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A NOTE FROM PRESIDENT TOM WEILAND

Most Sundays after church we go out for a bite to eat with several friends and their families. One of those families has a young boy who has an interest in science. On occasion he has asked me questions about what he has seen in the sky some evening earlier in the week or shared something he has learned at school. We discuss what he has seen or learned and I usually share some other bit of information or suggest further exploration. I find it quite enjoyable to share my knowledge with him about astronomy.

I like interacting with all the people who attend our public observations, but I find it particularly enjoyable to engage young people in conversations about astronomy. Their wonder is infectious. Maybe it's my education background, maybe it's because I think it's important to provide opportunities that encourage our youth to explore their interests, but I think one of the greatest services that we provide as an organization occurs when we share our love of astronomy with our youth via public observation sessions, scouts, church groups, school programs, and Family Science Day.

I commend those among our membership who regularly share their time to enlighten our youth and I encourage those of you who haven't availed yourself of such an opportunity to share your love of the science with others.....especially young people.... in whatever way you feel most comfortable. Clear Skies!

MINUTES OF THE APRIL 4, 2012, SPECIAL BOARD MEETING

On Thursday, April 4, 2012 at 7:30pm, a special meeting of the TCAA Board met at The Coffeehouse in downtown Normal to discuss details of a proposed Memorandum of Understanding (MOU) related to the Roll-Off Roof Observatory that is under consideration by the club. In attendance were Tom Weiland, Dan Miller, Paul Pouliot, Tony Cellini, Carl, Wenning, Bob Finnigan and Lee Green.

Carl submitted an update of the draft MOU and the assembled members discussed these issues in detail. Without going into extensive details, the following topics were discussed: placement of the facility, construction concerns, cost and proposed payment schedules, ownership issues with the SGNC, electrical and networking issues, grammar associated with the document, observing consideration, lighting, site access, insurance naming rights, maintenance and other issues. Carl agreed to amend the draft MOU to reflect the various comments of the members and to distribute a revised version to the Board.

Dan moved and Tony seconded that \$1,000.00 of club funds be allocated to the project which would be payable to the Sugar Grove Nature Center, contingent on need for additional financing of the facility. This motion was unanimously approved.

Tony moved and Paul seconded a motion to apply for insurance for the facility. Carl noted that an estimate for insuring the facility would run in the range of \$145-\$160 annual cost depending on the deductible amount. This motion passed unanimously.

Dan also requested permission to talk with an alternate architect about the project. His request was gladly approved. He also request permission to run Cat 5 cable between the existing observatory and the Nature Center; that request was also approved.

The meeting adjourned at approximately 8:30pm.

Respectively submitted,

Lee Green, TCAA Secretary

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To join the TCAA, send your name, contact info and dues payment to
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UPDATES ON RORO AND MEO

On Thursday, April 5th, the TCAA Board of Directors along with officers and key observers met at Normal's "uptown" Coffeeshouse & Deli to discuss a rough draft of a Memorandum of Agreement (MOA) drawn up by Carl that will be proffered to SGNC and Funks Grove Cemetery Association (FGCA) board members for their review and possible amendment. See the minutes of that special meeting elsewhere in this newsletter for details.

On Tuesday, April 10th, the TCAA Board of Directors approved a modification of the draft MOA for the proposed roll-off-roof observatory at SGNC. The document was immediately emailed to Angela Funk who turned it over to the FGCA whose members (with the exception of two) sit on the SGNC Foundation Board.

Throughout this time interval, Bob and Carl continued to discuss locations for the proposed observatory in light of the fact that the previously selected location west of the SGNC gazebo has underground utilities as marked by Erik Funk a day or two earlier. Following a review of the situation, Bob, Carl, and Tony agreed that the next best location would be to the southeast of the gazebo. That decision was also made on April 10th. The next day, following breakfast with Carl, Bob returned to SGNC to stake out the 16'x32' footprint of the building using orange flags so that SGNC-related board members could peruse the site prior to returning comments to the TCAA in relation to the MOA.

Bob, Carl, and Larry L. meet with John Bishop and George Farnsworth to talk about the project on Wednesday, April 18th. Discussed were the serviced needed from the Farnsworth Group and contributions by and insurance coverage of volunteers. The next day, Carl submitted a revised MOA to the TCAA Board members, officers, and key observers for their review. Following a number of discussions and clarifications, an updated version of the MOA was approved by the Board of Directors on Friday, April 20th, and forwarded to Angela Funk.

On April 19th, Dr. Linda French at IWU indicated that funding for updating the Mark Evans Observatory was approaching a done deal. She indicated that she was looking to find a home for the 16-inch telescope that will have to be removed, and noted that it might be given away to anyone willing to move it. Dan Miller and John Werner indicated an interest to do so shortly thereafter. This removes what could have been a significant roadblock to getting the work of updating the observatory done by August 7th at which time efforts to update MEO will move ahead at full tilt.

On April 23rd, Carl received a phone message from Angela Funk around 1 p.m. telling him that the FGCA Board meeting scheduled for that night was postponed for the lack of a quorum. That's not a bad thing for two reasons according to Carl: 1) not everyone on the FGCA board received a copy of the MOA that Carl transmitted to Angela on Friday at 1 p.m. and 2) there is no "great rush" now that our application for a Special Use permit has to go through the McLean County Zoning Board hearing during June (with an effective application deadline of May 10th). Even with earlier FGCA approval, we'd have to wait until at least mid June – and possibly mid July pending another meeting – to begin any work on the observatory.

On April 25th, Carl received an email from John Bishop at Farnsworth & Associates indicating detailed costs for the planning and inspection of the proposed observatory. The cost was far in excess of the amount anticipated, and so Bob F. and Carl initiated searches for modifications to the plan and new avenues for procuring the required work. This dynamic duo will share thoughts about how best to proceed with the RORO at the Board meeting in May. Things continue on track, however, with signing a Memorandum of Agreement with FGCA and SGNC, and with meeting requirements of the McLean County Zoning Board.

MONTHLY REFLECTIONS

By Carl J. Wenning

My first good night of observing during April was on the night of the 10th. The sky had been clear most of the week before, but the presence of the moon in the evening sky made observations of dim galaxies almost impossible. Yes, spring is the season of the galaxies. On April 10th I spent about an hour viewing with a Physics 105 student of mine at SGNC and, at the end, checked off four more galaxies from my Herschel II observing list. The next night I observed an additional 24 galaxies (plus several others not on my observing list), all in the Virgo-Coma cluster.

After returning home, I recounted all my Herschel II observations only to find to my great dismay that somehow I had miscounted and then over reported my count in last month's newsletter by 80! The 363 objects I had reported previously should have been 283. Adding the 28 galaxies from the two recent observing runs brings the actual tally to 311. I remain 89 objects from my ultimate goal. I am now 78% of the way there. The rest of the month was cloud filled and rainy, so there is nothing more to report.

APRIL E/PO

Lee Green hosted a birthday party with an observing session at SGNC on Friday, April 13th. Some 15 kids were in attendance at this event. Because the sky was overcast, the presentation consisted of a PowerPoint program followed by a tour of Sugar Grove Observatory. The family of the young boy celebrating his birthday donated \$50 to the TCAA in recognition of services rendered. A Carlock observing session scheduled for the same evening (and two more subsequently) with Carl Wenning and Sharon MacDonald had to be rescheduled to May as a result of an overcast sky.

On April 18th, a letter to the editor written by President Tom W. appeared in *The Pantagraph*. In the following days, several nice comments from readers appeared online at the newspaper's website. The letter undoubtedly added to the success of the April 21st POS. According to Lee G., "The weather did not cooperate for our April Public Observing Session, but in spite of the overcast skies, we decided to go ahead with the presentation portion of our program. Lee did a survey of Mars, its geology, some "Marscape" images from the orbiters, and a review of the missions to Mars with emphasis on the Spirit and Opportunity rovers and a preview of the August landing of the Mars Science Laboratory (Curiosity rover). We also talked about upcoming events including the ISU Family Science Day and the Venus Transit. We had a good turnout with 42 people attending along with several members including William, Tom and Carolyn, Paul, Eve, Amber, Tony, Duane, Lee and our newest member Jeff Benway."

On Sunday, April 22nd, TCAAers participated in Family Science Day at ISU. Three telescopes were set up outside to view the sun, and two display stations were inside the ISU Field House featuring meteorite identification and another dealing with eclipses and transits. Staffing the telescopes throughout from 1 p.m. to 5 p.m. that day were Paul Pouliot, Carl W., and William C. While outside, Eve and Amber graced a chalk drawing of the sun with spicules and prominences. Working the inside display were Duane Yockey, Tom Weiland, Lee Green, and Dan Miller. Dan spent much of the day working with Jimmy Simek from the NASA Glenn Research Center of Cleveland, OH, who was also present. Dan also substituted a bit during solar observing to give some break time. According to Family Science Day director, Willy Hunter from CeMaST, the number of visitors appeared to be down somewhat from last year. The solar observers reported quite the opposite with some 300 or more viewers glimpsing the sunspot-laden sun. About 10 large individual and sunspot groups were present on the sun's disk. A great number of membership, POS, and Venus Transit flyers were distributed at both locations. The lack of a proper "walking space" to hold the GPS activity for measuring the circumference of the earth resulted in it becoming a static outdoor display with handouts for completing the exercise on one's own.

Tom W. and Lee G. were present at SGNC on Friday, April 27th, to work with some of the 200-300 students there that day on a school field trip. According to Lee, "Olympia North Elementary School visited the Sugar Grove Nature Center on their annual Nature and Science Field Day for the whole school. Tom [and I] were assigned the 5th grade and had two classes. We showed a telescope and talked about the solar system. We had a scale model of each planet using 1" = 100,000 miles with a bowling ball as the Sun. We proceeded to step off each planet in turn and placed a replica at the proper location. At Jupiter, we ran out of room (and time) but we pointed to where we had flagged Saturn, and described the further distances to the outer planets. We hope the students gained a better idea about the true size of the solar system; I know that Tom and I came away with a better appreciation of these vast distances. Next week Olympia West and Olympia South will be visiting on Tuesday and Thursday and we will repeat the demonstration. This is the third year that the TCAA has assisted with this event."

Carl W.'s observing programs re-scheduled for April 20th, 27th, and 29th (Scouts), and April 28th (RBHS) were all rescheduled for later due to overcast skies.



NEXT POS MAY 19th

The third education and public outreach event of 2012 will take place on Saturday, May 19th at Sugar Grove Nature Center. The program will start at 8:30 p.m. with Tom Weiland giving a talk titled, "Saturn, the Ring World." The talk will run for approximately 20-30 minutes, and will be followed by a brief laser-mediated constellation tour. Subsequent to the sky lecture, members of the general public will be invited to view through a variety of telescopes set up for their viewing pleasure.

Recall that all POSs are on Saturday evenings, and this year feature a nearly moonless sky most evenings. Additional prominent sky objects such as planets, nebulae, star clusters, and galaxies will be viewed when visible. The schedule for the rest of the year can be found below. Note that a coordinator is still needed for the October 13th talk dealing with Uranus and Neptune. A new 2012 POS program brochure is available on the TCAA website at <http://www.tcaa.us/>.

Date (Sat.)	Time	Topic	Coordinator
June 16	9:00 PM ~ 11:00 PM	Arc to Arcturus and Speed to Spica	Carl Wenning
July 21	8:30 PM ~ 10:30 PM	Asteroids, Meteors, and Meteorites	William Carney
Aug 18	8:00 PM ~ 10:00 PM	Clusters and Nebulas of the Milky Way	John Werner
Sep 15	7:30 PM ~ 9:30 PM	Stories of the Constellations	Eve Pouliot
Oct 13	7:00 PM ~ 9:00 PM	Uranus and Neptune	(coord. needed)

MAKE PLANS FOR ALCon 2012 IN CHICAGO

The Astronomical League's annual summer convention will be held in Chicago, July 4-7. The theme will be *Celebrating 150 Years of Organized Astronomy: 1862-2012*. FEATURED SPEAKERS: Mike Simmons, President, Astronomers Without Borders Dr. Donald Parker, ALPO, Planetary Astrophotographer Dr. Dave Crawford, Co-founder IDA (remote presentation) Wally Pacholka, TWAN, Landscape Astrophotographer Dr. Jason Steffen, Kepler Mission Scientist Dr. Mark Hammergren, Adler Asteroid Expert Dr. Philipp Heck, Field Museum Meteorite Curator Dr. Hasan Padamsee, Physics Professor/Playwright, Cornell Univ. Vivian Hoette, Astronomy Educator at Yerkes Observatory Jeff Talman, Artist, Star Sound Installation, "Nature of the Night Sky" Dr. David Blask, Expert in circadian disruption/cancer/light pollution David Eicher, Editor-in-Chief, *Astronomy* Magazine. Complete details can be found online at <http://alcon2012.astroleague.org/> Make your room reservations now and save \$100 per night.

It now appears that two active and one "retired" TCAA member will be in attendance at this event. While this event is incredibly inexpensive for Chicago (just \$50 registration for a 4-day convention and \$69 for each of three nights at the convention center), we can still reduce costs further. Perhaps we can carpool to Chicago and save a bit on travel expenses, and Carl still has that room that he is willing to share at a \$35/day savings! If you plan on attending, please inform Carl at carlwenning@gmail.com and he will coordinate travel efforts.

HOW TIME FLIES

TCAA Historian Carl Wenning provides monthly updates about the history of the club going back to intervals of 50, 25, and 10 years. Details about all mentioned events will be found in either the club history (<http://www.tcaa.us/History.aspx>) or in *THE OBSERVER* archive found on the club's web site (<http://www.tcaa.us/Observer.aspx>).

50 Years Ago

May 1962 – Club members are holding a contest to name the club's newsletter, now in its 10th month. Club members take a trip to the Adler Planetarium in Chicago on May 20th. The club meets in the new ISNU Science Building (Felmley Hall), room 105, to hear a talk by John Bryan about astrophotography.

25 Years Ago

May 1987 – This month's meeting took place at the ISU Planetarium where members watched a video dealing with telescope types, listed to a short talk about planetary nebulas, and played another round of the popular game Astronomy Bowl answering questions posed by Carl Wenning.

10 Years Ago

May 2002 – On May 11th the TCAA took a field trip to Millikin University Observatory in Decatur to see their new 20-inch telescope housed atop the science building. Dan Miller served as host. The month also featured a planetarium visit, another meeting of the TCAARG (reading group), a public observing session, and an Astronomy Day display.

SLIT-DIFFRACTION SPECTROSCOPY W/SBIG SPECTROGRAPH ANALYSIS WITH RSPEC V1.4

By John Werner

Definitions:

Pixel – Light gathering site on camera sensor, size usually measured in microns (symbol μ).

Micron – A unit of length equal to one millionth of a meter. ST-7 pixel sites are 9μ in height and width.

Angstrom - The angstrom or ångström is a unit of length equal to $1/10,000,000,000$ (one ten billionth) of a meter. Its symbol is the Swedish letter Å. The Hydrogen Alpha absorption (or emission) line has a wavelength of 6562 \AA . **Resolution** - The spectral resolution of a spectrograph is a measure of its ability to resolve features in the electromagnetic spectrum. The Space Telescope Imaging Spectrograph (STIS) can distinguish features 1.7 \AA apart, giving it a resolution of 0.17 nm or 1.7\AA . (The SBIG spectrograph can achieve 2.2 \AA resolution!!)

Diffraction Grating - An optical device, ruled with thousands of fine parallel grooves, which produces interference patterns in a way that separates all the components of the light into a spectrum. A diffraction grating can be used as the main dispersing element in a spectrograph.

Kelvin - A unit of temperature (same size as a Celsius unit) where Absolute zero at 0°K is -273.15°C (-459.67°F). **Blackbody** - A black body at a constant temperature emits electromagnetic radiation called black-body radiation. The radiation has a spectrum that is determined by the temperature alone.

"Spectroscopy is at the heart of astrophysical inference" (ref. James Green, professor of astronomy at the University of Colorado) and is a path little traveled by amateur astronomers, but is within reach financially and technically. Most of what we know about stars, nebulae, supernovae, galaxies, binary star systems, comets, and other objects located in the universe is based on the interpretation of the light we capture. I am excited to report results from my initial classification of the following recognizable stars - Aldebaran, Sadr, and Sirius from major absorption lines that define a star's atmosphere composition. The emission spectrum of nebula M42 was also recorded.

A principal objective of this work was to develop techniques to effectively operate the SBIG spectrograph and to apply RSpec software to the captured data. Although there is a relatively steep learning curve and techniques to develop, these are not insurmountable with patience and a dedicated instrument setup (See Fig. 1). Thanks to Dr. Dan Miller, Millikin University, for providing the instrument to develop these techniques for Millikin University students and interested TCAA members.

Spectral Nature of Light

Adapted from MIT Spectroscopy - <http://web.mit.edu/spectroscopy/history/history-classical.html>

The spectral nature of light is present in a rainbow, but early man did not recognize its significance. It was not until 1666 that Sir Issac Newton showed that the white light from the sun could be dispersed into a continuous series of colors from a collimated beam of light entering a glass prism to disperse it. Newton coined the word "spectrum" to describe this phenomenon. Newton's analysis of light was the beginning of the science of spectroscopy.

The sun's radiation has components outside the visible portion of the spectrum. W. Herschel (1800) demonstrated that the sun's radiation extended into the infrared (longer wavelengths), and J.W. Ritter (1801) made similar observations in the ultraviolet (shorter wavelengths). These studies were the beginnings of radiometric and photographic measurements of light.

Spectral Lines and Their Quantitative Measurement

Joseph Fraunhofer, born near Munich in 1787, extended Newton's discovery by observing that the sun's spectrum, was separated by a large number of fine dark lines (1814), now known as Fraunhofer lines. These were the first spectral lines ever observed, and Fraunhofer defined the most prominent of them as the first standards for comparing spectral lines. Fraunhofer also studied spectra of the stars and planets, using a telescope objective to collect the light. This laid the foundation for the science of astrophysics.

Fraunhofer developed the diffraction grating, an array of slits, which disperses light like a glass prism, but with important advantages. T. Young demonstrated that a light beam passing through a slit emerges in a pattern of bright and dark fringes. Fraunhofer extended these studies to the case of two, three and many closely spaced slits, and thus developed the transmission grating. With this, he was able to directly measure the wavelengths of spectral lines. Fraunhofer's achievements are all the more impressive, considering that he died at the early age of 39.

Atomic Identity of Line Spectra

Fraunhofer did not understand the origin of the spectral lines he observed. Thirty-three years after his death, Kirchhoff found that elements and compounds have their own unique spectrum, and that by studying the spectrum of an unknown source, one can determine its chemical composition. With these advancements, spectroscopy became a true scientific discipline.

In the early 1800's J.F.W. Herschel, among others, studied spectra from terrestrial sources such as flames, arcs and sparks. These sources were found to emit bright spectral lines, which were characteristic of the chemical elements in the flame. I used gas emission tubes of Neon and Hydrogen, with well-known emission line wavelengths, to calibrate the spectra I obtained.

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SLIT-DIFFRACTION SPECTROSCOPY W/SBIG SPECTROGRAPH ANALYSIS WITH RSPEC V1.4 (CONT.)

(Continued from page 5)

Kirchhoff explained that the dark lines in the sun's spectrum were due to absorption of the continuous spectrum emitted from the hot interior of the sun by elements at the cooler surface. Analysis of the sun and star atmospheres became possible.

The SBIG Self-Guiding Spectrograph (SGS)

The SBIG spectrograph operates with the very modest 765 x 510 pixel SBIG ST-7 in combination with CCDOPS camera control software to capture spectra images. The ST-7 chip is small by today's standards, but is designed to work well with the SGS optical configuration. The object that is to be analyzed is viewed on the tracking CCD, simultaneously with the slit, which can be backlit by an LED during object acquisition to make it clearly visible on a tracking CCD. I found that the backlighting is not needed for extended nebula which frame and reveal the slit. The object is manually maneuvered onto the slit using the telescope controls. There is a self-guiding feature for long exposure spectroscopy; however I use an off-axis autoguider due to the limited size of the self-guiding sensor on the ST-7 to acquire a guide star. The spectra are recorded by the imaging CCD, oriented long-ways so the spectra fall across 765 pixels, with a cropped height of about 8 pixels for stellar sources. Two gratings are available. The standard grating, 150 rulings per mm, gives a dispersion of 4.3 angstroms per pixel, and allows the user to capture the entire interesting range from the Calcium H and K lines to H-Alpha with a single exposure. The resolution is about 8 angstroms.

A high resolution grating on a carousel in the instrument can also be used that gives 1.07 angstrom per pixel dispersion, with a resolution of about 2.2 angstroms. The spectral range is smaller, being only about 750 angstroms. This resolution is adequate to detect the Doppler shift due to the earth's motion around the sun when carefully calibrated, and detect spectroscopic binaries.

Two slits are provided with the unit. The slit installed at SBIG is 25 microns wide, but it appears to be 18 microns wide to the spectrograph since it is tilted. A wider slit, 100 microns wide, is included with the spectrograph for use in capturing the spectra of dim extended objects, such as galaxies. It appears to be 72 microns wide. It is more effective on dim objects since more light makes it through the slit, but at the cost of spectral resolution.

The author used the 25 micron slit and lower resolution grating for the very bright objects discussed in this article, providing a 3,200 angstrom range. Telescope pointing accuracy is very important for object acquisition.

My biggest challenge was gaining familiarity with object positioning on the off-axis autoguider relative to object position on the ST-7 tracking sensor for slit illumination. This scientific instrument can be used for stellar classification, analysis of nebular emission lines, identification of spectroscopic binaries, measurement of stellar velocities relative to our line of sight to +/- 6 km/sec accuracy, obtaining galactic spectra and red shift, and measurement of brighter Quasars.



Fig. 1 SBIG Spectrograph mounted to a Celestron 9.25 telescope at Farm View Observatory.

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SLIT-DIFFRACTION SPECTROSCOPY W/SBIG SPECTROGRAPH ANALYSIS WITH RSPEC V1.4 (CONT.)

(Continued from page 6)

M42 (Orion Nebula) Emission Spectra

The nebula M42 surrounds hot, young O-class stars and the electrons in atoms of the gas cloud are energized by collisions causing them to jump up to a higher "orbit" in the atoms. When they fall back down to a lower state they emit photons of light. These photons will be emitted at very specific frequencies, and by measuring these frequencies we can identify the gas. These lines, which appear as bright colored lines against a black background, are called emission lines. The spectrum formed is an emission or bright line spectrum, as shown in Fig. 2. I placed the spectrograph slit near the Trapezium cluster. The slit was easily seen against the background nebulosity. Dominate features in the emission spectra are OIII at 5007 Å and the H α line at 6563 Å.

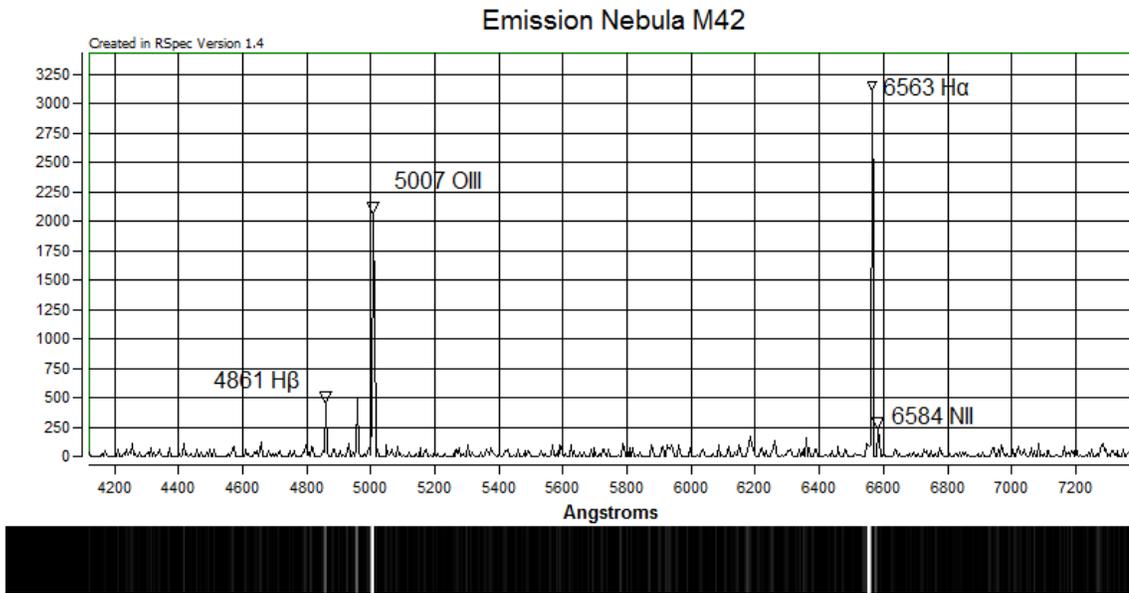


Fig. 2 Emission spectra of the Orion Nebula.

Star Classification

Stars are classified according to their spectra, which in turn represent their surface temperatures. Stars are classified into specific categories, O B A F G K M, from hottest (O at 30,000 Kelvin) to coolest (M at 3,000 K). Each class of stars has a unique absorption line spectra fingerprint, as shown below for Class A (10,000 K), F (7,000 K), and K (4,000 K) stars.

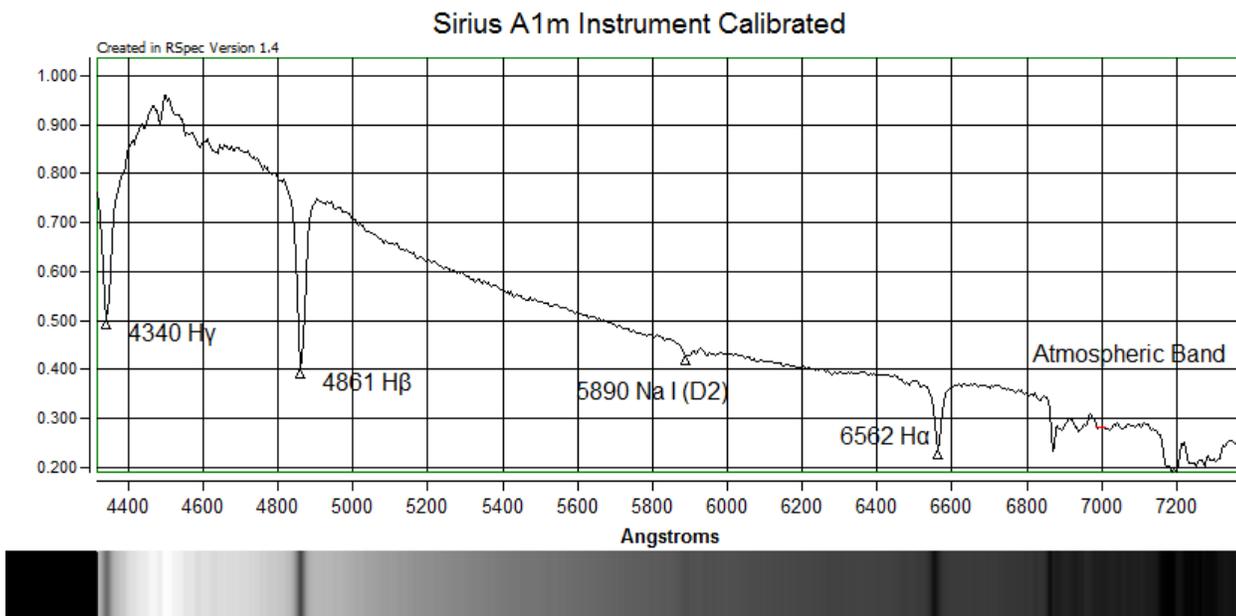


Fig. 3 Spectra for Sirius, class A1m, a main sequence star, 8.6 ly distant, where the m indicates metallic absorption lines.

(Continued on page 8)

SLIT-DIFFRACTION SPECTROSCOPY W/SBIG SPECTROGRAPH ANALYSIS WITH RSPEC V1.4 (CONT.)

(Continued from page 7)

Stars are surrounded by outer layers of gas that are less dense than the core. Photons of specific frequency can be absorbed by electrons in the outer layer of gas, causing the electron to change energy levels. Eventually the electron will de-excite and jump down to a lower energy level, emitting a new photon of specific frequency. The direction of this re-emission however is random, so the chances of it travelling in the same path as the original incident photon is very small. The net effect of this is that the intensity of light at the wavelength of that photon will be less in the direction of an observer, with the spectrum showing dark absorption lines.

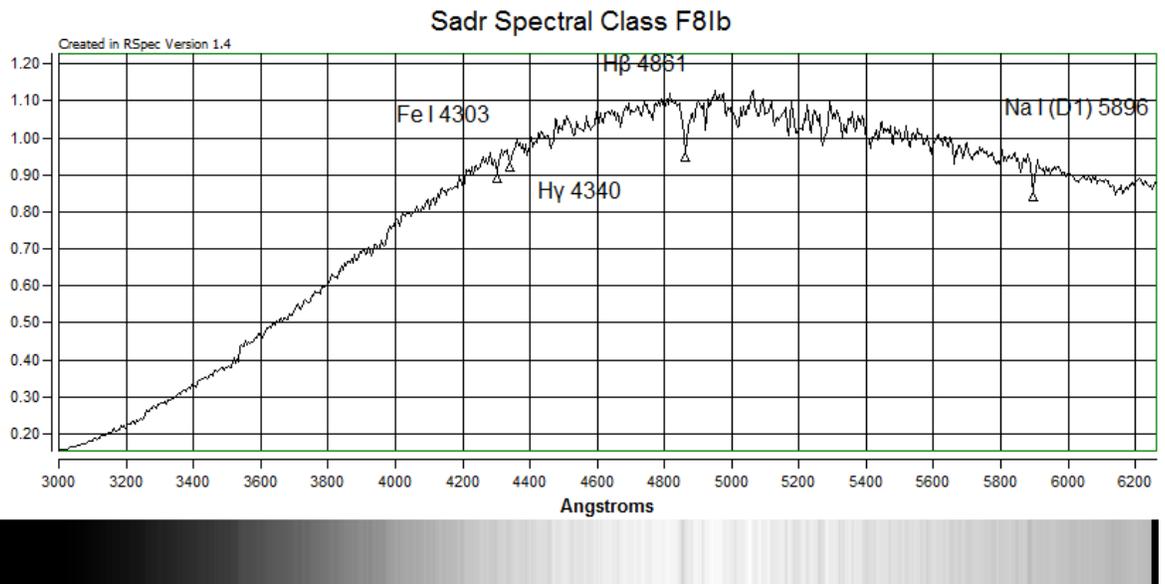


Fig. 4 Class F8Ib, Sadr (Gamma Cygni) is a luminous supergiant.

Sadr shows a peak intensity at a wavelength in the visible part of the spectrum. The instrument calibrated curve, representing the Blackbody curve, can be used to approximate the star's surface temperature from Wein's Law, expressed as: $\lambda_{\text{max}} = 0.29/T$ (in K) λ_{max} from the graph is about 5,000 Å, giving a surface temperature of about 5,800 K, near the professionally determined 6,100 K. Class F stars show weaker hydrogen lines (as compared to the strong H α , H γ , and H β lines for Sirius in Fig. 3) and the emergence of distinguishable Iron, Calcium, and Sodium absorption lines (See Fig. 4).

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SLIT-DIFFRACTION SPECTROSCOPY W/SBIG SPECTROGRAPH ANALYSIS WITH RSpec V1.4 (CONT.)

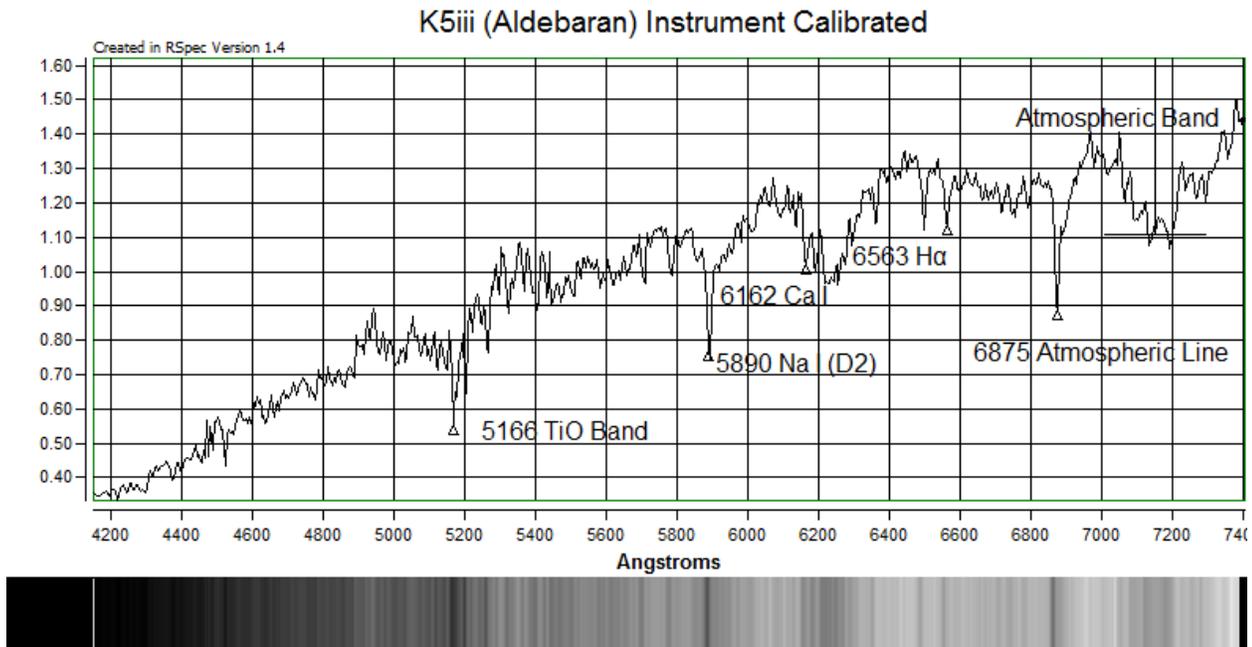


Fig. 5 Class K5III, Aldebaran (Alpha Tauri) is an orange-yellow normal giant, advanced in its stellar evolution.

Aldebaran's surface temperature of 4,010 degrees Kelvin, compared to the Sun's 5,780 degree temperature, gives it a distinct orange color not all that dissimilar to that of Mars. It has exhausted the hydrogen fuel in its core and hydrogen fusion has ceased there. Although not yet hot enough for fusing helium, the core temperature of the star has greatly increased due to gravitational pressure and the star has expanded to a diameter of 44.2 times the diameter of the Sun. Most molecules such as TiO are seen only in spectra of the coolest stars.

Resources

"Spectroscopy for Everyone" is an article in the August 2011 issue of Sky and Telescope highlighting low-cost entry into astronomical spectroscopy. You may already have a video camera or DSLR and a small telescope. Add an inexpensive diffraction grating to the front of your camera lens and you are then capable of capturing low-resolution spectra. Tom Field's RSpec software can create impressive charts with reference lines of prominent spectral features for spectra captured with a video camera.

Tom's website is incredibly rich with links to educational sites for astronomical spectroscopy <http://www.rspec-astro.com/>

There are other spectrography data processing software, such as Visual Spec. A great resource for understanding the spectra from a variety of astronomical targets is *Spectroscopic Atlas for Amateur Astronomers - A Guide to the Stellar Spectral Classes* by Richard Walker.

Christian Bull's site <http://www.astrosurf.com/~buil/> contains a wealth of very helpful information about spectroscopy. Christian is one of the leaders in the field. He's a pioneer who frequently leads the way into new technologies. His site has countless examples of the kind of deep, high-quality, scientific work that he does.

CONSTELLATION OF THE MONTH: URSA MAJOR

Ursa Major, or the Great Bear, is a northern constellation that high in the sky during spring and early summer. The main stars of the constellation make up one of the best known asterisms, the Big Dipper.

In Mythology, Ursa Major is said to be Callisto, a beautiful maiden that Jupiter took as a lover. Enraged, Juno turned Callisto into a bear. One day, the bear encountered a young herdsman that turned out to be her son who was about to kill the bear when Jupiter intervened placing both in the sky as the Great and Small Bears. Juno was incensed at her rival's heavenly place and prevailed upon Oceania and Tethys, the ocean gods, to prevent the bears from ever entering the sea. Thus their place was set near the North Celestial Pole where they never set.

Astronomically, Ursa Major is the third largest constellation with 1280 square degrees and is the 8th brightest constellation.

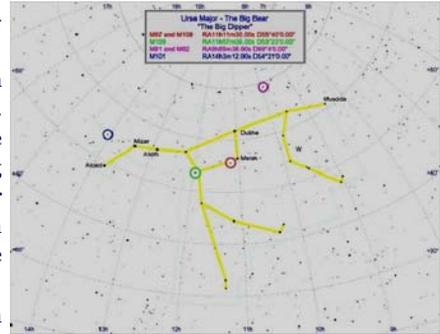
There are seven named stars that make up the Big Dipper. Merak and Dubhe are the two easternmost bright stars and are called the pointer stars. These stars are in a rough line with Polaris, the North Star. Those stars, along with Phecda and Megrez make up the dipper. The handle of the dipper, or the tail of the bear, includes three stars Alioth, Mizar and Alcaid. Several other stars are also named including Tania Borealis and Tania Australis which make up the rear foot and Muscida which is the eye of the bear and is a double star. Mizar has a visible companion star name Alcor just 15 arcminutes away. Looking at Mizar in a telescope shows that it has a close companion too.

Ursa Major contains a binary star system that is the prototypical of this type of variable star. W Ursae Majoris is a pair of dwarf stars that are orbiting each around at the astounding rate of about 8 hours. It is thought that the stars are so close near that they are deformed into ovoid shapes. The light curve of this system bears this theory out in that it is curved and has no linear elements.

Ursa Major also contains the star called Groombridge1830 which is also known as the Runaway Star and is in a class of stars called Population II objects. This star has the third largest proper motion moving over 7 arcseconds per year. Population II stars are thought to be old stars which are part of the galactic halo through which the spiral arms are passing. The brightest star in this class is Arcturus.

Since Ursa Major is located well away from the galactic plane known as the Milky Way, it contains a large number of galaxies. Among the deep sky objects are 7 Messier objects, M40, M81, M82, M97, M101, M108 and M109. M40 is the only Messier object that consists of two stars. M97 is a planetary nebula also known as the Owl Nebula. The other Messier objects are all galaxies.

In summary, Ursa Major is a large, bright, well-known constellation that has a rich variety of objects within its boundaries.



LET THERE BE LIGHT...

By Lee Green

Some modest progress has been made on our storage area at the Sugar Grove Nature Center. Lex Green and his little brother Lee had a chance to visit the Nature Center on Easter Sunday and rewired the light switch so it was placed at the entrance to the shed. Previously the switch had been mounted to the wall about 10 feet inside the building, behind a 4' high, 4' deep storage container that was difficult to reach, even if you were able to grope around and find its location in the dark. Several members of the staff of the Nature Center were very relieved to have such easy access. Where they were there, the brothers also extended the wiring into the TCAA's 'poker room' and storage area, although they did not complete the process.

Subsequently, Lee, with Tom Weiland's assistance on two occasions, was able to install the "can" lighting and get the fixtures wired. While there are a few details, remaining, we now have two switches inside the facility and we can now see what we are doing. The area is still being used primarily as a staging area for the electrical project, but it has already fulfilled a portion of its promise as storage facility for the club by housing selected boxes and telescopes that were moved from the Observatory.

Soon we will continue with the installation of the remaining electrical circuits. These are intended to provide illumination for the upper level of the shed, along with flood lights and 120v and 240V power outlets for the eastern work area. The western area needs to have new light fixtures installed as well as additional power outlets, so we will run conduit for these too. Once these improvements are completed, we will be nearly finished with our contributions to the SGNC Shed.

TCAA Treasurer's Report – April 2012

OPERATING FUND BALANCE – March 31, 2012 - \$ 1,276.10

Income

Libby Norcross (Dues) -	\$ 26.00
Nate Hahn (Dues) -	\$ 41.00
Jeff Benway (Dues) -	\$ 26.00

Expenses

LYB Inc. (Observer copies & postage) -	\$ 39.46
PayPal (Libby Norcross) -	\$ 0.87
PayPal (Nate Hahn) -	\$ 1.20
PayPal (Jeff Benway) -	\$ 0.87
Grinnell Mutual (Liability Insurance) -	\$ 144.00

OPERATING FUND BALANCE – April 30, 2012 - \$ 1,182.70

OBSERVATORY FUND BALANCE – March 31, 2012 - \$ 3,004.91

Income

None -	\$ 0.00
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Expenses

None! -	\$ 0.00
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OBSERVATORY FUND BALANCE – April 30, 2012 - \$ 3,004.91

TOTAL TCAA FUNDS – April 30, 2012 - \$ 4,187.61

Respectfully submitted,

L. Duane Yockey, Treasurer

MISSING OUT ON TCAA ACTIVITIES & EVENTS?

If you are missing out on club activities or celestial events, be certain to join the TCAA listserv. Many activities are planned at the last minute, and announced only hours in advance through the club's listserv. Reminders about celestial events are also broadcast to the membership through the club's listserv. To join this free service by Yahoo, send a blank email to TCAA-subscribe@yahogroups.com. Unsubscribing is just as easy. To unsubscribe, just send a blank email to TCAA-unsubscribe@yahogroups.com.

To keep up to date on celestial events not described in *The OBSERVER* or addressed in the listserv, visit Carl Wenning's observing page at www.phy.ilstu.edu/~wenning/observing_page.htm. It has been recently updated to include an extended sky calendar of events as well as additional space weather and satellite viewing links.

The OBSERVER

Newsletter of the TCAA, Inc.

Erin Estabrook, Editor
314 Covey Court
Normal, IL 61761

Are your dues due?



The Dues Blues?

If you see a check in the box above, it means your dues are due. To retain membership, please send your dues renewal to our esteemed Treasurer:

**Duane Yockey
508 Normal Avenue
Normal, IL 61761**