloped in a cloud, M43 just as the book says. Next I moved on to Sigma Orionis. Again the picture and description in the finder scope and telescope views match exactly what I see.

The finder scope alignment is a little off again and I would have been lost without TLO. The Rigel flashlight was very useful also, I didn't have to keep going indoors to read the book. The only problem was that every now and then I'd switch on the white LED accidentally. Another noteworthy observation was that the mount and tripod were rock steady. The scope can also be locked in any position even with a heavy eyepiece in.

I think I'm getting the hang of this and I like it. This is just the beginning of long and enjoyable journey to the night skies.

Stardust

By Patrick L. Barry and Dr. Tony Phillips

Philosophers have long sought to "see a world in a grain of sand," as William Blake famously put it. Now scientists are attempting to see the solar system in a grain of dust-comet dust, that is.

If successful, NASA's Stardust probe will be the first ever to carry matter from a comet back to Earth for examination by scientists. It would also be the first time that any material has been deliberately returned to Earth from beyond the orbit of the Moon.

And one wouldn't merely wax poetic to say that in those tiny grains of comet dust, one could find clues to the origin of our world and perhaps to the beginning of life itself.

Comets are like frozen time capsules from the time when our solar system formed. Drifting in the cold outer solar system for billions of years, these asteroid-sized "dirty snowballs" have undergone little change relative to the more dynamic planets. Looking at comets is a bit like studying the bowl of leftover batter to understand how a wedding cake came to be.

Indeed, evidence suggests that comets may have played a role in the emergence of life on our planet. The steady bombardment of the young Earth by icy comets over millions of years could have brought the water that made our brown planet blue. And comets contain complex carbon compounds that might be the building blocks for life.

Launched in 1999, Stardust will rendezvous with comet Wild 2 (pronounced "Vilt" after its Swiss discoverer) on January 2, 2004. As it passes through the cloud of gas and dust escaping from the comet, Stardust will use a material called aerogel to capture grains from the comet as they zip by at 13,000 mph. Aerogel is a foam-like solid so tenuous that it's hardly even there: 99 percent of its volume is just air. The ethereal lightness of aerogel minimizes damage to the grains as they're caught.

Wild 2 orbited the sun beyond Jupiter until 1974, when it was nudged by Jupiter's gravity into a Sun-approaching orbit-within reach of probes from Earth. Since then the comet has passed by the Sun only five times, so its ice and dust ought to be relatively unaltered by solar radiation. Some of this pristine "stuff" will be onboard Stardust when it returns to Earth in 2006, little dusty clues to life's big mysteries.

To learn more about Stardust, see the mission website at stardust.jpl.nasa.gov. Kids can play a fun trivia game about comets at spaceplace.nasa.gov/stardust .

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Astro Gadgets

Amateur astronomer inevitably involves accumulating more and more 'stuff'. Please email details of favorite gadgets you have bought ***or made*** or new products you have seen to gwarnes1@comcast.net and they'll appear here.

Note: The Spectrogram is intended as a service to members. STAR does not endorse any of the products mentioned. Descriptions are based largely on information supplied by manufacturers, distributors or members. STAR assumes no responsibility for the accuracy of these statements.

Are You Unbalanced? (Gravitationally, that is)

Big, wide field eyepieces are great, but when you use them on a smooth moving Dob you can be plagued by a bad case of 'telescope droop'. I recently found a cheap and easy solution to this - lead divers weights. I attach these to the mirror box of my scope with Velcro so I can add and remove them easily. A 1, 2 and 4lb weight cost a grand total of $10.50 from the following web site.

www.diversdirect.com

New Products

Egyptian Equatorial Mount

The Vixen Great Polaris German Equatorial Mount has a well established reputation as a great tracking mount for refractors and small aperture reflectors or catadioptrics. Now Vixen has launched the Sphinx, a GEM mount with GOTO capability via the Star Book handheld computer. The mount can support telescopes up to 22lbs in weight and uses 180 tooth worm gears for tracking. The Star Book uses a color LCD display to show the location of and guide the mount to 22,725 celestial objects. The Star Book can be upgraded by downloading software from Vixen's website (an upgrade to support the use of auto-guiders is planned). The mount and Star Book cost $1,825, a tripod is extra.

TeleVue 60

At last – a finder scope that is as expensive as a telescope! Seriously though, the new TeleVue 60 apochromatic refractor ($750) would make great travel scope, spotting scope, finder or telephoto lens for a digital camera. The diminutive Televue 60 OTA is only 10" long (360mm f/6) and can be purchased with an optional padded carrying bag.

Messier Objects – December

by Greg Cantrell

M36, 37 & 38 (NGC 1960, 2099 & 1912) – These wonderful open clusters, found in Auriga, are easily visible to the naked eye from a dark location. Binoculars reveal a line of fuzzy patches, while low power telescope views resolve rich open clusters.

M41 (NGC 2287) –This 4.5 magnitude open cluster in Canis Major is visible as a hazy patch near the bright star Sirius. Best viewed through binoculars or a telescope at low power.

M42 & 43 (NGC 1976 & 1982) – Known as the great Orion Nebula, M42 is easily visible to the naked eye in the sword of Orion. M43 is a small patch of nebulosity near M42 that requires a telescope to observe.

M78 (NGC 2068) – A small emission nebula in Orion, this 8.0 magnitude object is a difficult binocular object and is best viewed with a telescope.

Upcoming Events

Star parties and other astronomy-related events are an important part of the amateur astronomy experience. Listed below are several events offering dark skies and astronomical fellowship.

February 15-21The Cedar Key Star Party will be held at Cedar Key, Florida. Visit http://www.madbbs.com/~bemusabord/cedarkey.html

February 18-22 The Orange Blossom Special Star Party will be held at Hickory Hill, Brooksville, FL. Visit http://home1.gte.net/hoffmanc/index.html.

February 28-March 2 The Mid Atlantic Mirror Grinding Seminar will be held Smyrna, Delaware. Visti http://www.delmarvastargazers.org/archive/mw3/intro.html

March 16-23 The Texas Star Party will be held near Fort Davis, Texas. Visit http://www.texasstarparty.org/ .

March 18-20 The Mid Florida Stargaze will be held by the Astronomical Society of the Palm Beaches. Visit http://www.palmbeachastro.org/

Nov 23 **Nov 30** **Dec 8** **Dec 16**

Dec 23 **Dec 30** **Jan 7** **Jan 15**

Astro Links - Space Probe Calendar

It's going to be a busy few weeks for NASA & ESA with lots of space probes reaching Mars. Hopefully all will go well now that NASA engineers have learnt the difference between metric and standard measurements.

December 25th – ESA's Beagle 2 probe lands on Mars to search for life, including Christmas Turkeys. Find out more at www.beagle2.com and http://sci.esa.int/science-e/www/area/index.cfm?fareaid=9.

January 2nd – NASA's Stardust probe will fly trough the tail of comet Wild 2 and collect dust to return to earth. Find out more at http://stardust.jpl.nasa.gov/.

January 3rd – NASA's Spirit Mars Rover lands, More at http://mars.jpl.nasa.gov/mer/.

January 24th – Spirit is joined on Mars by NASA's sister probe Opportunity.

Duct Tape Chronicles

This month's Duct Tape Chronicles comes from David Butler of the Charlotte Amateur Astronomers Club who found The Spectrogram while surfing the Internet.

I recently started using the manual setting circles on my EQ6 mount (carrying a C9.25). During several futile attempts at precise polar alignment, I quickly realized the polar scope was not exactly parallel to the polar (RA) axis. Being that this is a Synta product, I can't say I was surprised. This error can easily be observed as the entire field wobbles when the mount is rotated around its polar axis. Although the polar reticule can be adjusted, there's no way to adjust the angle of the scope itself.

After inspecting the mount, I determined that the only way to fix the problem was to shim the shoulder of the polar scope where it meets the RA axis shoulder inside mount. The shim would have to be thin, and I needed a way to make the shim stick to the shoulder.

Hmm... Could this be another use for DUCT TAPE?

I carefully cut a tiny square from a piece of duct tape and while looking at a reference surface (a block wall works well), I determined where to insert the shim. After considerable trial and error, I ended up with three thicknesses of tape at one point, and a single thickness about 60 degrees on either side of first. Problem solved.

One more high-tech application for duct tape!

As an aside, heating and cooling professionals have long known that the last place you want to use duct tape is on a duct!!

Got Mail?

If you received your copy of *The Spectrogram* through the regular mail, do you have an email address it can be sent to? If so, please let Gavin know at gwarnes1@comcast.net.

Are You a STAR Member?

S*T*A*R is a member of United Astronomy Clubs of New Jersey (UACNJ) and the International Dark Sky Association (IDA). Meetings are the first Thursday of each month, except July and August, at 8:00 PM at the King of Kings Lutheran Church, 250 Harmony Rd. in Middletown . Meeting generally consist of lectures and discussion by members or guest speakers on a variety of interesting astronomical topics.

Memberships: ( )Individual....$25
( ) Family...$35 ( ) Institutional $25

Name_____

Address_____

City_____State___Zip_____

Phone_____

Email_____

Make checks payable to: STAR Astronomy Society, Inc and mail to P.O. Box 863, Red Bank, NJ 07701

Astro Pics

The lunar eclipse of November 8th provided a great opportunity to take some wonderful astro photos. The following series of pictures were taken by Frank Loso at the prime focus of 6" f/8 scope with Kodacolor 200 film. More of Frank's eclipse images can be found at http://www.netlabs.net/osi/TLE.htm.

Mike Lindner took this image with a Minolta Dimage 7i camera on tripod aimed into a 32mm TeleVue Plossl eyepiece on a 6" f/7 Dobsonian.

Ernie Rossi & Dan Pontone held an eclipse star party at Raritan Valley Community College. Here's Ernie signing up a new recruit!