

image by Jeff Johnson

Black Eye Nebula (M64)

Sharing the Universe with our Community for over 60 years

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The Astronomical Society of Las Cruces (ASLC) is dedicated to expanding public awareness and understanding of the wonders of the universe. ASLC holds frequent observing sessions and star parties and provides opportunities to work on Society and public educational projects. Members receive the *High Desert Observer*, our monthly newsletter, plus membership to the Astronomical League, which includes their quarterly publication, *Reflector*.
 Individual Dues are \$30.00 per year
 Family Dues are \$36.00 per year
 Student (full-time) Dues are \$24.00
 Dues include electronic delivery of the *HDO*. Prorated dues are available for new members. Dues are payable to ASLC with an application form or note to: Treasurer ASLC, PO Box 921, Las Cruces, NM 88004
ASLC members are entitled to a \$5.00 (per year) Sky and Telescope magazine discount.

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March Meeting -- ONE WEEK EARLIER THAN USUAL
 Our next meeting will be on **Friday, March 20**, at the DACC Main Campus, Room 141, Technical Studies Building, starting at 7:00 p.m.
 At the time of publication of the *High Desert Observer*, a speaker for the March 20 meeting has not been confirmed. Come join us and see what surprises are in store.

ASLC Board of Directors, 2015
Board@aslc-nm.org
 President: Daniel Giron; President@aslc-nm.org
 Vice President: Steve Barkes; VP@aslc-nm.org
 Treasurer: Patricia Conley; Treasurer@aslc-nm.org
 Secretary: John McCullough; Secretary@aslc-nm.org
 Director-at-Large: Tracy Stuart; Director1@aslc-nm.org
 Director-at-Large: Ron J. Kramer; Director2@aslc-nm.org
 Immediate Past President: rrichins73@comcast.net
 Director Emeritus: Walter Haas

New & Existing Member Package
 Membership Chair, Judy Kile has sent member packages to all current members before the June meeting. These were sent via Yahoo!Groups email. If you did not receive your package, please let her know (jkile@elp.rr.com) and she will send you a regular email with the package.

Committee Chairs
 ALCor: Patricia Conley; tconley00@hotmail.com
 Apparel: Ron Kramer; ronjkramer@aol.com
 Calendar: Chuck Sterling; csterlin@zianet.com
 Education: Rich Richins; Education@aslc-nm.org
 Grants: Sidney Webb; sidwebb@gmail.com
 Librarian: *****OPEN*****
 Loaner Telescope: Frank Fiore; ffchilehead@gmail.com
 Membership: Judy Kile; judykile3916@gmail.com
 Night Sky Network: *****OPEN*****
 Observatory:
 Leasburg Dam: Rich Richins; rrichins73@comcast.net
 Tombaugh: Steve Shaffer; sshaffer@zianet.com
 Outreach: Chuck Sterling; csterlin@zianet.com
 Web-Site: Steve Barkes; steve.barkes@gmail.com
HDO Editor: Ron Kramer; ronjkramer@aol.com

Outreach
 Outreach is a very important part of ASLC. We are always looking for more volunteers to help us educate the public. Even if you do not have a portable telescope to bring to the events, please consider attending our public outreach programs to help answer questions, share knowledge and point out constellations in the sky.

Events
 ASLC hosts deep-sky viewing and imaging at our dark sky location in Upham. We also have public in-town observing sessions at both the International Delights Cafe (1245 El Paseo) and at Tombaugh Observatory (on the NMSU Campus). All sessions begin at dusk. At our Leasburg Dam State Park Observatory, we hold monthly star parties. Located just 20 miles north of Las Cruces, our 16" Meade telescope is used to observe under rather dark skies. Please see *Calendar of Events* for specific dates and times.

Annual Dues
 Please note that annual dues are due in January. Contact our Treasurer, Patricia Conley (treasurer@aslc-nm.org) for further information. Dues can be paid at the next meeting or via mail, sent to Treasurer ASLC, PO Box 921, Las Cruces, NM 88004.

From the Prez

The ASLC is very active in outreach. Members have successfully conducted star parties at two schools on the same night on March 3rd and the report I received tells me everyone had a great time. Thanks to Chuck, Jerry Mc., Steve S., Cristina, Nils, and all the others who participated.



Outreach on radio is getting attention from BravoMic Communications. Program Director KC Counts has offered us opportunities for interviews on talk radio and also opportunities for public service announcements to be aired from time to time by the radio announcers. Bert Stevens, Robert Westbrook and I are working on getting the ASLC on air and if anyone wants to get in on this action let me know.

Congratulations to two of our members who have successfully built their own telescopes thanks to the guidance and encouragement from Nils Allen and Rich Richins. Our youngest member Emma Fuchs recently built her own 6 inch f/8 Dobsonian reflector and member Cristina Lugo had recently built her own 4.5 inch Dobsonian reflector as well. Cristina even took her scope to a couple of outreach events and showed kids, parents and teachers how to use it. All were impressed and had a great time.

There will be more outreach opportunities for us in various forms: radio, newspapers, school star parties, public star parties, etc.. For those who haven't participated in outreach yet, find out what you are more comfortable with and get involved. Its a lot of fun!

Daniel Giron, Jr.

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Recent Outreach Events

by Jerry McMahan & Steve Shaffer

Thursday, February 12; Desert Hills Elementary

We had a great turnout from club members as well as spectators. Members included: Tracy Stuart, 90mm Maksutov; Ed Montes, 102mm refractor; Chuck Sterling, 100mm refractor; Nils Allen, refractor; Steve Shaffer, 4.5 inch Dobsonian; Jerry McMahan, 125 mm ETX Maksutov; Rich Richins; 10 inch Dobsonian; Sid Webb;10 GoTo Dobsonian; Christina Lugo---Spokesperson.

Objects observed included Mars, Venus and Jupiter. Deep sky objects included Orion Nebula, Pleiades, open cluster M41, Double Cluster and the star Sirius. There was no Moon so we had good luck observing even though we had lights from the school and from town.

Saturday, February 14; Leasburg Dam State Park Observatory

I took the 8-inch SC and Chuck Sterling brought the 100mm refractor. I prefer to set up in day light, so even though it was cloudy and looked like we would not be able to see anything, I took a chance and set up anyway. It paid off. The southern sky cleared and later part of the north. It allowed us to get Mars, Venus and Jupiter, the Orion Nebula as well as clusters M45 and the Double Cluster. We were also able to get the galaxies M81 and M82.

Dave and Kathy Doctor were in the observatory, aided by Sid Webb. Other members, in attendance, included Daniel Giron, Ron Kramer, Ann McPhee, Rob Westbrook and Robert Williams.

One group of very interested spectators spent a lot of time at the Observatory and then with Chuck and I at the scopes out on the grass. They were enthusiastic about what they saw and with the questions they asked. What looked like an unlikely observing session, at the beginning, turned out to be a good one.

Thursday, February 26; Desert Spring Christian Academy

Chuck Sterling and I were at the school with my ETX-125 and Chuck's 100mm refractor. Early clouds made it uncertain, but it did clear in time to have a successful, but cold star party. Targets included the Moon and Jupiter. All four Galilean Satellites were visible at first. Later only three could be seen. A short while later all four could be seen again. It turned out that, from the East coast, Io passed in front of Ganymede.

Thursday, February 26; Sunrise Elementary School

Las Cruces Clear Sky Chart gave an accurate forecast for the evening of chilly wind and a few clouds. Niles Allen was already setting up when Cristina Lugo and Steve Shaffer arrived. Cristina was very proud of her brand new 4.5" Dob which Niles had helped her build in his telescope building class. I was jealous of Cristina's very clean mirror, mine is dirty. I will claim it is cosmic dust accumulated from many star parties. We were set up on the basketball courts to the south of the school. We viewed Venus, Mars, Jupiter, the Moon and the Great Orion Nebula. Jupiter was fun, started out with two moons close together, later we had three moons close together and then went back to just two moons. It was not a huge crowd but a very nice steady stream of students and adults coming out to look through the telescopes for the evening. Never had long lines. The wind had died down by about 7pm but by the time I got home it was completely overcast just as predicted.

Friday, February 27, 2015; NMSU Open House at Tombaugh Observatory

I had gone by the observatory a week prior to see that the shutter would open. In January the shutter was frozen shut with ice and snow. Once again the Open House was the same night as our ASLC monthly meeting. I opened the dome and set up the telescope to view the first quarter Moon. I tried out a 2" 37mm 75 degree eyepiece that Jerry had left. It gave a nice view but had limited eye relief such that it was difficult to use while wearing eyeglasses. We had 49 views of the moon. Jerry McMahan left the meeting halfway through and came to help. Trish Conley came by after the meeting.

The March and April Open House will also be the same nights as the ASLC meeting. Stop by after the meeting and have a look at and through our 12.5" telescope. It is only a few blocks away.

Saturday, February 28; MoonGaze, International Delights Café

The ETX and 100mm refractor were present again, along with Jerry McMahan and Chuck Sterling. Christina Lugo brought her Newtonian reflector, that she made herself. Ed Montes brought his refractor and John McCullough answered questions for the public.

Early clouds were a problem, but when it cleared, the seeing conditions were good. Christina brought the portable heater, but didn't need to get it out of the car. It was not very cold, even later in the evening. Ed looked at the Orion Nebula and we also had the Moon and Jupiter. Once again we had all four of Jupiter's large moons. On one side, starting closer to Jupiter, was Europa, Io and Callisto. Like Thursday we saw those three and then two and then three again. This time Europa passed in front of Io during the short time we were missing a moon. My phone app showed that Europa and Io had changed positions relative to their proximity to Jupiter.

Tuesday, March 3; Lighthouse Academy

We had this star party scheduled. It rained most of the day. By evening the sky had cleared some what, but the lady in charge e-mailed that the area where the scopes would be set up was covered with water, so the event was canceled.

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Calendar of Events (Mountain Time - 24 hr. clock)

MAR 20	03:36	New Moon
20	16:45	Spring (Vernal) Equinox
20	19:00	ASLC Monthly Meeting, DACC Main Campus, Room 141 (Technical Services Bldg.). Please note date change for this meeting
21	16:13	Moon-Mars Conjunction
21	dusk	OUTREACH; Messier Marathon at Leasburg Dam State Park
22	13:51	Moon-Venus Conjunction
25	00:55	Moon-Aldeberan Conjunction
27	01:43	First Quarter Moon
27	21:00	OUTREACH; Tombaugh Observatory
27-30		OUTREACH; Star Party at SpacePort American (tentative)
28	dusk	OUTREACH; MoonGaze, International Delights Café
APR 01		Venus at 36.6° Eastern Elongation
04	06:01	Partial Lunar Eclipse
04	06:06	Full Moon
08	07:06	Moon-Saturn Conjunction
08	08:16	Jupiter-M44 Conjunction
11	dusk	OUTREACH; Leasburg Dam State Park Observatory
11	21:44	Last Quarter Moon
15		OUTREACH; Hermosa Heights Elementary Daytime Presentation (proposed)
17-18		Enchanted Skies Star Party, Magdalena, NM (www.enchantedskies.org)
18	12:57	New Moon
21-22		Lyrids Meteor Shower
21	10:35	Moon-Aldeberan Conjunction
21	12:09	Moon-Venus Conjunction
24	19:00	ASLC Monthly Meeting, DACC Main Campus, Room 141 (Technical Svcs. Bldg.)
24	21:00	OUTREACH; Tombaugh Observatory, NMSU Campus
25	17:55	First Quarter Moon
25	dusk	OUTREACH; MoonGaze, International Delights Café
30	19:29	Mercury-M45 Conjunction

Be sure to visit our web site for the latest updates: www.aslc-nm.org

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February Meeting Minutes

by John McCullough

Show & Tell

There was no Show & Tell session to allow the feature presentations to begin at 7:00 pm.

Call to Order

Daniel Giron, President, Astronomical Society of Las Cruces (ASLC, the Society), called the February meeting to order at 7:00 pm, 27 February 2015, Room 141, Doña Ana Community College (DACC), Las Cruces, New Mexico.

President's Comments

The President, Daniel Giron, welcomed the group, including a number of visitors, to tonight's meeting and noted that tonight was a rare occurrence in that there would be two (2) presentations and thus no formal business meeting.

Officer's Reports

Note: There were no Officer Reports to allow the presentations to begin shortly after 7:00 pm.

Committee Reports

Note: There were no standing Committee Reports to allow the presentations to begin shortly after 7:00 pm.

Old Business

Note: No Old or New Business was discussed to allow the presentations to begin shortly after 7:00 pm.

Presentation #1

This month's first presentation was by Dr. Al Grauer of the Catalina Sky Survey (CSS) on the latest in Earth-approaching objects, entitled "Space Rocks!". Dr. Grauer is an astronomer and investigator at the CSS Schmidt telescope located on Mt. Bigelow in the Catalina Mountains just north of Tucson, Arizona, (2510 meters above sea level). He is involved in the inventory of near-earth objects (NEOs), or more specifically, the potentially hazardous asteroids (PHAs) that pose an impact risk to Earth and its inhabitants (the site is owned and operated by Steward Observatory of the University of Arizona). Dr. Grauer described the equipment used for the sky survey and its development. He also described the process of discovering, tracking, and establishing the orbit of NEOs and the role amateur astronomers play in confirming those orbits. He then talked about previous Earth impact events, some, like Chelyabinsk, quite recent, and their effect on the planet. He talked about the source of various types of "space rocks" and their frequency in the solar system and finding them on the Earth's surface. Dr. Grauer finished his presentation by talking about the Cosmic Campground project he and his wife are working on in the Gila Wilderness. Dr. Grauer also hosts a public radio segment entitled *Travelers in the Night*, that is now available on Spreaker.

Presentation #2

This month's second presentation was by Canadian astrophotographer and astronomy author Alan Dyer on his astroimaging work in southern New Mexico and around the world. In addition to Alan's *Amazing Sky* work, he recently returned from an educational/teaching trip to Churchill, Canada, on Hudson's Bay where he conducted a workshop in imaging aurora borealis in balmy -35°C - -25°C temperatures (-50°C wind chill). Alan displayed multiple images of aurora, eclipses, nightscapes, and various atmospheric and celestial phenomena. Additional amazing images and information can be found at Alan's website, amazingsky.photoshelter.com.

Following the completion of both presentations, thank you gifts provided by Cristina Lugo and David Giron were presented to both speakers. That was followed by drawings for door prizes. Joyce Paul won a poster as an attending guest and Bert Stevens won a T-shirt as an attending member. Daniel reminded the group that the March monthly meeting will be held a week early, on 20 March, the speaker TBD.

The February meeting of the Astronomical Society of Las Cruces concluded at 9:00 pm.

-Respectfully submitted by John McCullough, ASLC Secretary

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Additional Committee Reports

Treasurer Report (Summary), January 2015 (by Patricia Conley)

Income	\$264.93 (dues, books, calendars, interest)
Expenses	\$1,082.00 (insurance, safety deposit box)
Net Income (Loss)	(\$855.07)

Apparel Report (Summary), February 2015 (by Ron Kramer)

Inventory	\$846.50
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We are now fully stocked with Hoodies, shirts and caps, in both men's and ladies. Invoice given to Treasurer.

ALCON2015 Report, February (by Bert Stevens)

We have a very exciting event coming up this July. The nationwide Astronomical League (A.L.) is holding their annual convention here in Las Cruces at the Hotel Encanto from July 6 to July 11. This event, called ALCON 2015, will bring astronomers, both amateur and professional, to our doorstep. It will be an opportunity to hear interesting talks and meet interesting people.

The ASLC invited the A.L. to hold their convention here about two years ago. After they accepted, a group of ASLC volunteers formed a committee to plan and execute the convention, with Ron Kramer, who has been spearheading this project, as its chair. The convention committee has been meeting for almost a year.

The committee contains some very active members who have had experience in running conventions. They have come up with a plan and have put it into effect. Contracts are being signed and venues arranged.

The convention will begin with two days of tours. We have planned unique tours that give you a perspective not available to the casual visitor. On Monday, July 6, we will have two tours. One tour will cover the Very Large Array of radio telescopes west of Socorro and the Mineral Museum at New Mexico Institute of Mining and Technology in Socorro. This bus tour will take all day and dinner will be in Socorro before we head back.

The other tour on Monday is to the New Mexico Museum of Space History in Alamogordo. The tour will be conducted by a NMMSH staff member who will highlight some of the interesting artifacts of the space program located there. The NMMSH also has many items from the White Sands Missile Range.

The second day of tours has two tours as well. One tour is broken into two groups, one going to Apache Point Observatory and the other to the National Solar Observatory in Sunspot, NM. After their tours, they will have lunch in Cloudcroft, NM, and have time to wander around the town. In the afternoon each group will tour the observatory that they did not tour in the morning.

The second tour will visit the White Sands Missile Range. We will tour the Missile Museum and the Missile Park. Lunch will be at the Officer's Mess. Later, we will visit the launching site of the V-2 rockets in the late 1940s and early 1950s.

Wednesday will be a free day for most people. The members of the Astronomical League's Council will have their annual meeting to plan League activities for the next year. In the evening we will have a Meet and Greet in the lounge to allow everyone to get to know each other before the main part of the event starts.

Thursday starts with the opening ceremony where various local and national astronomical dignitaries will give short welcoming speeches. The rest of the day will consist of talks presented at the hotel. The speakers on all three days will present interesting information on astronomy and observing. There will also be door prize drawings scattered throughout the papers sessions. In the evening we will have observing at EMI Technologies, Inc. on north Telshor Blvd.

We will also be having tours for those not interested in the talks (typically spouses). These will be going to the Farm and Ranch Museum, Old Mesilla, the Las Cruces Museums (Museum of Art, Branigan Cultural Center, Museum of Nature and Science and the Railroad Museum), the Farmer's Market, and more. We will also have a room where astronomical vendors will be able to display their wares. We have some really interesting companies coming.

Friday will also have many interesting papers during the day. In the evening, we will be going out to Leasburg Dam State Park for a "Star-B-Que". This will be a real southwestern meal catered by Famous Dave's BBQ down in El Paso. We will have entertainment and as it gets dark, we will open up the observatory and set up ASLC member telescopes for the convention attendees to experience the New Mexican sky.

The Association of Lunar and Planetary Observers (A.L.P.O.) will also be at ALCon 2015. They will be presenting papers on planetary observing and results of their previous observing campaigns. They will also have their own business meeting. A.L.P.O. brings a very research-oriented aspect to our event.

Saturday will start with the Astronomical League's General Meeting where the results of the Council meeting will be discussed and the new League Officers announced. We will also have talks by the National Young Astronomer Award winner and runner up. These young people often have talks on amazingly complicated subjects that are sometimes hard for even experienced amateur astronomers to follow. The winner of the Horkheimer-Smith award will also present their work at this time.

Saturday afternoon will have the final papers session of the event. It will be followed by a cocktail hour with a cash bar. The evening starts with the Banquet, a fine meal at the hotel and the very special appearance of an old friend. We will then have Pat Hynes from the New Mexico Space Grant Consortium as our Keynote speaker. This will be followed by the final door prize drawings and presentation of awards by the Astronomical League. With that, ALCon 2015 will draw to a close.

This event is getting national publicity and it is sure to have local publicity as well, so we need to make sure that we do a great job representing Las Cruces and the ASLC. While the convention committee has done a great job in planning the convention and pre-event preparation, we need your help.

During the event, we will need volunteers to work in different parts of the convention. We will need ASLC members to sit at the registration table, the concierge table, monitor the vendor's room and many other jobs that will need to get done to make this a success. Members of the ASLC voted to invite the Astronomical League to come to Las Cruces, now we need to make them welcome.

We are expecting at least 150 people to attend this event. As the host Society, they are our guests. We need you to help us take care of our guests. We hope you will register and attend the convention by going to <http://alcon2015.astroleague.org>. You can register for the entire event, or for just one day.

But if you do not want to attend the whole event, we hope you will volunteer to help out at least one day. If you can find the time, you can contact our Volunteer Chair, Judy Kile at jkile3916@gmail.com. Those who volunteer and work at least four hours will receive entry to the papers sessions at no charge. This is an opportunity to enjoy learning about astronomy and observing without having to travel outside of Las Cruces. Please join us!

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NOTE: The ASLC Meeting will be held one week early due to the schedule of DACC. We will meet on March 20, starting at 7:00 pm, at DACC Main Campus, Room 141 (Technical Services Building)

Back at the Telescope

by Berton Stevens

At our February meeting, Alan Dyer mentioned the fantastic progress that has occurred in recording images, especially at low light levels. Back in the latter half of the last century, images were taken on photographic film. Just like today, there were color, and black and white films. Both types relied on the sensitivity of silver halide crystals to light. Each crystal held in the emulsion would undergo a slight chemical change depending on how much light it received. After exposure, the film would be developed in chemicals that converted the silver halide crystals that had received light into silver metal. The remaining silver halide crystals would be dissolved away by a "fixer" chemical, leaving the film no longer sensitive to light.

Since each crystal would only convert to silver metal during development if it received enough light, the number of crystals that convert to silver is higher in areas that receive a great deal of light and only a few in the areas that received only a little light. The end result is that the film has a negative image of the original, since the silver blocks the light coming through it. To produce a final image, the negative is projected onto an emulsion-coated paper. After processing, the result is a negative negative or positive image, a nice print of whatever was originally photographed.



These three images show the differences in the resulting images taken on fine, medium, and coarse grain films. You can see that the finer the grain, the more detail is visible in the image. However, the finer grain films are less sensitive to light and require a longer exposure to get a good grey-scale in the image.

The size of the silver halide crystal controls the sensitivity of the film. The larger the crystal, the more light it will intercept, allowing it to reach the amount of light needed to become capable of being developed. Unfortunately, it also reduces the resolution of the film. The larger crystals mean that the final image is slightly blurrier. Fine-grained films like Panatomic-X were very slow, with an exposure index (E.I.) of 32, while grainy films like Tri-X were much faster with an E.I. of 400.

For astrophotography, there was another issue. While silver halide crystals absorb light, if it does not come fast enough, the film does not react to it in a linear manner. In a short exposure, the number of crystals that convert to silver is linearly related to the amount of light received. In a longer exposure, it takes more total exposure (intensity multiplied by time) to activate the crystal so it will develop into silver. This is called reciprocity failure and requires even longer exposures than would be expected. Effectively, the exposure index drops as the exposure time increases.

Color film was based on the same silver halide crystals, so was subject to the same problems. The first development step in color film processing was essentially the same as with black and white film. Later steps introduce the color dyes that result in a color image.



Color film is about 0.00065 inches thick with nine layers. The top layer (a) is a hard gelatin layer to protect against scratches. The blue sensitive layer (b) records the blue image but is not sensitive to green or red. A yellow filter layer (c) removes any blue light that gets through the blue layer. The green image is recorded in the green sensitive layer (d). A gelatin layer (e) separates the green and red layers. The red sensitive layer (f) records the red colors in the image. The subbing layer (g) attaches the emulsion to the base. The plastic base (h) provides support for the emulsion and allows the film to move through the camera. An antihalation layer (i) keeps any light that has come this far from being reflected back into the film and creating halos.

Today's electronic imaging is much more sensitive than photographic film. While film has a quantum efficiency of just fifteen percent, CCD detectors can reach above the ninety-percent level. This allows the CCD to make much better use of the photons that it receives than film does. Each photon that hits a CCD cell generates an electron. At the end of the exposure, the electrons are transferred to an analog to digital converter that provides a binary number related to the charge that was in that CCD cell.

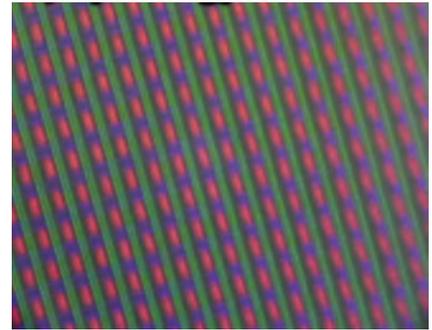
Just like in film, the larger the CCD cell, the more photons it intercepts and the higher the sensitivity of the CCD. But this also reduces the resolution of the CCD, since to make the CCD cells bigger, you have to put fewer of them on a chip of a fixed size. Unlike film, however, where the imaging area was fixed to 36 mm by 24 mm, you can make the CCD chip larger to accommodate the larger cell size while keeping the number of cells constant. This does mean that you will need a longer lens of a longer focal length telescope to get the same image, but the CCD will be more sensitive.

In color film, each spot on the film can represent any color. As an analog medium, there are no limits to the number of colors. CCDs, however, are really only black and white: a CCD cell does not have color sensitivity unless you put a filter in front of it. To generate a color image, there are two options. One is to have a filter wheel in front of the CCD and take four images with different filters: red, green, blue and a luminosity image without a filter. These are then combined into a single color image with almost any image processing program.

The other alternative requires a CCD chip that has a set of color filters built into the CCD. Adjacent cells usually have different color filters over them. To match the sensitivity of the human eye, the following pattern of filters over CCD cells is used:

R B R B R B R B
 G G G G G G G G
 R B R B R B R B
 G G G G G G G G
 R B R B R B R B
 G G G G G G G G

A microscopic view of a one-shot color CCD's surface. The colors are the filters used to allow only that particular color of light into the CCD cell. This particular pattern, called a Bayer mask, attempts to match the human eye's color response with twice as many green cells as red or blue cells.



You will notice there are twice as many green (G) cells as there are red (R) or blue (B) cells. This more closely matches the eye's sensitivity to the green portion of the spectrum. This pattern is called a Bayer mask or Bayer filter. With this system, only one exposure is required, so this is sometimes called one-shot color. Since the output of the CCD is a digital value, the number of colors is more limited than with film. This is more of a problem with CCDs that have 8-bit output (resulting in only 16.7 million colors) than ones that have 12-bit (68.7 billion colors) or 16-bit output (281 trillion colors). It should be noted that most display screens and printers can only handle the 16.7 million color level.

So how do these two methods of imaging compare? For astronomical imaging, we are almost always dealing with very faint objects. This means long exposure times to gather enough photons to create a good image. In more technical terms, you want to make the exposure long enough that you get a good signal-to-noise ratio. You can get images that are just long enough to show the object, but the associated noise, either electronic (CCD) or grain (film) is so high that the image is unacceptable. The only option is more exposure.

One way to get more exposure is to take multiple images of your target. These are frequently called subexposures or "subs". The subs are combined, increasing the total exposure time and thereby reducing the noise. This can be done with film, but it is a very tedious process to create the final image. CCD imaging allows the computer to do all the work of aligning and stacking the subs to create a final image. This is a great leap forward in producing astrophotos.

A more practical advance is that electronic imaging does not use physical media until the final picture is ready to be printed. In the pre-electronic era, printing images onto print paper always resulted in wasted paper and chemicals trying to get the image just right. With CCDs, you can make whatever adjustments you want to the on-screen image until you are satisfied with it and then post it on the Internet for all to see. Paper prints only get a wide distribution if they appear in a magazine or book.

So while film photography was a great improvement over hand-drawn sketches, CCD imaging is a great advance over film photography. Electronic imaging reduces waste, allows increases in signal-to-noise ratio by easily combining the best-looking subs and allows wide distribution of images. It brings astrophotography to almost anyone who is willing to spend a little time learning to take and process the images.

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Please consider offering a submission (article, image, blurb, etc.) to future issues of *High Desert Observer*. The aim is to have the best Society newsletter in the United States, and it can only be accomplished with contributions by our members. Thank you for your consideration.

If you have any comments or contributions to this monthly newsletter, please let me know. Every question will be answered.

Ron Kramer, Editor
 ronjkramer@aol.com

“Enchanted Skies Star Party”



Friday, April 17 at 4:00PM thru Saturday Night April 18, 2015
Magdalena, New Mexico

**Family friendly guided star viewing
in New Mexico’s darkest skies.**

Enjoy a host of daytime & nighttime activities. Green laser tours of the night sky!
Solar telescope “crawl” by day. Bring your binoculars/ telescope or use ours to discover what YOU
can find in the night sky!

Knowledgeable Astronomers from New Mexico Tech, The Very Large Array, Magdalena Ridge
Observatory, and Magdalena Astronomical Society will be on hand for fascinating programs.

This event is aimed @ beginners/ intermediate astronomy fans but Open to All!

Tickets are available on line at www.enchantedskies.org

or at the following locations:

Magdalena Visitors Center/Bear Mountain Gallery,
M/M Café, Socorro County Chamber of Commerce, The Very Large Array Gift Shop.

Tickets are \$10.00 per person/per day or \$15.00 for both days.

Children 17 and under are free.

Space is Limited so get your tickets in advance, dry camping and RV parking is available at the dark
sky site, hotel packages are available. Food at the dark sky site or dine in restaurants in Magdalena.

For the full list of activities, hotel packages, and tickets, go to
www.enchantedskies.org or call Judy Stanley @ 505-515-5780,
<esspm@gmail.com>

What to bring? Binoculars, telescopes, lawn chairs, flashlights, warm clothes, a sense of wonder
and a desire to explore the Universe!

*This event is hosted by the Magdalena Chamber of Commerce, in collaboration with
the Magdalena Astronomical Society and the New Mexico Tech Astronomy Club.*

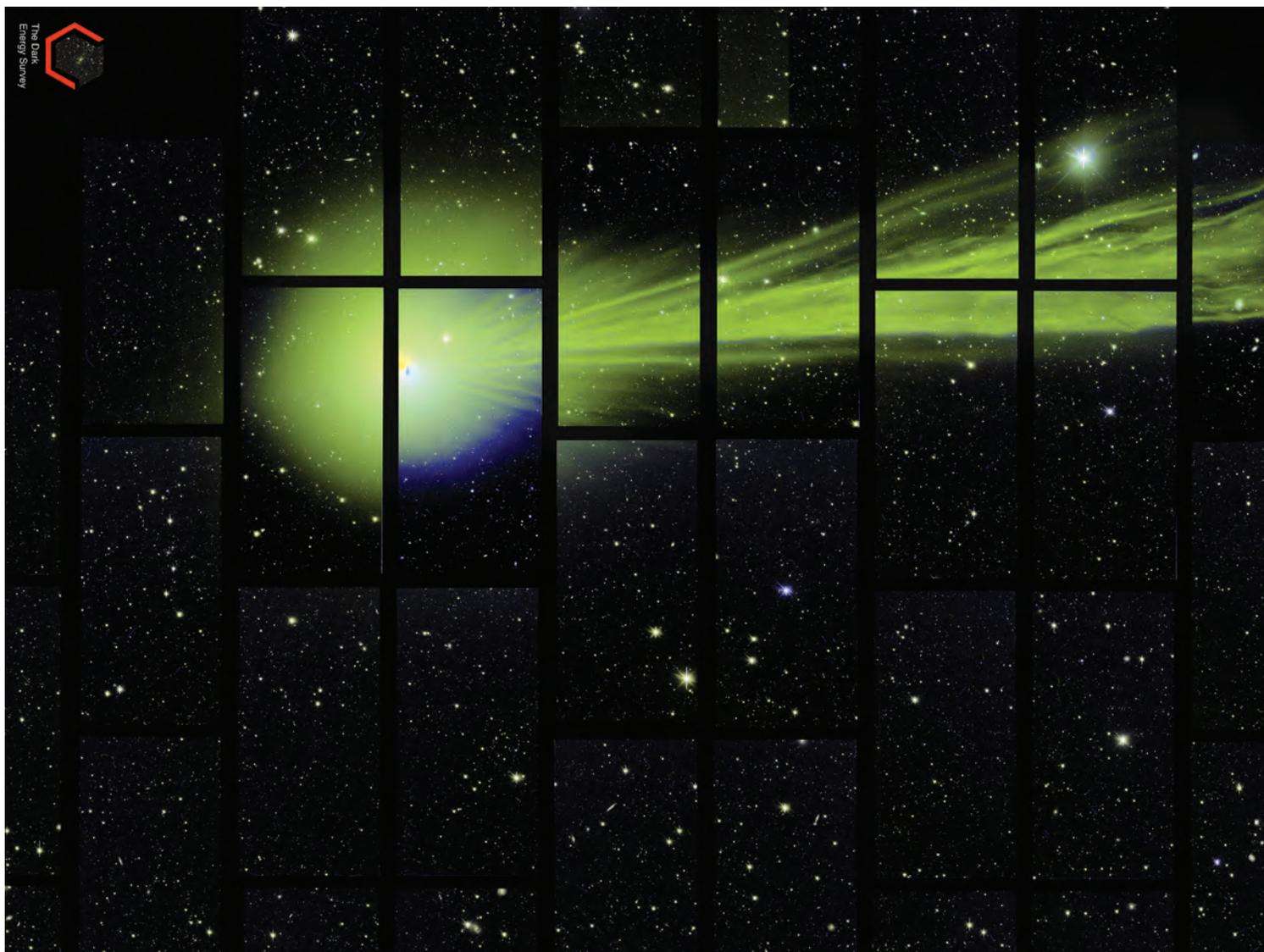
Sponsorship Grant from the New Mexico Department of Tourism

SAVE the DATE: “Enchanted Skies Star Party”

NEW MEXICO True

Adventure that Feeds the Soul. newmexico.org October 14 through 17th, 2015 in Magdalena, NM

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Photo of the Month

Despite being extremely high resolution, the cameras of the world's most advanced new mega-telescopes also tend to have extremely narrow fields of vision. The Dark Energy Survey, for example, has a main camera with a 2.2-degree field of view. And that's considered quite wide by the standards of devices that try to peer billions of miles through space. Despite the small cone of vision it projects out from the surface of the Earth, though, it turns out the Dark Energy Survey can accidentally capture some truly amazing candid images. The international team of researchers that directs the Dark Energy Survey was trying to look deep into the southern sky when they were delighted by one of the greatest photobombs in recent memory: comet C2014 Q2, called Comet Lovejoy, just happened to wander into view.

The image is actually patched together from several photos, as with all of the Dark Energy Survey's photos, which shows you how enormous the comet appeared when it blundered into the view of a camera trying to peer billions of miles into space. The image first came to public attention via the wonderful Dark Energy Detectives blog, from a mention as one of a team's favorite memories of their time directing the Survey telescopes: "[Lovejoy] reminds us that before we can look out beyond our Galaxy to the far reaches of the Universe, we need to watch out for celestial objects that are much closer to home!"

Despite the spectacular imagery, Lovejoy isn't a particularly unique comet. The comet is currently about 51 million miles from Earth, slowly orbiting the Sun on a wide path. Its actual head is only about three miles in diameter, but the visible head composed of the cloud of gas and dust thrown off by this constantly melting ice-ball is some

400,000 miles across. It was notably bright in the sky for a while there, but reached its closest point to the Sun just over a month ago, and will continue to decrease in brightness from now until long after everyone currently reading this post is dead.

The image shows Lovejoy as glowing green, which results from ultraviolet fluorescence of its component chemicals. So-called “diatomic carbon” (or C₂) is probably responsible for the distinctive green tint, which should help astronomers come to a better understanding of the composition of Lovejoy’s icy body. Other comets tend to dissociate into different gaseous products, and thus glow a different color.

The Dark Energy Survey is intended to look at the changing distribution of matter in the universe, which modern theory says is partially a result of the influence of dark energy. Among other things, the hope is to compare the predicted distribution of matter, which takes known physics into account, with the observed distribution of matter, which takes all of physics into account. What makes this effort difficult is that the overall difference between prediction and observation may be due to more than just dark energy alone. It may be impossible to extricate the impact of one unknown substance from the impact of another.

The comet Lovejoy is actually one of several with that name — comet C2011 W3 (Lovejoy) was also discovered by the same man, and has also provided some incredible astronomical imagery. That comet came many times closer to the Sun than Q2 (Lovejoy), just about a 20th of the distance between the Earth and the Sun. The resulting photos were some of the most spectacular comet snaps in recent memory.

* * *

Photo of the Month # 2



Dated 1947

From left to right, Brad Smith, Jed Durenberger, Clyde Tombaugh, Chick Capen, Walter Haas
The “Founding Fathers” of the Astronomical Society of Las Cruces (provided by Mary Alba)