

# Reflector

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Vol. 67, No. 1

December 2014



**Big and Bright at ALCon 2014**

**Distant Echo—Globular Clusters**

**ALCon 2015—Las Cruces, New Mexico**

**Outreach Idea: A Telescope Clinic**

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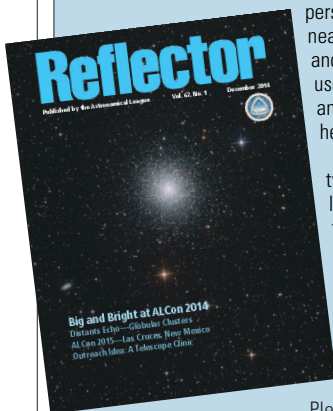
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This image was submitted by **Brian Ottum**, member of the **Astronomical Society of Las Cruces**. Seventy-five 300-second exposures were taken May 31 and June 1, 2014, using a modified Canon EOS 5D Mark III and a personal remotely controlled 10-inch f/5 Newtonian reflector on a Paramount MX near Animas, New Mexico. Calibrating (10 darks, 10 flats, 10 bias frames), aligning, and stacking were done with ImagesPlus software, and Adobe Photoshop CC was used for final processing. A homemade cooler box, made with mylar bubble wrap and a thermoelectric cooler, surrounded the camera and removed some of the desert heat. Everything was remotely controlled from Brian's Michigan basement.

With over six hours of total exposure, M13 nearly fills the space between the two 7th-magnitude stars in Hercules. Notice that the galaxy NGC 6207 in the lower left exhibits some structure. The tiny galaxy IC 4617, at magnitude 15.2, is to the left of M13. Galaxies fainter than magnitude 20 can be spotted in this deep exposure.

To our contributors: The copy and photo deadline for the March 2015 issue is January 15. Please send your stories and photos to our magazine editor, **Ron Kramer** ([editor@astroleague.org](mailto:editor@astroleague.org)), by then.

The Astronomical League invites your comments regarding the magazine. How can we improve it and make it a more valuable resource for you, our members? Please respond to the editor's email address above.



## Reflector

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# Reflector

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### Our Avocation is Like No Other

With our trained eyes, we appreciate like no one else the starry realm that lies over our heads and beneath the rocky globe at our feet. With our binoculars, telescopes, and cameras, we see planetary worlds that are nothing like our own. We see light that left distant suns long before Columbus sailed the ocean blue. We see spectacular star cities whose distances and sizes numb our minds. We see galaxies as they existed millions of



years before humans walked the Earth.

We are the ones who see these things; we are the ones who see this immense universe first hand without prejudice or fear. Our view, both visual and

mental, is not restricted to our small planet in this corner of the cosmos. What other group of people can truthfully say that?

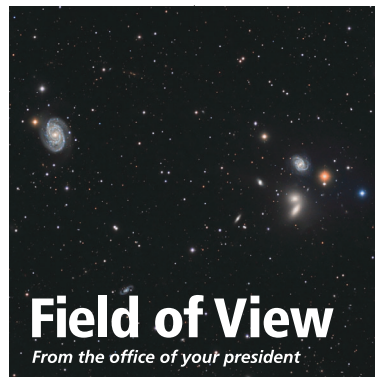
Indeed, our avocation is like no other.

The public recognizes this. It seems that folks are always interested in happenings in the night sky and always appreciate peeks through the eyepiece at some heavenly wonder. They understandably want to see these sights for themselves.

Leonardo da Vinci, viewing from the pre-telescope world of the sixteenth century, once noted, "There are three classes of people: those who see, those who see when they are shown, those who do not see." While we might not see as well as da Vinci, we surely can see far and we certainly can show others. (We can only hope that "those who do not see" are few.) Why not participate in an astronomy outreach program showing others what they can see?

Just consider who could be in line waiting for a look through your telescope.

It is not unusual to have a young boy and



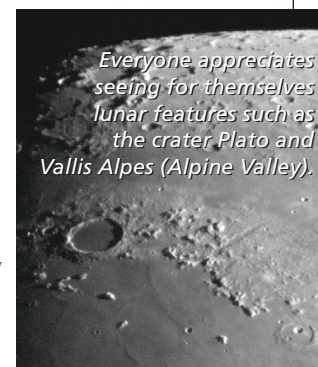
girl, with parents in tow, excitedly reciting astronomy facts while waiting to see Saturn; or a contrary teenager with iPhone in hand outwardly acting disinterested, but inwardly hoping for a magnificent view of the ringed world; or a recent immigrant family patiently standing in line

to see lunar craters; or people carrying motorcycle helmets and wearing leather jackets with dangling chains wanting a good look at mighty Jupiter; or a doctor who just wants to see Mars with his own eyes. Next comes the teacher, followed by the young couple on a date, followed by the octogenarian who has waited all her life for her first view through a quality telescope. Surely, it is a microcosm of humanity.

If you could hear their comments and thoughts as they walk away after seeing something amazing through your telescope,

what would they be? Very likely the young boy and girl would be pestering their parents to bring them back soon, the teenager would be speedily texting how cool Saturn was, the family would be thanking the amateur astronomers for showing them lunar detail they never expected to see, the motorcyclists would be slyly motioning thumbs up, and the doctor would be thinking how small we are in this fantastic universe. The teacher, the couple, and the great-grandmother would all be strolling away quietly, lost in deep thoughts about what they had just seen and what it all really means.

Because of your efforts, they have all seen further with their eyes, and, even



more importantly, with their minds. They all have been awestruck by this incredible universe. What they felt is unlike anything they have experienced in their daily lives. It is real. It is personal. It is due to you.

Our avocation is truly like no other!

*John Goss*



TITLE PHOTOGRAPH: BIG LICK GALAXY GROUP; LYNN HILBORN; WHISTLE STOP OBSERVATORY; GRAFTON, ONTARIO, CANADA

## Blinded by the Light: A Summit and Call to Action to Protect Our Night Skies

The Colorado Plateau and adjoining areas of the Southwest have pristine, clear, dark skies. On August 18–20, 2014, IDA, the Keystone Center, Lowell Observatory, and the City of Flagstaff,

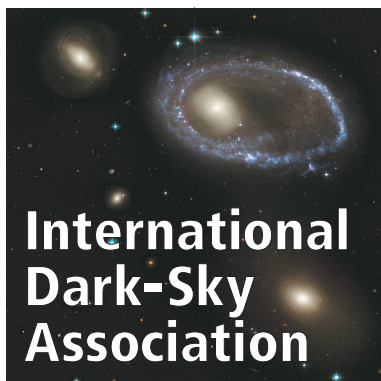
Arizona, put on a conference—"Blinded by the Light: A Summit and Call to Action to Protect Our Night Skies"—to find common solutions to the growing threat from poorly designed and placed outdoor lighting that is proliferating across the world. The IDA board and staff used this occasion for an IDA retreat and for an IDA board meeting.

IDA Board Member Jim Benya was one of the coordinators for a half-day pre-conference tutorial on the principles of outdoor nighttime lighting held at the Flagstaff City Hall. Board Member Chris Monrad, along with Jim Benya and IDA Acting Executive Director Scott Kardel, were speakers at the conference. IDA also had several poster displays and a booth at the conference.

More than 150 participants attended the conference, which had an agenda designed to maximize participation. There were representatives from multiple industries, cities, counties, the federal government, observatories, Indian nations, and amateur astronomers. The main portion of the conference was held at the very comfortable and modern High Country Conference Center in Flagstaff. A main goal of the conference was to involve municipal governments and businesses from across the nation in understanding the importance of dark nighttime skies and the importance of installing proper nighttime lighting.

Several talks addressed new lighting technology, light emitting diodes (LEDs), and the effects of nighttime lighting on astronomy, public safety, and human health. There was also a session that set up individual group discussions for the rest of the conference. This session featured a large panel consisting of representatives from the Bureau of Land Management, the National Park Service, astronomers, lighting engineers, city officials, and local activists. As the conference proceeded, action items were produced, and IDA will provide more details as these items are further formulated and acted upon.

Flagstaff is the world's first International Dark Sky City. It is also the home to Lowell



## International Dark-Sky Association

Observatory, the U.S. Naval Observatory's Flagstaff Station, and Northern Arizona University. Flagstaff is the take-off point for tourists going to visit the Grand Canyon, many nearby national monuments, and the Hopi and Navajo Nations. Preserving the dark sky of

Flagstaff is important for its citizens on multiple fronts. It is part of their natural heritage, and it is an important part of their economy ranging from tourism to professional astronomy.

I must say the outdoor lighting in Flagstaff is the best I have ever seen. The lighting levels seem appropriate for public safety and security. Almost all lights are shielded and directed downward. Advertising signs are relatively unobtrusive, with light-colored lettering on dark backgrounds. However, low-pressure sodium lighting is the predominant technology used for Flagstaff's street lighting system. While I found the monochromatic yellow lighting from low-pressure sodium to be quite good with little glare, it is a technology that is going away. The system is hard to maintain, and a decision must be made soon about its replacement, which will be LED lighting.

LEDs are more economical in the long run and can last up to 20 years. If an LED system is improperly designed, it can produce increased light pollution due to brighter lighting, and its color should not be in the bluish end of the spectrum. The challenge is finding the right system to preserve Flagstaff's present skies while saving money in the long run. If done right, cities can have both good lighting and dark skies. Evolving technology threatens us with more poorly designed lighting, but also offers us better control of this lighting. It will be easier to reduce or turn off the lights as the traffic wanes late at night on a busy artery. It is also possible to turn lights on when a pedestrian needs to cross the street, and to turn them off after the street crossing has been completed. In a low traffic situation it is possible to turn streetlights on in front of a moving vehicle and turn them off after the vehicle has passed. Modern technology is at our disposal to use for good or bad. Flagstaff is a superb model for what a community is able to accomplish through education and regulation.

**Tim Hunter**, Co-founder, IDA  
 Phone: 520-293-3198; Fax: 520-293-3192  
 Email: ida@darksky.org; www.darksky.org.

If you could have just *one* field resource, which should it be?

**"Best 'at the scope' guide in existence. Made all the better with the addition of the great Moon section."**

*Peter Kurtz, Cape Cod Astronomical Society*

**"This is the only reference I bring to the telescope."**

*Chris Ragaisis, on CloudyNights*

**"Great field manual! THE best book to use with a GOTO scope!"**

*Joe Lalumia*

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*Jim Barnett, review on CloudyNights*



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### To the Editor:

I sympathize with Mr. Brad Young ("To the Editor," September 2014 *Reflector*, page 6) and his concerns about the Astronomical League's Analemma Observing Club. I, too, spent a year designing, building, and using an instrument to collect data in pursuit of the



certificate and pin. I became the third person to successfully complete the requirements, but this award was not easily won.

I share his conclusion that the complexity far exceeded the requirements stated on the Analemma Club's web page. I exchanged many emails with Mr. Lowell Martin, Analemma Club coordinator, for clarifications. My initial derivation of the Earth's eccentricity by algebraic manipulation of a formula I found online, for example, was rejected by Mr. Martin, who informed me of the approach that he required. I am a retired computer scientist, so quadratic regression is not a new concept, but nowhere is the requirement to use that process stated or explained. I doubt that the typical Astronomical League member has even heard of quadratic regression, let alone possesses the spreadsheet and math skills to arrive at an acceptable solution.

I complained about this in a couple of emails to Dr. Aaron Clevenson, an Astronomical League national Observing Program coordinator. I sent him a copy of my completed submission and even offered to rewrite the Analemma Club's webpage in the hope that other members wouldn't spend a year collecting data every few days only to discover that the last activity was beyond their capabilities. (As an aside, I also objected to it being listed as a beginner-level program when I went through it. I am happy to see it's been changed to advanced!) I don't know how many League members have completed this program, but I would like someone to examine the number of awards issued compared to the length of time the program has been in existence and see how that stacks up to the other programs. Having very few completions over a long time should indicate a serious problem and I believe League leadership should take action if that turns out to be the case.

**Alex Vrenios, PhD, Patron Member**

### Looking Back in Asteroid Photometry

Dr. Frederick Pilcher, our minor planet coordinator, wrote a very interesting paper titled "Amateur—Professional Research

Collaboration: Asteroid CCD Photometry and Light Curve Analysis," located on page 16 of the March 2014 issue of the *Reflector*. It really struck me with memories of when I was involved in doing photometry of minor planets in my early days.

It was Dr. Pilcher who got me interested in doing photometry on asteroids and in other related fields. When I was a new member of the Association of Lunar and Planetary Observers (ALPO) in 1984, he was the first one I corresponded with. I was always interested in minor planets beforehand and then I decided to do photometry work with my new Optec SSP-3 photometer. Then in April 1985, I monitored the asteroid (4) Vesta and came up with some interesting light curves. Dr. Pilcher encouraged me to write a paper and get it published in the *Minor Planet Bulletin*.

I was excited about doing first-class astronomical work, but I had never written a paper before. Later that year, I was overwhelmed by seeing my paper on Vesta published in the *Minor Planet Bulletin* for the very first time!

I continued to do photometry on asteroids and got my observations published in the *Minor Planet Bulletin* throughout the next ten years. I corresponded with other scientists, like Dr. Richard Binzel, who was a student at the University of Texas at the time and now teaches at MIT. He edited my papers for the *Bulletin*. I also corresponded with Dr. Alan Harris, formerly of NASA's Jet Propulsion Laboratory and now at the Space Science Institute, for advice on asteroid photometry. In later years, I pursued other astronomical interests but I never really abandoned my work in minor planet photometry.

Then in 2012, I got around to do CCD photometry on an asteroid (433) Eros. Again with Dr. Pilcher's encouragement, I monitored Eros for four nights and got a paper published in the *Minor Planet Bulletin's* spring 2013 issue—my first time in 17 years! Of course, I will continue to do more in the future.

I'm glad I had a chance to meet Dr. Frederick Pilcher at the 2003 ALPO meeting in Boardman, Ohio. I didn't realize back then that he helped spark my interest in first-class work on our solar system and in related fields. I hope other amateurs had the same experience as I did with Dr. Pilcher's encouragement. I learned a lot

from him. He's a great man and he would certainly enrich the lives of many people who study the minor planets.

**Frank J. Melillo, Holtsville, New York**

### What We're Doing Right

Some astronomers among us have voiced concerns that our hobby is in decline and "graying." They've wondered what we haven't been doing right to promote outdoor astronomy. But this has been pondered on and off for years, at least as long as I've been looking up at the sky—so it's not "news." I believe we're on the right track, and the reasons for my optimism are as follows: A) Amateur astronomy has a certain "life cycle," beginning with young people in their formative years—perhaps by seeing popular "star party" targets, as my father once showed me and my siblings. B) Some time during high school, young people focus on becoming more like adults, and many important things take over their time and energy (like cars, dating, and career formation). They eventually have "full plates," and for about two decades, the everyday necessities crowd out most everything else. C) After age 40 or so, both time and money may become available—and with them comes the inclination to think about things they remembered from their youth. This was true for me, and I've seen it in many others.

Given the above, the best thing we can do now is to actively promote opportunities for young people to get a sample of the best things one can see through a telescope, through public star parties and school programs, as we have been doing. Of course, there may be other types of youth and family outreach activities that can be explored. The fruits of this effort should not be expected in the short term, but rather about 30 years from now when those we have inspired today will have lived through the busy "intermediate years" and will have the time and money to indulge in astronomy. Changes in the economy may have contributed to a short-term reduction in participation, if only for financial reasons. But our population will continue to grow and support a steady base of new hobbyists. Tighter wallets or purses may bring about a renewal of interest in amateur telescope making, and well as the maintenance and restoration of existing astronomy equipment. As Mark Twain might have put it, rumors that amateur astronomy is dead have been greatly exaggerated.

**John Symborski**

*A. L. Mid-East Regional Representative*

## Welcome to the new Reflections column

This feature allows our volunteer staff the opportunity to comment on what's new, and what some of our plans are for the future.

This issue marks an expansion from 24 to 32 pages. With it, we can bring our readers more of the news, articles, and images that so many of you have told us make this quarterly magazine a pleasure to read. We are hoping our readers will offer suggestions on how to make this publication even better in the years ahead.

Now that we have the extra pages, we will need to fill them up. Perhaps the creative writer in you will put into words what has been rattling around your brain for so long, and submit an article. Images are certainly welcome and we will have several pages of your wonderful pictures. Some of these images might even make it onto our front or back covers. Think of the bragging rights!

Here are a few guidelines for submissions:

### ARTICLES

- Text documents should be in Microsoft Word (.doc) or a similar format.
- Do not embed any images; please send images as separate .jpg or similar format files.
- Be sure to include your society affiliation(s) and photo credits, if any.



### IMAGES

- Data should accompany images, including equipment used, location where imaged, date(s) taken, processing, etc.
- Include the object's name (you'd be surprised at how many pictures we receive without any identifying information!).
- Images should be

between 2 and 15 megabytes in size and in .jpg or a similar format.

- Be sure to include your society affiliation(s).

Submission dates are as follows:

- March issue: no later than January 15
- June issue: no later than April 15
- September issue: no later than July 15
- December issue: no later than October 15

Oh, one more thing: we will soon be offering our readers the option of receiving a paper copy of the *Reflector*, a digital copy, or both. The digital copy will be a high-resolution PDF file, readable using Adobe Reader (which is available for free, and is on just about every computer out there), and will be about 50 megabytes in size (less than a two-minute download on a broadband Internet connection). We are hoping the majority of readers will opt for the digital copy, as the environmental impact of printing 16,000 copies each quarter is substantial.

Thanks for reading this. If you have any comments, suggestions, or complaints, please let me know at [editor@astroleague.org](mailto:editor@astroleague.org).

—Ron Kramer

## The Astronomical League is Working Closely with NASA to Bring You Special Observing Challenges and Awards

The first challenge in this series was the Mars and Comet Siding Spring close encounter. There is a certificate for those who submit an image to the NASA website ([solarsystem.nasa.gov/news/challenges.cfm](http://solarsystem.nasa.gov/news/challenges.cfm)) and also engage in an outreach event related to this event. The Mars-comet encounter was on October 19, 2014, and the deadline for submission is December 19, 2014. There are no exceptions to this deadline.

The second event in the series is Comet 67P Churyumov-Gerasimenko: the Rosetta mission encounter. There will be a certificate for those participating. The requirements should be the same as those for the Mars-Comet Siding Spring event. The date for the Comet 67P event is November 11, 2014, with a submission deadline of January 11, 2015.

Watch the Astronomical League home page, [www.astroleague.org](http://www.astroleague.org), for updates. For more information, contact Aaron Clevenson at [aaron@clevenson.org](mailto:aaron@clevenson.org).

## Observing Program Coordinators Needed

The Astronomical League is looking for a few good men and women to volunteer as observing program coordinators. We are specifically looking for coordinators for the Outreach Program and for the Herschel 400 Program. If you are interested and willing, please contact Aaron Clevenson, a national Astronomical League Observing Program coordinator, at [aaron@clevenson.org](mailto:aaron@clevenson.org) by the end of December 2014. There may be additional opportunities as well.

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The constellation Gemini depicts the twins Castor and Pollux from Greek and Roman mythology. Two stars with those names form a prominent pair 4.5 degrees apart on the outskirts of the winter Milky Way. Like their namesakes, the stars Castor and Pollux look like twins, but they are not identical. Pollux, the southern star of the pair, is slightly brighter and more yellow than the white star Castor. Both are bright enough to be seen in metropolitan areas even with significant light pollution.

Twenty degrees west-southwest of Castor, near the galactic equator, lies another set of fraternal twins in the constellation Gemini: M35 and NGC 2158. This pair of star

clusters can be viewed in a single telescopic field of view, although unlike the Dioscuri pair of stars, a dark observing site is recommended.

I took the accompanying image of M35 and NGC 2158 with a 4-inch f/6.3 apochromatic refractor using an SBIG ST-2000XCM CCD camera. The exposure was 30 minutes. North is up and west is to the right. The field of view is centered on M35, and NGC 2158 is in the lower right hand corner.

Philippe Loys de Chéseaux is usually given credit for discovering M35 in the year 1745. Charles Messier knew of its existence in 1750 but he did not add it to his catalog until 1764. Twenty years later, William Herschel discovered NGC 2158.

With an integrated magnitude near 5.0, M35 can be found 2.5 degrees northwest of the star Eta Geminorum. From an

# DEEP-SKY OBJECTS

## FRATERNAL TWINS IN GEMINI

By Dr. James R. Dire, Kauai Educational Association for Science & Astronomy



extremely dark observing site, M35 appears as a fuzzy glow to unaided eyes. Binoculars begin to bring out the true stellar nature of the cluster. However, the cluster is best appreciated with a 6- or 8-inch telescope. The apparent diameter of the cluster is 30 arcminutes, similar to the diameter of the Moon. The edge of the cluster is irregular and blends in with background and foreground stars.

M35 contains several bright yellow and orange giant stars. The brightest star in the cluster is the G0 star SAO 78038, shining at magnitude 7.4. SAO 78038 is a binary star with components of magnitudes 7.5 and 8.7 separated by 31 arcseconds. This pair is easily split using a 3-inch refractor. There is a blue-white star on the southeast edge of the cluster of similar brightness. It is not a true member of the

cluster, however, but a foreground star. The second brightest actual member of the cluster is an orange star on M35's north side shining at magnitude 8.5. The cluster contains many faint red and blue stars, too. Overall, M35 has 120 stars brighter than 13th magnitude and may contain 500 stars in all. The cluster is nearly 3000 light-years away.

Just under half a degree southwest of M35 lies the tiny

star cluster NGC 2158. Wide-field telescope-eyepiece combinations display both star clusters simultaneously, although in small telescopes the 4-arcminute, 8.6-magnitude cluster may appear only as faint nebulosity. At higher magnifications (greater than

100x) with an 8-inch telescope, many stars can be resolved. Most of the brighter stars are 13th magnitude red giants, but there is a magnitude 10.5 white star on the southeast edge of the cluster. The high concentration of stars in NGC 2158's center gives it the appearance of a small globular cluster, but it is not one.

NGC 2158 is considered an intermediate age galactic star cluster because

the the most massive star still on the main sequence is spectral class F0. Estimates place its age at two billion years. In comparison, M35 is thought to be merely 100 million years old and it contains main sequence stars in all spectral classes. NGC 2158 lies 16,000 light-years away, much farther than M35. Were it the same distance as M35, the cluster would be much more impressive than its line-of-sight fraternal twin. ☼

### Call for League Officer Nominations

The two-year term of the office of secretary and the three-year term of the office of treasurer end on August 31, 2015. If you are interested in using your talents to serve in one of these important positions, we would like to hear from you. Please volunteer!

For specific information regarding the duties and responsibilities of these two offices, please refer to the League's bylaws, which can be accessed on the League website at [www.astroleague.org](http://www.astroleague.org).

Candidates should send background statements explaining why they are interested and a photo of themselves for publication in the *Reflector* to Nominating Committee Chair Bill Bogardus at [vicepresident@astroleague.org](mailto:vicepresident@astroleague.org). Please limit all statements to approximately 250 words. All nomination materials must be submitted by March 15, 2015.



# WEBMASTER AWARD

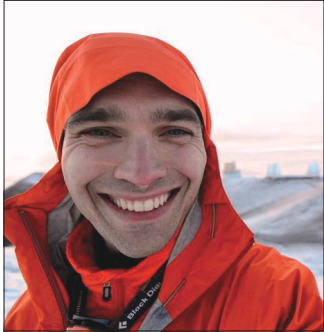
## 2014 Webmaster Award

Congratulations to Ward Vuillemot for winning of the 2014 Astronomical League Webmaster Award. He is with the Seattle

Astronomical Society, [www.seattleastro.org](http://www.seattleastro.org).

This clean, colorful, and complete website is easy to navigate. It has multiple

ways to reach different parts of the site. The calendar on the opening page is easy to read, and the website as a whole is smartphone friendly and uses social media exceptionally well. As one of the judges said, "The site has a community theme running through it that makes you feel like you're part of something." Well done, Ward!

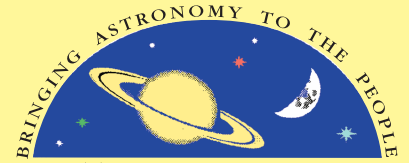


This award recognizes the effort given by an individual to produce a website that is essential to the vitality of an astronomy club. Some of the categories used in judging are simplicity of design, cleanliness, attractiveness, and ability to convey information.

The Astronomical League's Webmaster Award is presented each year to the webmaster with the best club website. A website is an important asset to any astronomy club. Most websites are designed, administered, and updated by the club's webmaster. The purpose of this award is to acknowledge the club webmaster who does an outstanding job of web site design and administration.

- The webmaster of any astronomy club that is a current member of the Astronomical League is eligible.
- The website will be judged on its content, its ease of navigation, and its ability to attract people.

Club presidents, please send webmaster nominations and the club's website address no later than April 1 to [WebmasterAward@astroleague.org](mailto:WebmasterAward@astroleague.org) or to Mike Rao, Astronomical League Webmaster Award Administrator, 2559 Rusk Street, Houston, Texas 77003. 🌟



## ASTRONOMY DAY

April 25 & Sept. 19, 2015

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**For additional information, contact:**  
Garry Beckstrom  
Assistant Astronomy Day Coordinator  
810-853-7827  
[garry@beckstromobservatory.com](mailto:garry@beckstromobservatory.com)

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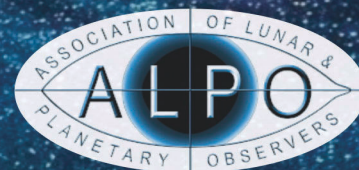
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# ALCON 2015

LAS CRUCES, NEW MEXICO  
AMERICA'S DARK-SKY PARADISE  
JULY 6 - 11

HOSTED BY: THE ASTRONOMICAL SOCIETY OF LAS CRUCES  
AND THE ASTRONOMICAL LEAGUE

ALSO PRESENTING: THE ALPO ANNUAL MEETING



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# ALCON 2015 REGISTRATION INFORMATION JULY 9, 10, 11

Printable form available at [astroleague.org](http://astroleague.org).

Mail completed form with your check made payable to ALCON 2015 to:  
 Astronomical League, ALCON 2015  
 9201 Ward Parkway, Suite 100  
 Kansas City, MO 64114

Please use one form for each attendee. One check is acceptable for your group. You may also register at [alcon2015.astroleague.org](http://alcon2015.astroleague.org) and make remittance with PayPal.

Name: \_\_\_\_\_

Name and Title for ID badge: \_\_\_\_\_

Email address: \_\_\_\_\_

Mailing address: \_\_\_\_\_

City: \_\_\_\_\_

State: \_\_\_\_\_

Telephone number: \_\_\_\_\_

Astronomical Affiliation (Club)? \_\_\_\_\_

Are you a member of ALPO? \_\_\_\_\_

## Registration Schedule

### Early Registration Fees (after June 25, add \$20)

For each item you wish to select, please enter the amount on the right.

Individual 2 or 3 day registration: (\$50) \_\_\_\_\_

Single day registration: (\$30) \_\_\_\_\_

Couples 2 or 3 day registration: (\$80) \_\_\_\_\_

Students: (\$20) \_\_\_\_\_

Children under 15 years of age accompanying adults who are registering: **FREE**

### ALCON Box lunches (includes lettuce, tomato, condiments, chips, fruit, dessert, water or Coke).

Price per day: \$16      Thu      Fri      Sat

Turkey & Cheese      \_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

Ham & Cheese      \_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

Roast Beef & Cheese      \_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

### Friday night Star-B-Que

(Price includes bus transport from the hotel to Leasburg Dam State Park, parking is very limited.) (\$40) \_\_\_\_\_

### Saturday Night Awards Banquet (select one)

\* Grilled Spring Vegetables & Fettuccine Alfredo (\$40) \_\_\_\_\_

\* Chicken Chimayo with a light jus, Roasted Potatoes & Vegetables (\$40) \_\_\_\_\_

\* Pork Loin with Chile on the side, Roasted Potatoes & Vegetables (\$40) \_\_\_\_\_

All selections include: Garden salad w/dressing, chocolate cake, rolls with butter and iced tea.

**Make your reservations by calling the Hotel Encanto at 1-866-383-0443. Make sure to ask for the "ALCON 2015 Convention" special rate, \$99/night. Must reserve by June 14 to receive the ALCON rate. Free parking and free internet access.**

**Transportation from the El Paso International Airport to the Hotel Encanto can be arranged through Las Cruces Shuttle and Taxi. Call 1-800-288-1784 to reserve transportation and be sure to identify yourself as an ALCON conference attendee to get discounted rates of \$40 one-way and \$60 roundtrip. Reservations must be at least 72 hours in advance. For more information go to [www.lascrucesshuttle.com](http://www.lascrucesshuttle.com).**

### ALCON Merchandise (Order Deadline June 25)

Silk-screened T-shirt, White \_\_\_\_\_; or Royal Blue \_\_\_\_\_

S \_\_\_ M \_\_\_ L \_\_\_ XL \_\_\_ XXL \_\_\_ XXXL \_\_\_ : \$20

Embroidered polo shirt, White \_\_\_\_\_; Royal Blue \_\_\_\_\_

Mens: S \_\_\_ M \_\_\_ L \_\_\_ XL \_\_\_ XXL \_\_\_ XXXL \_\_\_ : \$25

Womens: S \_\_\_ M \_\_\_ L \_\_\_ XL \_\_\_ XXL \_\_\_ XXXL \_\_\_ : \$25

Help the League help amateur astronomy by making a tax deductible donation \_\_\_\_\_

*The organizers reserve the right to make changes to the event as necessary due to circumstances beyond their control.*

### Summary:

Registration Type \_\_\_\_\_ +

Merchandise \_\_\_\_\_ +

ALCON Box Lunch \_\_\_\_\_ +

Friday's Star-B-Que \_\_\_\_\_ +

Saturday's Award Banquet \_\_\_\_\_ +

League donation \_\_\_\_\_ =

**Grand Total: \$ \_\_\_\_\_**

**G**lobular clusters are stunning. With hundreds of thousands to millions of stars, their appearance in the eyepiece has been described as glittering diamonds on black velvet. My very first view through a telescope was of **M13**, and is still fresh in my memory several decades later. Valued not just for their beauty, these star cities reveal much about the nature and history of their parent galaxies. Their ages reveal that most of the Milky Way's 158 known globulars were formed with the galaxy itself. They retain their spherical orbits, a relic of the protogalactic cloud's architecture prior to collapse into its present, flatter structure. Recent investigations show that younger clusters are often produced in waves or stages, and theories of capture and formation attempt to explain them. Merging and interacting galaxies show new, large clusters being formed, likely precursors of these young globulars. The **Antennae** (NGC 4038 and 4039) and **Centaurus A** (NGC 5128) are prime examples of this process. As the result of tidal interaction, they are likely forerunners of our own future four billion years hence, as Andromeda draws nigh.

**Whiting 1** is just five billion years old, its youth born through accretion and disruption of its parent dwarf galaxy by our Milky Way. Giant ellipticals at the cores of galaxy clusters are masters of such accretion and, as their deep gravitational wells inculcate hapless victims and impress upon them local topography, the relatively stable globulars are

The number of known globulars within the Milky Way hovered in the 140s until two imaging techniques in the last dozen years opened a window to finding new members. Deep imaging in search of dwarf satellites of the Milky Way and long-wavelength studies have revealed otherwise invisible globulars. For many years, **M4** and **NGC 6397** were considered

Despite its proximity, no hint of it appears on images taken at visible wavelengths, and its only light reaching us is in infrared or longer wavelengths. My searches for it at the eyepiece were unfruitful, and I find it ironic we can see other globular clusters at such great distances as described below, but the nearest of these magnificent objects is invisible.

# DISTANT ECHO

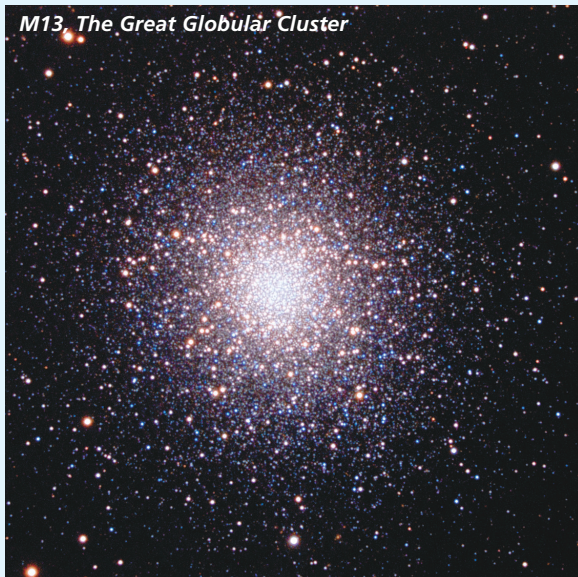
By Dave Tosteson

often all that remains of the smaller galaxies. **M87**, at the heart of the **Virgo Cluster**, and **NGC 3311** in **Abell 1060** possess 10 to 20 thousand globulars each, most accumulated through merging with smaller galaxies. Knowing they carry so much history within enhances the experience of viewing them in the eyepiece, so let's journey near to far and see what stories these globulars visible to us can tell.

the globular clusters closest to Earth, between 6,000 and 7,000 light-years distant. But in 2006, **Froeblich** studied the **Two-Micron All-Sky Survey** (2MASS) and found what is now thought to be the nearest globular to our Solar System, **FSR 1767**. Though only 4,900 light-years from Earth, it is situated just below the galactic plane in the direction of our galactic center, factors explaining its obscurity and ability to avoid detection.

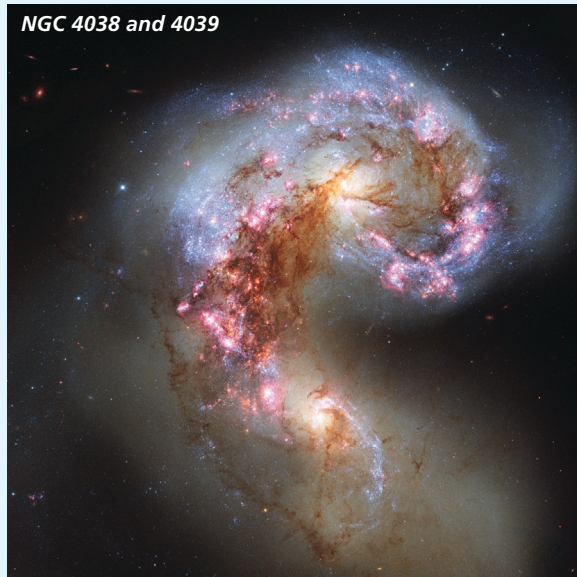
At the midpoint of **Messier's** catalog, the tightly packed, 7.6-magnitude cluster **M54** near **Zeta Sagittarii** does not appear traumatized through the eyepiece, but in the early 1990s, astronomers realized it was the captured core of an orbiting dwarf galaxy now enmeshed within the Milky Way. Four or five waves of star formation are stamped within the record of its HR diagram, possible relics of orbital passes into denser portions of the central Milky Way. The intermediate-size black hole (9,400 solar masses) found in 2009 at its center solidifies its nature as the remnant, dense core of the accreted galaxy known as the **Sagittarius Dwarf Elliptical**, and a dispersed cousin of **Whiting 1**.

A similar fate likely befell our galaxy's largest and most massive globular, **Omega**



**M13, The Great Globular Cluster**

WIKIPEDIA



**NGC 4038 and 4039**

VERY LARGE TELESCOPE (VLT), EUROPEAN SOUTHERN OBSERVATORY (ESO)



**Centaurus A, NGC 5128**

ESO/WFI (OPTICAL); MPI/ESO/APEX/Weiss et al. (submillim)

Centauri. At close to a full degree in size and 16,000 light-years away, the number of stars visible in large aperture instruments is overwhelming. Noticeably flattened, its two million stars overspill the widest eyepieces of my 25- and 32-inch scopes, a situation possibly ameliorated by development of a 40 mm Ethos-SX 110-degree product. Similar to **M54**, evidence has been found for a medium-size black hole in its core. Of our Local Group's 700 or so globulars, only **G1** (Mayall II) in **M31** is intrinsically brighter and more massive. These largest of traditional globulars, possibly intergalactic intruders, unveil galactic formation history and are visible to large distances for both amateurs and professionals, exemplified by **NGC 1023** and **M87** discussed below.

Moving into our galactic halo, we find the globular **Whiting 1** at a distance of 130,000 light-years. First noted in 2002 during a search for companion dwarf galaxies of the Milky Way, its stellar population suggests an age of 5 billion years. Subsequent studies hinted it was originally another member of the Sagittarius Dwarf, as its position and speed coincided with the stream of that galaxy's path. Its younger age compared to others from its galaxy of origin offer clues to cluster formation

dynamics. In 2006, I spotted its 15th-magnitude, 1.2-arcminute glow in my 32-inch reflector from the Okie-Tex Star Party.

During a trip to New Zealand in November 2012, I used my portable 66 mm refractor to look at our largest satellite galaxy, the **Large Magellanic Cloud**. It carries a dozen or so globulars, the brightest of which is 10th magnitude and visible in that instrument. The LMC is at a distance of about 160,000 light-years. William Herschel spotted the halo cluster **NGC 2419** on the last day of 1788. At 272,000 light-years, it is one of the most distant of our galaxy's globulars, and shows the Magellanic Clouds are passing within, if not orbiting, our galaxy's outer halo. I have twice observed it in my 25-inch in rather poor seeing. One of the intrinsically brightest of our galaxy's globulars, its brightest stars at magnitude 17.3 should begin to resolve in larger scopes.

John Herschel first observed **NGC 1049**, the brightest of six globulars in the nearby Fornax Dwarf Galaxy, from the Cape of Good Hope in South Africa in the mid 1830s. At magnitude 12.1, it has a much higher surface brightness than the galaxy itself, which was discovered a century later, in 1938, by Harlow Shapley. This galactic neighbor within the Local Group is thought to be

630,000 light-years distant. One of its globulars, **Fornax 4**, is much younger than its cousins, and is thought to be a possible captured dwarf galaxy core from a dwarf-dwarf merger, and a clue to why a few of our Milky Way's globulars show signs of youth.

Discovered by E. E. Barnard in 1881 using a 6-inch refractor, the barred irregular Local Group galaxy **NGC 6822** is 1.6 million light-years from us. Much detail is visible in amateur scopes, including dozens of H-II regions. Several globulars can be observed, including **Hubble VII**, a magnitude-16.28 speck, 11 billion years old. Similar to other dwarfs, it has another globular, **Hubble VI**, younger by several billion years, indicating waves of cluster formation have likely taken place in these galaxies. Both are visible in my 32-inch reflector.

The **Andromeda Galaxy** is 2.2 million light-years away and contains about 500 globulars, three times as many as our galaxy. The brightest, **G1**, is 14th magnitude and visible in 8-inch scopes. The faintest in Hodge's paper from thirty years ago was **G132**, a 19th-magnitude mote just visible in my 25-inch scope from the dark West Texas skies in the mid-1990s. In between these extremes I have observed over 160 of our sister

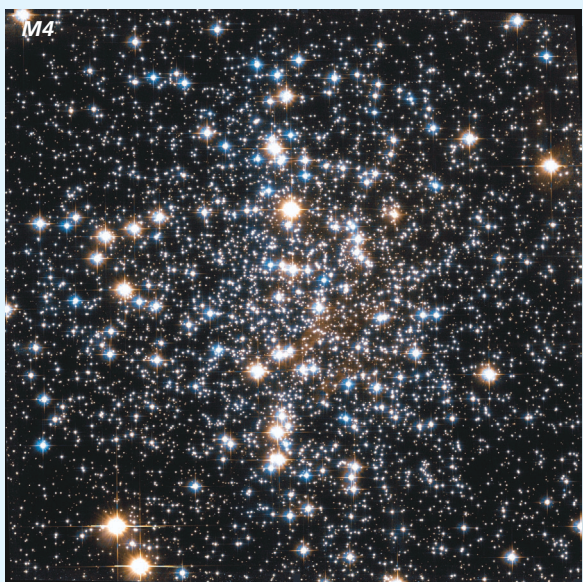
galaxy's globulars, more than the known population of our own galaxy, and most of its retinue should be visible in large-aperture instruments given time and excellent observing conditions. Recent data about **M31** suggest stellar populations and outlying globular clusters can be found out to 500,000 light-years from its center. Dark matter halos surrounding galaxies such as our own and Andromeda likely host many objects and structures about which we are only beginning to learn.

The beautiful 9th-magnitude face-on spiral in **Camelopardalis**, **NGC 2403**, is a member of the **M81** group. At eight million light-years away, it is visible in binoculars, but a telescope will show many of its rich details, including **F46**, a 17.9-magnitude globular on the outskirts of the galaxy. This cluster was nonstellar, faint, and seen with averted vision in 2004 using my 25-inch reflector at 353x.

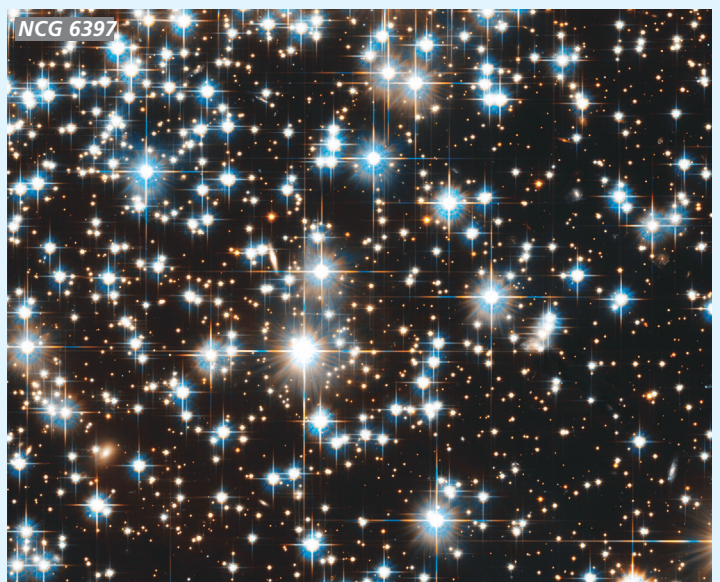
William Harris and his colleagues reported in 2002 on Hubble imaging of globulars in the nearby merging galaxy pair known as **Centaurus A**, or **NGC 5128**. This nearest of active galaxies is at a distance of 12 million light-years, and its globulars had been difficult to spot and study for several reasons. Its proximity to us



eter); NASA/CXC/CfA/Kraft et al. (X-ray)



NASA/STScI/WikiSky

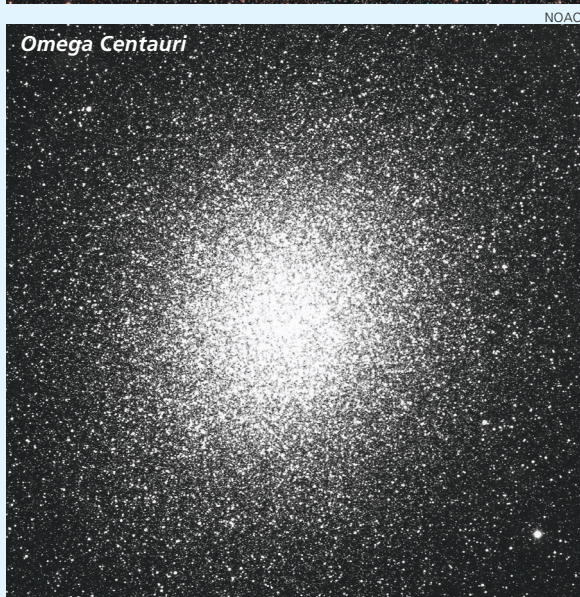


NASA/ESA and the Hubble Heritage Team (AURA/STScI)

spreads its clusters over a large area, and they are camouflaged by both a dense starfield and many background galaxies. At the 2004 Texas Star Party I was able to separate and identify **vh81-106**, a magnitude 18.5 object within this crowded starfield, using Megastar augmented with the U.S. Naval Observatory's A2.0 database of stars to 21st magnitude and the image from Sandage's *Hubble Atlas of Galaxies*.

In 2006, Spitler and colleagues used the Hubble Space Telescope to image the area around the **Sombrero Galaxy, M104**, in search of globulars. In their list of 659 objects, the second-brightest is given a visual magnitude of 18.91. Its coordinates correlate with a bluish, oval-shaped object that appears suspiciously like an elliptical galaxy. In reference to the discussion for **Omega Centauri, G1** in M31, and the bright globular in **NGC 1023**, this larger and flatter object could represent a captured dwarf galaxy's core. On the highest-resolution image of **M104** I found, Vicent Peris's Astronomy Picture of the Day from March 8, 2008, there is an object 4 arcseconds south of the paper's designated position

that is possibly another globular. I was able to see the bluish, oval shaped object at the paper's position (see data below), but did not attempt or describe the



fainter object 4 arcseconds south of it. The brightest putative globular on Spitler's list, #001, is just 13.5 arcseconds northeast of the oval, bluish object #002.

These two are about the same brightness and are both visible in my 32-inch scope. This brightest object is listed as magnitude 18.79 (V), and appears round and white on the image. The distance to the Sombrero varies by a factor of two in the literature, from 29 to 65 million light-years, with the most reliable sources putting it closer.

The brightest and largest globulars of different galaxies have been studied in comparison, to discern what they may teach about origins, formation and environments for both the clusters and their parent bodies. Soren Larsen and his colleagues discovered a very bright globular in **NGC 1023** in 2001. Designated **n1023-13** in their *Astronomical Journal* paper, it resembled both **Omega Centauri** in our galaxy and **G1** in Andromeda. Much larger and more compact than the others found in **NGC 1023**, its high ellipticity of 0.37 was greater than the two above, and similar to the most highly flattened in the LMC. Speculation is that these are captured cores of dwarf spheroidal galaxies, stripped by tidal pressure through several orbits around

their new host. From my home in 2007 using my 32-inch reflector at 929x, I was able to see **n1023-13** several times, confirmed by another observer.

The distance to **NGC 1023** is 10 megaparsecs, or 33 million light-years.

In the cases of **NGC 4038/4039** and **M87**, respectively, we see how globular cluster formation theory and dwarf galaxy capture data show overlap present in what were thought to be standard sizes of cluster types. The complex environments of large galaxy clusters allow interaction and development of structures seen nowhere else. Eons of merging between dwarf and larger galaxies have given **M87** a mass of several trillion suns. Its halo, extending many hundreds of thousands of light-years, contains an accumulated inventory of 12,000 globular clusters, most captured from hapless, involuntary contributors that wandered too close to its immense gravity. Within this vast domain lay species only recently identified, including what are known as ultracompact dwarf (UCD) galaxies. First spotted in the Fornax cluster in 1999, they have been found in Virgo, Coma, and other large galaxy clusters. Containing ten to one hundred million stars and thought to be tidally stripped nuclei of dwarf elliptical galaxies, their formation processes seem to favor certain mass and size ranges. But there could be a continuum formed by the overlap of their extremes, with dwarf and giant elliptical galaxies at the top and the largest globular-type objects at the lower end, such as Region S described below within the Antennae.

In May 2011, I used my 32-inch f/4 reflector at the Texas Star Party to view two objects around **M87** representing these two classes. **Strom 547** is a UCD in the northeastern halo of the giant elliptical galaxy at the heart of the Virgo Cluster. At magnitude 18.34, it appeared stellar at 650x and had no structure or central brightening. Another object, **[CHA 90] 39**, found by the

**Hubble's ACS Virgo Cluster Survey VII**, was studied by Haseran. About one magnitude fainter at 19.46, this object could be one of the massive young globulars formed from tidal interaction and capture of a dwarf galaxy or, like **Omega Centauri** and **G1** in Andromeda, it could be the core of a captured galaxy. In the eyepiece it was stellar, faint and seen several times, with my friend Tim Parson able to confirm it.

The closest pair of interacting and merging spirals to us is the magnificent **Antennae**, or **NGC 4038** and **4039**. Traditional distance estimates of 40 million light-years have been recently reexamined, specifically by Schweizer and colleagues in a study involving the 2007 Type Ia supernova in its southern tail. Their revised distance is 71 million light-years, placing them beyond the Virgo Cluster. Whitmore, in a 1999 *Astronomical Journal* article, identified four types of clusters based on age, from newly formed, ionizing clusters containing hot O- and B-type giants, to the 10- to 11-billion-year-old original globulars still identifiable in the

collisional debris. Many of the bright star-forming regions contain up to dozens of clusters. The exception may be "Region S," the second brightest cluster in the merger. HST images show a dense core surrounded by resolved outlying stars to a distance of nearly 500 parsecs, twice the size of the largest globulars in the Local Group. At the 2002 Texas Star Party, I used my 25-inch reflector at 454x to spot this distant echo of tide and time. The adjacent knots "R" and "T" were also seen. The trebled augment of apparent magnitude in this giant new cluster, if it is a globular in formation, and if the above distance holds, shows we may be able to see these bright, nascent globulars to even moderately greater distances. Their massive, energetic young stars are ionizing the surrounding gas to burn as a young Pleiades, with thousands of times more stars.

What is the future for globular hunters? At the 45-megaparsec distance of **NGC 3311** in **AGC 1060**, there is only the faintest hint of resolution on the Digitized Sky

#### References:

Harris et al.: *AJ* 124, p. 1435, September 2002.  
Larsen: *AJ* 122, p. 1782, October 2001.  
Spitler et al.: *AJ* 132, p. 1593, October 2006.  
Whiting et al.: *ApJS* 141, p. 123, 2002.  
Whitmore et al.: *AJ* 118, p. 1151, October 1999.

#### Data:

Whiting 1: 02h 02m 57s, -03d 15m 10s.  
F46 (in **NGC 2403**): 07h 36m 28.3s, +65d 40m 34s.

vhh 81-106 (in **NGC 5128**): 13h 26m 06s, -42d 56m 45s.  
Strom 547 (UCD in Virgo Cluster): 12h 30m 58.40s, +12d 25m 44.8s.  
[CHA 90] 39 (in **M87**): 12h 30m 51.10s, +12d 26m 12.0s.  
Hubble VII (in **NGC 6822**): 19h 44m 55.7s, -14d 48m 57s.  
F46 (in **NGC 2403**): 07h 36m 28.7s, +65d 40m 34s.  
GC #002 (in **M104**): 12h 40m 39s, -11d 38m 32s.  
GC #001 (in **M104**): 12h 40m 10s, -11d 38m 20.7s.  
n1023-13 (in **NGC 1023**): 02h 40m 28s, +39d 04m 39s.

Survey plates for the thousands of globulars visible with the best Hubble imaging. This puts the brightest of these at beyond 21st magnitude, likely out of range of amateur visual recovery. Could merging, gas-rich spirals spawn visible new giant clusters at this distance? Until graced with strigiform access, these are our likely limits. Professionals have probed large galaxy clusters, such as **Abell 1656** in Coma, to catalog globulars at over 300 million light-years. VLT imaging of **Abell 2151** in Hercules has

hinted at large, bright "Antennae-like" clusters within the haloes of interacting spirals, awaiting curious eyes to unveil their secrets. New HST image processing has revealed myriad potential clusters around distant cD galaxies at the core of large galaxy clusters, such as **Abell 68** in central Pisces. At 2.1 billion light-years, researchers can study this group so distant the galaxies themselves barely register on the POSS 2 plates. ☼

Dave Tosteson  
djtost1@gmail.com

## Looking for a Winter Astronomy Observing Project? Think Radio!

Are you an amateur astronomer looking for a new observing challenge, or perhaps a student looking for a unique science fair project? Or maybe you're an educator looking for space science projects to engage your students, or ways to integrate engineering practices into your curriculum. The largest coalition of amateur astronomy organizations in the world, the Astronomical League, has teamed up with the **National Radio Astronomy Observatory (NRAO)** and **Associated Universities, Inc.**, to begin a new astronomy "badge" program. You may have gazed at the stars, enjoyed meteors streaking across the sky, or looked at the massive planet Jupiter through a telescope, but most people don't think about the invisible universe we miss by using our eyes alone. Unlike most League observing programs, the new **Radio Astronomy Observing Program** encourages explorers of all ages to gaze at the cosmos and "see" the invisible radio universe. Many objects in space (for example, the Sun, Jupiter, and gas

and dust in the Milky Way) emit radio waves. The **Radio Astronomy Observing Program** is designed to introduce and encourage observations in the radio part of the electromagnetic spectrum, as well as the construction of various types of radio telescopes and observing instruments. The program focuses on five major observing projects: space weather, the Sun, the planet Jupiter, meteors, and galactic radio sources. Each of the projects can be completed using instruments that individuals or small teams construct themselves, or existing radio telescopes at NRAO facilities or elsewhere.

Projects range from beginner to advanced levels, and are open to

amateur astronomers, educators, and learners of all ages. Participants earn a bronze certificate from the Astronomical League for completing a single observing project, a silver certificate and silver pin for completing two projects, and a gold certificate and pin for completing four observing projects. In addition to getting people to think about astronomy in a new "light," the Radio Astronomy Observing

Program can help bring together educators and amateur astronomers to address critical needs in science, technology, engineering, and mathematics (STEM) education. The U.S. Federal STEM Education 5-Year Strategic Plan calls for the nation to "increase and sustain youth and

public engagement in STEM by supporting a 50 percent increase in the number of U.S. youth who have an authentic STEM experience each year prior to completing high school." In addition, the Next Generation Science Standards call for integrating engineering practices in science learning from kindergarten through 12th grade. Amateur astronomers are known for the excellent education and public outreach work they do, and through the Astronomical League's 10,000+ members, and collaboration with NRAO, the new **Radio Astronomy Observing Program** will help address these national priorities.

Begin exploring the invisible radio universe today! Check out the new Radio Astronomy Observing Program online at [www.astronomicalleague.org/programs/radio-astronomy-observing-program](http://www.astronomicalleague.org/programs/radio-astronomy-observing-program).

—Tim Spuck  
AUI STEM Education  
Development Officer  
(tspuck@aui.edu)



While “the stars are big and bright, deep in the heart of Texas” might just be considered a metaphorical statement, it came true recently: the 2014 ALCon held in San Antonio saw a stellar lineup up of speakers meet with a rich cluster of amateur astronomers from across the country and from nearly forty astronomical societies. They gathered together to discuss, promote, and share the awe of our universe.

**Talks, Papers, and Presentations: a Sample**

ALCon’s official master of ceremonies, Robert Reeves, kicked off the conference by introducing the presenter of ALCon’s lead talk. Erika Rix of the Austin Astronomical Society encouraged everyone to try their hands, quite literally, at astronomical sketching. Erika emphasized that the key to creating accurate, beautiful drawings is perseverance. As she related her personal trials with a sketchbook, it became obvious that the big advantage to

THE STARS ARE BIG AND BRIGHT, DEEP IN THE HEART OF TEXAS  
**ALCon 2014**

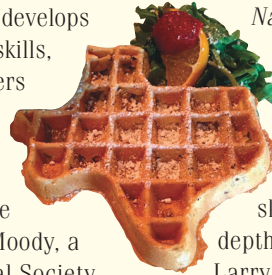
Hosted by the San Antonio Astronomical Association

sketching is that it develops general observing skills, allowing astronomers to see more.

The morning continued at a brisk pace with the host club’s Dave Moody, a Royal Astronomical Society Fellow, giving a captivating account of his recent visit to the RAS library. Society Fellows have the privilege of perusing original works by the giants of science, culminating with Newton’s *Philosophiae*

*Naturalis Principia Mathematica.*

Throughout the three-day conference, observers—both planetary and deep sky—were treated to in-depth presentations by Larry Mitchell, Mike Reynolds, Robert Reeves, Wayne Bailey, John Westfall, Julius Benton, and Richard Schmude, all discussing some facet of what amateurs like to do best: spend time at the eyepiece. Some of these and other papers



given during the ALCon were sponsored by the Association of Lunar and Planetary Observers.

Don Olson, a Texas State University professor and a *Sky & Telescope* contributor, presented a different aspect of studying the night sky. In “Celestial Sleuthing,” he described his adventures across Europe and elsewhere to decipher exactly when and where famous paintings and photographs that have an astronomical bent were created. He gave accounts of his sleuthing on works including Claude Monet’s “The Cliff at Sunset” and Ansel Adams’ photograph, “Autumn Moon, the High Sierra from Glacier Point, Yosemite National Park, California.”

Thursday evening’s Star-B-Q found attendees enjoying their favorite beverages as they chatted with old friends and made new ones. While they savored the Texas dinner favorite, beef brisket, Dr. Mike Endl of the University of Texas walked the audience through

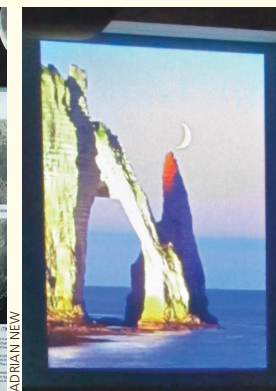
TEXAS TOAST (A WAFFLE), THE SIGNATURE BREAKFAST AT THE SAN ANTONIO HILTON AIRPORT, PHOTO COURTESY GENEVIEVE GOSS



Lisa Tobias proudly shows off the special ALCon 2014 polo shirt.



Master of ceremonies, Robert Reeves



Deciphering the when and where of Monet’s “Sunset”



Speaker and RAS Fellow Dave Moody



Dr. Mike Endl at the Star-B-Q



Astronomical sketcher Erika Rix



G.E. Austin receives the Horkheimer/O’Meara Journalism Award from John Goss



Lonnie Wege of Celestron presents Hagan Hensley the 2014 Horkheimer/Smith Award for his outstanding service to astronomy.



President Carroll Iorg “passes the gavel” to President-elect John Goss.



the latest research in discovering extrasolar planets.

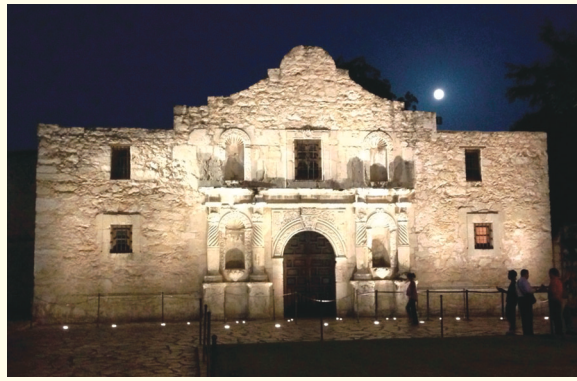
On Friday morning, a scheduling snafu was avoided when John Goss stepped up to discuss the Library Telescope Program. This is a program where clubs make easy modifications to very portable, simple-to-use telescopes with quality optics. The clubs then donate them to their local library systems where patrons can check them out just as they do books. It is a great way to interest young people in our hobby.

Two of the more popular tourist attractions in San Antonio are the downtown River Walk and the nearby Alamo, known to nearly everyone. A bus full of ALCon attendees visited these sites after Friday's talks for an evening of strolling, people-watching, and dining. From the expressions they wore when they returned to the bus—and on time, at that!—it was obvious that everyone had a good time.

Saturday morning was devoted mostly to the Astro-

nomical League business meeting where two presentations were given. The first one was about ALCon 2015 in Las Cruces, New Mexico, and the other outlined ALCon 2016 in Washington, D.C. We hope to see Astronomical League members from across the country at these two exciting locations!

Amateur astronomy's nemesis, the scourge of light pollution, was confronted in a talk by Bob Gent, former Astronomical League president and former International Dark-Sky Association board president. Light from LEDs—light-emitting diodes—in the form of electronic billboards is taking hold across the nation. Bob described the issue and encouraged everyone to speak to their local authorities about the concerns that this new form of outdoor lighting raises.



The Alamo was visited during Friday night's bus tour to River Walk.

WILLIAM BUCKLEY

The 2014 Horkheimer/Smith Award winner was Hagan Hensley of the San Antonio Sidewalk Astronomers. Hagan talked about his involvement in amateur astronomy and that it would not have been possible without encouragement from his family, especially his

parents, Rick and Shelly Hensley. G.E. Austin, winner of the Horkheimer/O'Meara Journalism Award, spoke for a few minutes and thanked the members of his club, the Rose City Astronomers, for their support and encouragement.

Everyone came away realizing that the continuation of our avocation depends on young people and that the encouragement they receive from adults—including all of us—is essential. It is up to us to mentor and encourage young people and to nominate them for Astronomical League youth awards.

### Annual Astronomical League Youth Awards

The Astronomical League's student award winners presented their projects and discussed their interests. Pranav Sivakumar of Tower Lakes, Illinois, first-place winner of the 2014 National Young Astronomer Award competition, gave a fascinating discussion of his research project, "Morphological Identification of Wide-Separation Gravitationally Lensed Quasars." The second-place winner, Katie Shen of Potomac Falls, Virginia, discussed a "Census of H-II Regions in SDSS."

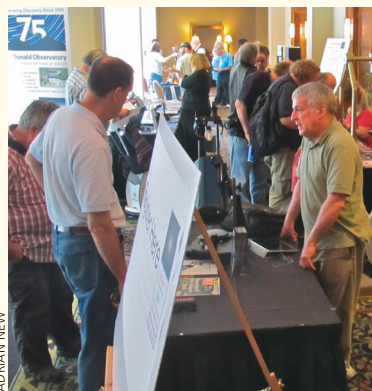


JOHN GOSS

...king "Is there another Earth out there?"



Keynote speaker Dr. Don Pettit, explorer and astronaut



Between listening to talks, folks enjoyed talking with vendors.



Bob and Claire Gadbois had a great boat ride at the River Walk.

JOHN GOSS



Katie Shen receives the National Young Astronomer Award, Second Place.



Denise Moser of League Sales discusses the AL observing manuals.



Mark Jurena, ALCon 2014 chair



Richard Schmude announces that Paul Maxson is receiving ALPO's 2014 Walter H. Haas Award.

ADRIAN NEW



John Goss presents Pranav the Horkheimer/O'Meara Journalism Award, Third Place, and later the National Young Astronomer Award, First Place.

Speaking of young people in amateur astronomy, one way to interest and involve them is by bringing our hobby to the public. Solar outreach dynamo, Stephen Ramsden, gave an energized presentation on how to connect with young people, especially those who wouldn't likely be exposed to amateur astronomy. Stephen is doing great work around the country, bringing his array of solar equipment to an interested public.

### The Gala Awards Banquet

The concluding event for ALCon 2014 was the ever-popular awards banquet. This year featured the Astronomical League leadership handoff from President Carroll Iorg to President-elect John Goss and Vice President-elect Bill Bogardus. John expressed his gratitude for

Carroll's guidance, resulting in a dynamic organization with many dedicated volunteers.

We were fortunate to have Dr. Don Pettit, explorer and astronaut, as the keynote speaker. Dr. Pettit presented an engaging talk, "Techno Stories from Space," in which he gave many illustrations of life aboard the International Space Station and discussed how living in space can be very different than living on Earth.

### Awards

★ **Walter H. Haas Award**—presented by Richard Schmude to Paul Maxson

★ **Astronomical League Recognition of Appreciation**—presented by Carroll Iorg to Betty Iorg

★ **Astronomical League Recognition Plaque**—presented by John Goss to Carroll Iorg

★ **Horkheimer/Smith Youth**

**Service Award**—presented by Lonnie Wege to Hagan Hensley

★ **Horkheimer/O'Meara Youth Journalism Award**—presented by John Goss to G.E. Austin

★ **National Young Astronomer Award**—presented by John Goss to Pranav Sivakumar

★ **G.R. Wright Service Award**—presented by Carroll Iorg to Aaron Clevenson

★ **Astronomical League Award**—presented by Carroll Iorg to Dr. David Hough

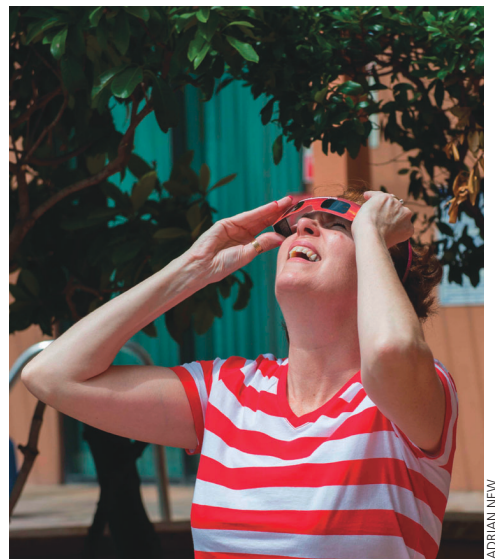
★ **Leslie C. Peltier Award**—presented by Carroll Iorg to James H. Fox

The Astronomical League would like to thank those who made ALCon 2014 possible: Robert Reeves, master of ceremonies; Mark Jurena, chair; Scott Logan, SAAA President; Dave Grosvold, webmaster; Adrian New, photographer; Mark Goll, audiovisual support; the many volunteers from the San Antonio Astronomical Association, too numerous to name individually; the many volunteers from the San Antonio League of Sidewalk Astronomers; the Association of Lunar and Planetary Observers; the many speakers, including Dr. Amanda Bayless, Aaron Clevenson, William Bucklew, Forrest Mims, Laurie Allai, Matthew Will, and Michael Young. The Astronomical League also wishes to thank Mike Reynolds' Meteorites, Rick's



Stephen Ramsden preparing his solar array

Astronomical Jewelry, Mike Simmons of Astronomers without Borders, Lonnie Wege of Celestron, Explore Scientific, Oceanside Photo and Telescope, Orion



Trying out the solar sunglasses

Telescopes and Binoculars, and *Sky & Telescope* for their help making ALCon 2014 a unique experience. ☀



Between talks: Nina Chevalier, Bryan Tobias, Hagan Hensley and Rick Hensley



President Carroll Iorg presents Betty Iorg a special award for enduring Carroll's many years serving the Astronomical League and amateur astronomy.



# Gallery



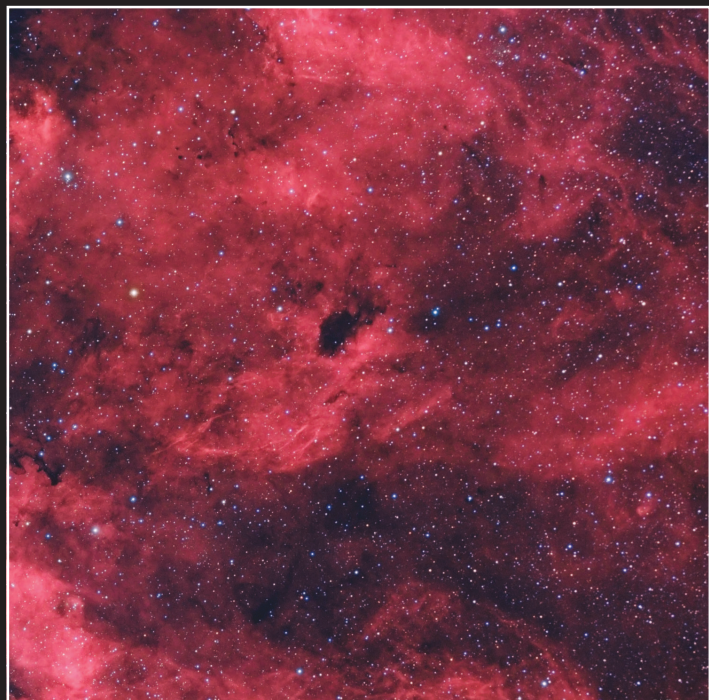
NGC 6979, “Pickering’s Triangle” in Cygnus, taken by Bill Worley, from the Cottage Observatory in Altoona, Pennsylvania, on September 16 and 18, 2014. Equipment included a TPO 10-inch f/8 Ritchey–Chrétien telescope, SBIG ST-8300M camera with Baader filters, all on a Celestron CGE Pro mount. 5 hours and 10 minutes total exposure time (H-alpha, 19 x 10 minutes; red, green, and blue, each 8 x 5 minutes)



M106, taken in March 2011 by Frank Colosimo, member of the Chesmont Astronomical Society, Delaware Valley Amateur Astronomers, and the Delaware Astronomical Society. It is a result of 16.5 hours of imaging. Using a Starizona Hyperion telescope and an SBIG STL-11000 camera with Baader filters, this picture results from 40 luminance frames at 10 minutes each, 35 red at 7 minutes, 27 green at 6 minutes, and 31 blue at 6 minutes. Frank was situated in New Ringgold, Pennsylvania, where he has two observatories, called the Blue Mountain Vista.



NGC 55 (Caldwell 72) is a large, Magellanic barred spiral galaxy (an irregular/dwarf galaxy with a single arm that resembles the Large Magellanic Cloud) located approximately 7.2 million light-years away in Sculptor. Along with NGC 300 it is part of the Sculptor group of galaxies. Imaged by Dan Crowson on October 22, 2014, next to the National Radio Astronomy Observatory’s Very Large Array (Socorro, New Mexico), and October 23, 2014, from the Cosmic Campground (Alma, New Mexico) with a SBIG ST-8300M on an Astro-Tech AT90EDT at f/6.7. Luminance: 12 x 600 seconds, binned 1 x 1; red, green, and blue: each 8 x 300 seconds, binned 2 x 2; 240 minutes total exposure.



Barnard 343—a wide-field view of this dark nebula in Cygnus, with IC 1311 toward upper right. Taken with a Takahashi FS-60C at f/6.2 on an EM200 Temma II mount with a SX Lodestar guide scope, using a QSI 540wsg camera at  $-10^{\circ}\text{C}$  with Astrodon H-alpha (3 mm) and Generation 2 Tru-Balance I-Series LRGB filters. The settings were 5 x 15 minutes H-alpha and 2 x 5 minutes each RGB (all binned 1 x 1). Processing was done with Astroart 5.0 and Adobe Photoshop CS4 (slightly cropped; 10 darks, flats, dark flats, and bias frames). Jeffrey Johnson took this on August 30 and 31, 2014, in Las Cruces, New Mexico. Jeffrey is a member of the Astronomical Society of Las Cruces.

**By Ted Forte,  
Huachuca Astronomy Club**

How many times have we heard it? People tell us about a telescope at home that languishes in the closet because they were unable to make good use of it. Some were gifts to children or spouses and some were just personal indulgences. Now they are all just dust collectors—hidden from view, deprived of starlight, forgotten.

The need is obvious, the solution simple. Why not try a telescope clinic at a club meeting? This is a very powerful way for an astronomy club to make an impact in their community, liberate some neglected telescopes, and make some new friends.

That's what the **Huachuca Astronomy Club of Southeastern Arizona** did recently. We invited people to bring in their telescopes for some individual help. The idea was suggested by the HAC president, David Roemer, when we found ourselves without a program for an upcoming meeting. Perhaps it was the perfect opportunity to reach out to those would-be observers who just need a little help to get started. It was also a chance to present the factors to consider when buying that first telescope, in plenty of time for the holiday season. Choosing the wrong telescope is often the death of a budding interest, so a little knowledge here can go a long way.

Once we decided on the format for the meeting, it turned out to be a pretty simple thing to put together. Every club has a wealth of expertise that is ready-made to share. So, all we had to do was get the invitation out to the telescope-challenged public and project a welcoming image.

We obtained quite a bit of publicity for the event. One of the advantages of a small town is that we have a good rapport with the local media and plenty of venues to advertise our

activities. Announcements were repeated often in the local papers and on the local radio station. In addition to a prominent place on our club website and notices in our newsletter and newsgroups, we had fliers in the library, the city visitor center, and the local mall. The *Sierra Vista Herald* even printed a special notice from our club president as a letter to the editor. Clubs that find themselves in more populous areas won't have to work as hard to fill the room, but no matter where you are, getting the word out will no doubt be the key to success.

When the big night arrived, we started the meeting with a short talk on telescopes—different types, how they work, and what factors are important when choosing a telescope. One of our members, an amateur telescope maker, showed and described a small telescope that he made from scratch on a shoestring budget: food for thought for the DIY crowd.

We had a few telescopes that members brought in for demonstration. They gathered small groups of guests around them as the members demonstrated the pros and cons of different types of mounts.

But the real work went on as members paired up with guests needing help with the telescopes that they brought. We had guests bring in everything from the "department store" 60 mm refractor to a 10-inch Newtonian on a serious German equatorial mount. Our program could not have worked better. There seemed to be at least one club member for every problem telescope and our members rose to the challenge with exceptional aplomb. We spotted mirrors, collimated scopes, tightened tripods, and walked people through star alignments. I think everyone left happy, confident, and more proficient. We even had six people join the club.

We offered a special door

# A TELESCOPE CLINIC:



# GREAT IDEA FOR OUTREACH



**1:** HAC member Bert Keller describes a Dobsonian reflector. **2:** HAC president David Roemer assists a family with their telescope. **3:** HAC member Nancy Hannaford demonstrates the Astroscan to Kevin Sopuch while HAC founding member Ray Perger (left) looks on. Kevin joined the club at the clinic. **4:** HAC president David Roemer helps the door prize winner adjust her new binos. **5:** HAC member and former AL president, Bob Gent, assists Glenn Gray with his Celestron Newtonian. Glenn joined the club at the clinic. **6:** HAC member Cindy Lund (right) discusses an SCT. **7:** HAC member Ken Duncan assists Susan Raymond with her small refractor. Susan joined the club at the clinic. **8:** HAC member Rob Shernick talks to a youngster about telescope making.

The Huachuca Astronomy Club of Southeastern Arizona (HAC) was formed in 1982 in Sierra Vista, Arizona. HAC promotes interest in astronomy and related sciences and crafts, through education, fellowship among interested individuals, and through monthly meetings, member and public star parties, and other events. Membership is open to anyone interested in astronomy. HAC celebrated its 25th anniversary in 2007.



prize, too. One of our members donated a homemade binocular chair complete with 15 x 70 binoculars. With just a little sprucing up by another member, it became quite a nice prize. It was won by a family with pre-teen kids, so it worked out just great.

It is important to put your best foot forward and take every opportunity to project a friendly, welcoming image. We had free soft drinks and cookies (next to a donation jar), lots of hand-outs, and we did all the usual meet-and-greet activities that are so important. We gave away star maps, club brochures, club newsletters, articles on how to choose a telescope, and fact sheets that contained links to websites and book and software recommendations. We also distributed some of the Astronomical League's downloadable outreach handouts (see [www.astroleague.org/outreach](http://www.astroleague.org/outreach)).

It's not something that we would do very often; maybe once every two or three years. It was well worth the small effort, as it fostered a lot of good will and attracted some new members. Your mileage may vary, of course, but with just a little planning and a few dedicated members, it can be a great success.

When we first started advertising the event, someone directed a comment to our website contact link. He said that he had attended a meeting once and asked a member about a problem he was having with his new telescope. He evidently got a condescending and unhelpful response. Sometimes members forget that we were all beginners once. Happily, he decided to give us another try and attended the clinic. Toward the end of this meeting he came up to me to say how impressed he was with the event, how helpful everyone was, and how much he had learned. He said he'll be using that telescope now. That's a pretty good verdict. ☀

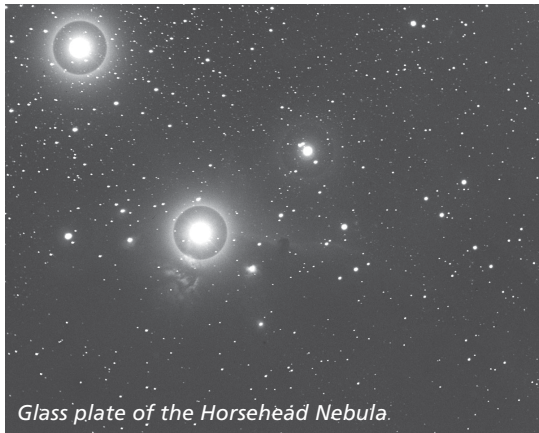
Before iPhones, tablets, and laptops, there were human computers, some of whom worked at the Harvard College Observatory. Women like Henrietta Swan Leavitt, Williamina Fleming, and Annie Jump Cannon made some of the most important discoveries in astronomy in the early 20th century. Their work was even featured in the television series *Cosmos*, hosted by Neil deGrasse Tyson.

A year ago, Carroll Iorg, then president of The Astronomical League, put out a call for members of the League to help preserve astronomical history and promote discovery by transcribing telescope logbooks from the Harvard College Observatory. These logbooks record some of these women's most famous discoveries: in the case of Henrietta Leavitt, the Leavitt Law, more commonly known as the period-luminosity relationship for Cepheid variables, and Annie Cannon's work on creating the stellar classification system. More than thirty people responded to this request and supported the initial initiative to transcribe these logbooks. Transcribing these logbooks not only helps preserve frail

Typical logbook page from Harvard College Observatory

# Volunteers Needed to Preserve Astronomical History and Promote Discovery

By David Sliski



Glass plate of the Horsehead Nebula.

documents that are slowly crumbling away, it also makes the data searchable by scientists today. This is important to support the goal of the Digital Access to a Sky Century at Harvard (DASCH) project: to scan the half-million glass plates corresponding to every observation in each logbook. The logbook information is necessary to digitize the plates, for without this information, we do not know the date and time of each exposure.

The other photograph shows an example of a logbook that still needs to be transcribed.

"Digitizing the [roughly] 500,000 glass plate images covering the full sky will foster new scientific discoveries for the currently 'hot' field of

studying variability of astronomical objects, or time domain astronomy, as we bring to light these long-hidden archives," says Harvard Professor Josh Grindlay, the leader of the DASCH project. To find out more about the DASCH project please visit [dasch.rc.fas.harvard.edu/project.php](http://dasch.rc.fas.harvard.edu/project.php).

We still have more than ninety logbooks containing about 9,000 pages of text left to transcribe. We are hoping more volunteers can assist with this project in our new web-based interface as part of a collaboration between the Harvard-Smithsonian Center for Astrophysics and the Smithsonian Transcription Center. We are currently transcribing these documents since optical character recognition (OCR) doesn't work well on these hand-written entries. Harvard is partnering with the Smithsonian Transcription Center to recruit digital volunteers. This effort is part of a larger Smithsonian-wide initiative that launched in August 2014. By transcribing historic documents and collection records, the resources of the Smithsonian and its partners are being brought to a new global audience via the web.

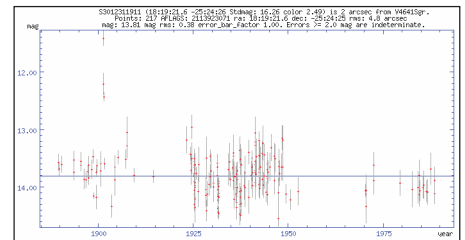
The plot or light curve, above, shows real data from scanned glass plate negatives which reveal a roughly 3-magnitude outburst occurred in 1901 from a black hole system that was discovered during a similar outburst in 1999 (Grindlay and others, in preparation).

"By simply typing in selected parts of the logbook entries for each plate, the public can

partner with us as we make new discoveries while preserving the past," explains former Harvard Curatorial Assistant David Sliski, who led the effort to make this transcription project possible.

Given the level of participation in these transcription efforts so far, the Smithsonian/NASA Astrophysics Data System, in collaboration with the John G. Wolbach Library at the Harvard-Smithsonian Center for Astrophysics, will be using the transcription platform to publish rarely seen historical documents to make this content more accessible by scientists and amateurs alike. Stay tuned to see some of these early works come online in early 2015.


For more than 100 years, amateurs have been supporting professionals in an attempt to acquire more data to increase our understanding of the



Plot of light curve

cosmos. We hope that projects like this will allow volunteers to continue to support professionals by offering exciting projects that enable science to be done and discoveries to be made. In fact, many of the initial discoveries or follow-up observations of comets, asteroids, and even planets were done using the telescope logbooks you will be transcribing. With your help, we may be able to rediscover these potentially lost discoveries while also making significant contributions to the field of time domain astrophysics.

We hope you will join us in this very exciting project, which will preserve the past while allowing us to discover new phenomena in the future.

To support this project please visit, [transcription.si.edu/browse?filter=owner:11](http://transcription.si.edu/browse?filter=owner:11) 

## Solar Viewing: Safety is First

By Phil Whitebloom

Like many amateur and professional astronomers, I find it exciting to share viewing experiences with others. Adults and children of all ages are amazed at what they see when they look up in the sky through telescopes and binoculars. Our closest star, the Sun, is particularly interesting to observe. Its close proximity to Earth allows us to view changes in its features in almost real time. Watching prominences grow, change shape, and even drift away from the Sun is very cool. I have seen plages get brighter and brighter as flares are happening, and have even seen a resulting filament get created. These were observed using a hydrogen-alpha telescope. When using a telescope with a "white light" filter, sunspots and their features can be seen in great detail. Over a period of time you can watch them change in shape and size and move across the face of the Sun. No matter what type of filter you use, the Sun is so dynamic when active that you never get tired of observing it.

What's most important in any kind of solar observing is to be safe. Here are some guidelines that will ensure a safe solar viewing experience.

### Safety Guidelines

- Only use filters that are approved for solar observing.
- When using materials like aluminized mylar or black polymer glasses, always make sure there are no tears or pin holes visible. If these flaws are visible, immediately dispose of the filter material. Do not use it.
- Make sure your telescope or binoculars are not directly facing the Sun while you are attaching your solar filters. The intense energy from the Sun can damage your optics and potentially burn somebody as the light focuses to a point as it passes through the optics.
- Depending on the type of telescope and filter being used, you may want to use an additional neutral-density or "black" filter at the eyepiece end of the telescope to reduce the Sun's brightness and make your viewing more comfortable.
- Ensure your solar filters are securely in place before beginning your viewing. It is good to periodically check them to make sure they have not come loose or been damaged.
- When allowing first-time visitors to look through your optical solar device, it is good practice to take a moment to tell or remind them that it has special filters that will protect their eyes from damage. Using a telescope or binoculars without the protection of these special filters could cause permanent damage to their eyes and even cause blindness.
- Welding glass is sometimes used as a safe solar filter to view the Sun. However, not all welding glass is safe. Number 14 welding glass is the recommended shade to use.

- If you ever have a question regarding the safety of a solar filter, stop and ask someone who knows. This can be your local astronomy club, your favorite local astronomy store, or an experienced individual.

### Use common sense!

As an additional note, I have seen unfiltered telescopes that had been used during the night left out during the daytime without a lens cover. As the Sun passed across the sky and aligned with the front end of the telescope, the sun burned a hole—a perfect circle—through the

eyepiece cover. Always put the lens cover over the front of a telescope or binoculars if they will be left outside during the daytime.

By following the above guidelines and always remembering that it is *never* acceptable to view the Sun without proper solar filters, you can safely enjoy the spectacular views that only the Sun, our closest star, can offer. ☀

*Phil Whitebloom is an amateur solar astronomer and imager. He is a member of the Howard County Astronomy League (HAL) in Howard County, Maryland.*

## Advanced Binocular Programs Debuts

The new **Advanced Binocular Double Star Program** is the result of enthusiastic member response to the **Binocular Double Star Program** launched in 2011. It has one of the highest participation rates of programs introduced over the past 15 years.

Members repeatedly tell me how much they've enjoyed observing double stars with binoculars and sometimes express surprise at the experience. Setting aside their telescopes and picking up binoculars to sweep the night sky's wide fields for these gems provides the change of pace so many observers say they welcome.

Conceived as a beginner's program, the Binocular Double Star observing list allows observers to select pairs suitable to their binoculars. And just about every size instrument has been used to qualify for the award.

It became clear that experienced observers with medium to large binoculars were generally able to split even the most difficult targets on the list—many logged all 120

objects. The Advanced Program picks up where the original leaves off. It's designed for members who've completed the original program and are ready to "roll up their sleeves" and tackle an exciting new list of 100 colorful double and multiple stars featuring tighter separations and greater differences in magnitudes.

If you enjoyed the original program, I think you'll find the Advanced Binocular Double Star Program a fulfilling next step in binocular observing. If you

haven't checked out the original program yet and you love binocular viewing, I recommend you give it a try. Information about these programs and others may be found on the Astronomical League website at [www.astroleague.org/observing.html](http://www.astroleague.org/observing.html).

My thanks go to the Astronomical League Council for making this program possible. As always, I welcome members' questions or comments. Clear skies!

—Bob Kerr



### Astronomers Without Borders OneSky Telescope

Ideal for beginners  
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## NASA–Astronomical League Observing Certificate Program

NASA has a vested interest in supporting the amateur astronomy community! This group of technology-savvy astronomy enthusiasts has a well-developed, local and nationwide reach, and so can be a very effective tool in engaging the public in the many wonders of astronomy and space science. In addition, NASA can benefit from citizen science and professional–amateur collaborations for, among other things, long temporal baseline observing.

NASA is collaborating with the Astronomical League's Observing Program office to host a series of observing challenges. These challenges will have both an observing component and an outreach component and will focus on a current celestial event, like an eclipse or transit, or a NASA mission event, like New Horizon's arrival at Pluto. Once an astronomer completes the

challenge, uploads observations, and performs outreach, he or she can apply for an observing certificate signed by representatives of both NASA and the Astronomical League.

Currently there are two active observing challenges open: Comet Siding Spring at Mars and the landing of

Rosetta/Philae on Comet 67P/Churyumov–Gerasimenko. Future challenges already being planned are the July 2015 New Horizons encounter with the Pluto system and the August 21, 2017, total solar eclipse across the continental United States.

For more information on these challenges, go to [solarsystem.nasa.gov/news/challenges.cfm](http://solarsystem.nasa.gov/news/challenges.cfm).

—Lou Mayo

*Astronomer and Program  
Manager at NASA's Goddard  
Space Flight Center*

## How We Got H II Regions

Sometimes practical considerations affect our words forever. Take the H II regions of the universe.

During the 1950s and 60s, breakthrough astronomy research was published in the *Astrophysical Journal* by the University of Chicago Press.

Subrahmanyan Chandrasekhar was the editor of *ApJ*. His name and the University Press name assured the astrophysical world that this was the authoritative word on astrophysics.

During this time, when I was the editor for astronomy books at the Press, a problem surfaced: how do you create a symbol for ionized hydrogen regions that cannot be confused with anything else, a symbol that all research papers can use no matter the language?

At this time, metal blocks

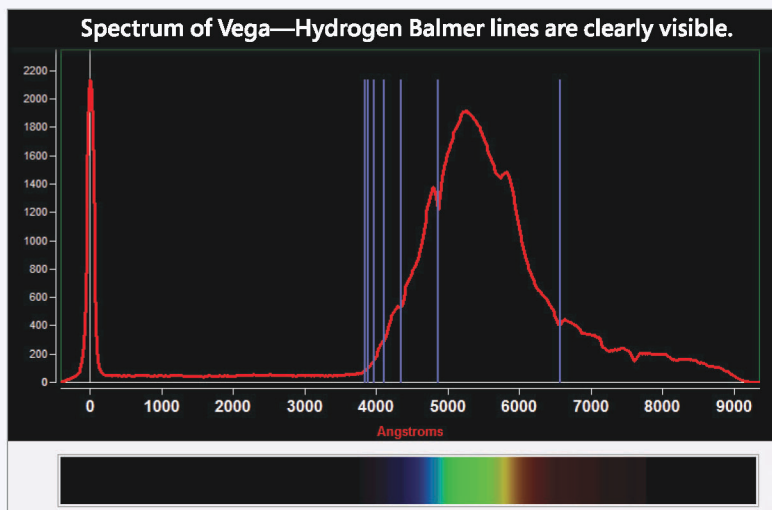
were the only printing method. Little blocks of metal with raised, inked letters, numbers, symbols, or Roman numerals were pressed against the paper to make their marks. Superscripts and subscripts were only available if attached to a symbol, and they seldom went above “3.” All research papers were printed in Times New Roman typeface (one of five at the time) because it was a typeface easily read by all nationalities.

In the beginning of the research on H II regions, each publisher used a different symbol for ionized hydrogen regions, and each was confusing. H2 looks too much like H<sup>2</sup>, which was a special character ordered from a foundry, and you needed as many special characters made as the author used in that article (expensive!). But H<sub>2</sub> looked like the beginning of H<sub>2</sub>O or the hydrogen molecule. H II was often “corrected” by some printer as H77 or as “Hill.” Worse, if you use H

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II, you know someone will begin discussing H I regions. H I regions? Where is the low region? Or “Hi” to you too!

Limited by what printing presses could do, Chandra searched for an answer with our printer, my boss, and me at a long meeting. Even Times New Roman only existed in two forms at the time: standard and small caps. Which symbol could not be confused with anything else? Chandra found the answer. If we used a capital H and used a Roman numeral II in small caps, it would be easy to label ionized hydrogen atom regions without confusion, and we had H's and Roman numerals in small caps in metal blocks already!

Now computers can print any symbol you can think of, but practical constraints still rule. A similar problem today is “How can I get this computer to print a superscript to a superscript and still have it legible?”

—Sue Wheatley

North Houston Astronomy Club



### Check out the latest educational game from NASA's Space Place—OFFSET!

Take matters into your own hands and help cut back on carbon emissions to slow the pace of global warming. Part “Pong,” part resource management, and 100 percent retro, this game is challenging, exciting, and educational. Players learn how the global carbon cycle works, about different sources of carbon, and about the ways alternative energy and reforestation can help offset those sources. And if a player wants to succeed, they will also learn the importance of having quick fingers and strong multitasking skills! You can download it from [tinyurl.com/p8rcrwn](http://tinyurl.com/p8rcrwn).

### Now Accepting Nominations for the 2015 Mabel Sterns Newsletter Editor Award

Now is the time for club presidents and vice presidents to nominate their favorite hard-working newsletter editors for the 2015 Mabel Sterns Newsletter Editor Award. Please refer to the Astronomical League website for complete details: [www.astroleague.org/all/awards/sterns/sternss.html](http://www.astroleague.org/all/awards/sterns/sternss.html).

### Attention Astronomical League Master Observers!

In recognition of your accomplishment, reaching the level of Master Observer, the Astronomical League would like to honor you at the next ALCon convention that you are able to attend. This recognition will occur at the awards banquet traditionally held on Saturday evening at the conclusion of the convention. It is our intention to celebrate the occasion with a proclamation of your title awarded by the Astronomical League along with a wall plaque for each Master Observer to commemorate the achievement.

All that is required is for you to contact the vice president at [vicepresident@astroleague.org](mailto:vicepresident@astroleague.org), to indicate your intention to attend ALCon at least 30 days before the opening of that year's convention.

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# 10, 25, and 50 Years of the Astronomical League's Newsletter

By Mike Stewart,  
Astronomical League Historian

## September 1964

**Editorial Mortality**  
This edition of the irregularly published 9.5 will be the last edited by this masthead observer [Norman C. Dalke of Seattle]. The next issue will be put together by the Rochester (New York) astronomical group, who were volunteered into action by the Instrument Section chairman of the League, George T. Keene. Getting acquainted by meeting notices may be a round about method of learning about different parts of the country, but you'd be surprised at the amount of information an editor gleans from this interstate who's who. It seems that no one society has a corner on the travail of providing year-round activities that will entuse all members, nor does one group have all the right answers. The story did not announce the passing of the editor, only the passing of the editorial baton. As Mr. Dalke pointed out, the leaders of



astronomical clubs today share a challenge with those of 50 years ago.

*Note: The Reflector's publication cycle changed throughout its lifetime. Volume XIV, no. 3 was published in September 1964. There was no*

*December edition. The next issue, Vol. XIV, no. 4, came out in April 1965, which explains the offset in dates for this "50 years ago" installment.*

## December 1989

**ALCON '89—**  
Spokane, Wa.  
The 43rd National Convention of the Astronomical League, hosted by the Spokane Astronomical Society, brought about 140 participants to its attractive setting at



the campus of Eastern Washington University in Cheney, a few miles from Spokane. Though the attendance was small, this was not unexpected considering the remote location in the Pacific Northwest. Nevertheless, all parts of the country were surprisingly well represented. Under the capable guidance of Gene Dietzen, Chairman, and Katie Hershfield, co-Chairwoman, the whole Convention unfolded from Thursday, July 20 through

Saturday, July 22 in a most professional manner, both as to the quality of its program and the smoothness by which it was conducted. Sessions included David Levy and John Dobson. Richard Shaffer of JPL gave the banquet address on the Ulysses Project. Dr. Donald Parker



received the Astronomical League Award; the G.R. Wright Award for League service went to Executive Secretary Merry Edenton-Wooten. Peter Collins was named the Leslie C. Peltier recipient.

## December 2004

**"David" finds "Goliath"**  
While it may be impossible to spot our solar system's smallest planet using a telescope only four inches in diameter, astronomers have used just such a device to find a Jupiter-sized gas giant orbiting a star located about 500 light-years from Earth, in the constellation Lyra. This world circles its star every 3.03 days at a distance of only 4,000,000 miles, much closer and faster than the planet Mercury in our solar system.

*Note: In the past ten years, Pluto has been reclassified, and hundreds of exoplanets have been discovered.*

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# 2015 Year In Space Wall Calendar

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## Two in the View

A new observing program is all about viewing two or more objects in the eyepiece at the same time. Sure, you've looked at M81 and M82, or M31, M32, and M110 at the same time. But have you looked at NGC 6207 at the same time as M13? This observing program continues with that theme.

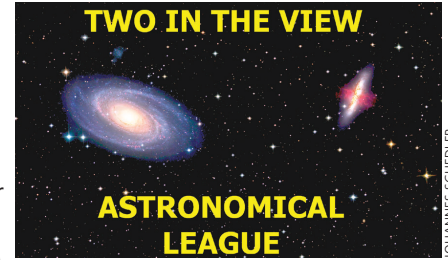
The list of targets was created to cover as many northern constellations as possible. Also, many possible combinations of object types were selected so that the list isn't just pairs of galaxies. Most of the targets are galaxy sets, as that combination is most prevalent in the sky. Many of the targets have more than two objects in the list. You only have to see two of them to count as an observation. Seeing more than two is just an added treat.

There are 109 sets of objects on the list, varying from nearly overlapping to separated by 1.09 degrees. There are five additional classes of objects that you can use to create your own "Two in the View." You are allowed up to fifteen observations of this type. These optional types are:

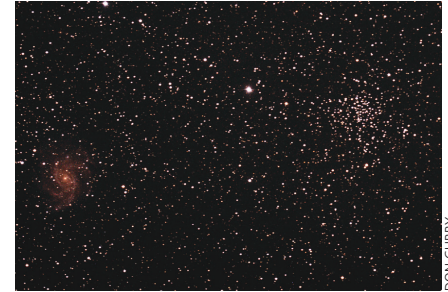
- Any planet and the Moon
- Any two planets
- Any planet and an NGC or IC object
- Any comet and an NGC or IC object
- Any two NGC or IC objects not on the program list of 109 object sets

To complete this program you need to locate and observe 100 sets of objects. Manual, go-to and photography are allowed. Go-to or photography will be noted on the certificate. All of the object sets will need to be logged with data requirements listed on the website. If you see more than two objects, please note that in your logs and sketches. All objects require a simple sketch including relative sizes, orientation, and separation, as well as all other visible objects. It is not meant to be an exercise in sketching, just enough to confirm what you saw. For those doing this program using astrophotography, the sketching is replaced by your images; logs are still required for balancing the problem of magnification vs. field of view. Fast telescopes and ultra-wide eyepieces make this easier. So get out those wide-field eyepieces and have fun!

**Bob Scott**, *Two in the View* coordinator



The new "Two in the View" pin  
NGC 6939 and NGC 6946



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**Editor's Note:** Congratulations to all these outstanding astronomical observers! All awards, except the Herschel 400, require current Astronomical League membership for eligibility. If you have questions about an award, please contact the corresponding Observing Program chair. Their contact information can be found on the Observing Program website at [www.astroleague.org/observing](http://www.astroleague.org/observing). If further assistance is required please contact either of the national Observing Program coordinators.

**Asterism Observing Program**

No. 15, Martin Dukeshire, Yakima Astronomical Society

**Binocular Double Star Observing Program**

No. 72, Kathy Machin, Astronomical Society of Kansas City; No. 73, Grant Mills, Member-at-Large; No. 74, Thomas Rocco Pennino, Amateur Observers' Society of New York and Astronomical Society of Long Island; No. 75, Jon L. Schuchardt, Delaware Valley Amateur Astronomers; No. 76, Stephen L. Snider, Albuquerque Astronomical Society; No. 77, Kevin C. Carr, Member-at-Large

**Binocular Messier Observing Program**

No. 1021, Laura Hintz-Keller, Indiana Astronomical Society; No. 1022, Mike McCabe, Astronomical Society of Southern New England; No. 1023, Steve Nagel, Northern Virginia Astronomy Club; No. 1024, Kevin Carr, Member-at-Large; No. 1025, Michael J. Hegedus, Charlottesville Astronomical Society; No. 1026, Rakkhal Kincaid, Haleakala Amateur Astronomers; No. 1027, William Wood, Little Colorado River Valley Astronomy Club; No. 1028, Louis Dorland, Omaha Astronomical Society; No. 1029, Susan Pollard, North Houston Astronomy Club; No. 1030, Pamela Fulton, Central Texas Astronomical Society; No. 1031, Bernard Venasse, Member-at-Large; No. 1032, Jim Kaminski, Member-at-Large; No. 1033, Jon Schwartz, Eugene Astronomical Society

**Bright Nebula Observing Program**

No. 5, David Douglas, Advanced, Member-at-Large

**Caldwell Observing Program**

No. 209, Nina Chevalier, Silver, San Antonio League of Sidewalk Astronomers; No. 210, Rick Olson, Silver, Rose City Astronomers; No. 211, Stephen L. Snider, Silver, Albuquerque Astronomical Society; No. 212, Kevin McKeown, Silver, Albuquerque Astronomical Society; No. 213, Paul Harrington, Silver, Member-at-Large

**Carbon Star Observing Program**

No. 53, Steve Tzikas, Northern Virginia Astronomy Club; No. 54, Dick Francini, Neville Public Museum Astronomical Society

**Comet Observing Program**

No. 75, John W. Whisenhunt, Silver, San Antonio League of Sidewalk Astronomers; No. 76, Johnny Barton, Silver, Central Texas Astronomical Society; No. 27, Richard Owens, Gold, Astronomical Society of Kansas City

**Constellation Hunter Observing Program**

No. 144, Glenn Wolford, Member-at-Large; No. 145, Marie Lott, Charlie Elliott Chapter of the Atlanta Astronomy Club; No. 146, Kari Krippen, Island County Astronomical Society

**Deep Sky Binocular Observing Program**

No. 354, Douglas Wiese, High Desert Astronomy Club; No. 355, Glenn Sanner, Huachuca Astronomy Club; No. 356, Nora Jean Chetnik, Member-at-Large; No. 357, Juan Velasquez, Denver Astronomical Society



**Flat Galaxy Observing Program**

No. 21, Honorary, Dick Francini, Neville Public Museum Astronomical Society; No. 22, Honorary, Bruce Scodova, Richland Astronomical Society

**Globular Cluster Observing Program**

No. 257, Jim Twellman, Astronomical Society of Eastern Missouri; No. 258, David Whalen, Charlie Elliott Chapter of the Atlanta Astronomy Club; No. 259, Stephen Jones, Houston Astronomical Society; No. 260, Ric Heins, Minnesota Astronomical Society; No. 261, Les Rudy, Member-at-



Large; No. 262, Rob Torrey, Houston Astronomical Society; No. 263, John Benham, Olympic Astronomical Society

**Hydrogen Alpha Solar Observing Program**

No. 10, Aaron Clevenson, North Houston Astronomy Club; No. 11, John W. Whisenhunt, San Antonio League of Sidewalk Astronomers; No. 12, Scott Azmus, Member-at-Large; No. 13, Grant Martin, Astronomical Society of Eastern Missouri; No. 14, Mark Bailey, Member-at-Large; No. 15, Rob Ratkowski, Haleakala Amateur Astronomers; No. 16, Theo Ranakers, Charlie Elliott Chapter of the Atlanta Astronomy Club

**Local Galaxy Group & Galactic**

**Neighborhood Observing Program**  
No. 29-DA, W. Maynard Pittendreigh, Member-at-Large; No. 30-DA, David M. Douglass, Member-at-Large; No. 31-DA, Stephen L. Snider, Albuquerque Astronomical Society; No. 32-DA, George R. Kepple, Huachuca Astronomy Club

**Lunar II Observing Program**

No. 59, Diomar De Jesus, Member-at-Large; No. 60, Ryan Behrends, Hill Country Astronomers

**Lunar Observing Program**

No. 886, Chad Thibodeaux, Baton Rouge Astronomical Society; No. 888, Jonathan L. Schuchardt, Delaware Valley Amateur Astronomers

**Messier Observing Program**

No. 2607, Gerard Jones, Honorary, Minnesota Astronomical Society; No. 2674, Tara Heine,

Honorary, Austin Astronomical Society; No. 2675, Thomas T. Watson, Honorary, Tucson Amateur Astronomy Association; No. 2676, Scott Azmus, Honorary, Member-at-Large; No. 2677, Brian Sisk, Regular, Northern Cross Science Foundation; No. 2678, Jim Kiminski, Honorary, Member-at-Large; No. 2679, Gregory J. Moore, Honorary, Member-at-Large; No. 2680, Lloyd Blake, Honorary, Boise Astronomical Society; No. 2681, Kevin C. Carr, Regular, Member-at-Large

**Meteor Observing Program**

No. 166, Thomas P. Mazingo, Honorary, 53 hours, Barnard Astronomical Society; No. 170, Kenneth Larry Jones, 6 hours, Barnard Astronomical Society; No. 171, Kevin McKeown, Honorary, 54 hours, Albuquerque Astronomical Society

**Open Cluster Observing Program**

No. 64, Terry Trees, Basic, Member-at-Large; No. 65, Jeff Haidet, Advanced, Toledo Astronomical Association; No. 66, John Sayers, Advanced, Member-at-Large; No. 67, John R. Benham, Advanced, Olympic Astronomical Society

**Outreach Observing Award**

No. 439-M, Dr. Stephen M. Schiff, Astronomical Society of the Palm Beaches; No. 440-S, Jim Ketchum, Astronomical Society of Kansas City; No. 457-M, Louis Dorland, Omaha Astronomical Society; No. 561-S, Bob Hoover, Huachuca Astronomy Club; No. 588-O, Andrew Edelen, Astronomical Association of Southern Illinois; No. 589-O, Robert Morefield, Astronomical Association of Southern Illinois; No. 590-O, Harry Treece, Astronomical Association of Southern Illinois; No. 591-S, Nicholas Wethington, Ames Area Amateur Astronomers; No. 592-M, David Falkner, Minnesota Astronomical Society; No. 593-S, Brian Reasor, Raleigh Astronomy Club; No. 594-M, Michael P. Keefe, Raleigh Astronomy Club; No. 595-O, Ken Boquist, Popular Astronomy Club Quad Cities; No. 596-O, Mitchell Milani, Popular Astronomy Club Quad Cities; No. 597-O, Dino Milani, Popular Astronomy Club Quad Cities; No. 598-O, Jim Pfhistner, West Kentucky Amateur Astronomers; No. 599-O, John Schaub, Popular Astronomy Club Quad Cities; No. 600-O, Theo Wellington, Barnard-Seyfert Astronomical Society; No. 601-O, Adrian Palmer, Omaha Astronomical Society; No. 602-O, Clifford Bullock, San Bernardino Valley Amateur Astronomers; No. 603-S, Valorie Whalen, Atlanta Astronomy Club; No. 604-O, Leigh Anne Lagoe, Back Bay Amateur Astronomers; No. 605-O, Christy Smith, Oklahoma City Astronomy Club; No. 606-O, Charles "Chuck" Rice, Oklahoma City Astronomy Club; No. 607-O, Clint Gately, Oklahoma City Astronomy Club; No. 608-O, Russell Wheeler, Oklahoma City Astronomy Club; No. 609-O, Anthony Lucero, Oklahoma City Astronomy Club

**Planetary Nebula Observing Program**

No. 5, Richard L. Tyson, Imaging, Amateur Observers' Society of New York

**Solar System Observing Program**

No. 83, Marilyn Sameh, Wabash Valley Astronomical Society; No. 84, Zach Stockbridge, Member-at-Large

**Southern Skies Binocular Observing Program**

No. 84, Willie K. Yee, Amateur Observers' Society of New York; No. 85, Howard Knytych, Rose City Astronomers; No. 86, Dee Friesen, Albuquerque Astronomical Society

**Sunspotters Observing Program**

No. 167, Tara Heine, Austin Astronomical Society; No. 168, Nora Jean Chetnik, Member-at-Large; No. 169, Mark Bailey, Member-at-Large

**Universe Sampler Observing Program**

No. 115, Robert Togni, Telescope, Central Arkansas Astronomical Society

**Urban Observing Program**

No. 158, Gregory Brown, Member-at-Large

## Digital vs. Paper

As astronomers, we all have an obligation to be "green," which means we do what we can to avoid the waste of our precious natural resources. We are all aware of the pollution of our air, water, dark skies, etc.

In keeping with our "green" policy, we are investigating the possibility of offering either print or digital copies of the *Reflector* to all of our members. As such, we would like any feedback, comments or questions regarding this issue.

Essentially, our members would have the choice of receiving the *Reflector* as a paper copy, which they presently do, having a PDF file available for download, or both. Digital subscribers would receive an email when the next issue is available, along with an access password for that issue. The file would be about 50 megabytes in size, and would take less than two minutes to download on a broadband Internet connection. The image and text quality will be much better than the existing PDF file on our website.

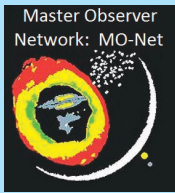
Please send any comments to [editor@astroleague.org](mailto:editor@astroleague.org), including whether you would prefer the digital or print version. We would like any comments before January 31.

### Master Observer Network: MO-Net

Did you know that the Astronomical League provides a way for you have your questions answered by astronomers who have done a good bit of observing? We do! It is the Master Observers Network. It is a list server that emails participating Master Observers, who will respond to your queries.

To submit a question, use the "Observe" tab on the Astronomical League website ([www.astroleague.org](http://www.astroleague.org)) and select "Ask a Question."

If you are a Master Observer and would like to be added to the list of recipients, please contact Aaron Clevenson at [aaron@clevenson.org](mailto:aaron@clevenson.org). We would love for you to join us.



### Member-at-Large Dues Increase

Due to increased processing costs, the annual membership dues for a domestic Member-at-Large increase to \$40 and for an international Member-at-Large increase to \$50 effective January 1, 2015. Be sure to pay your Member-at-Large dues today to lock in the previous rate!

### Star parties are for you!

If you've never been to a star party, check out the list on the next page and pick one that is close to you. Before you go, here is a sampling of what you can do there:

- Visit vendor booths to see first hand the equipment you want.
- Look for a new scope. See the full variety surrounding you.
- Discover something. Take in a talk given by those who enjoy the subject.
- Observe something new. You're surrounded by those who have been there already.
- Meet like-minded people with whom you can talk shop.
- Learn about other clubs and how they do things.

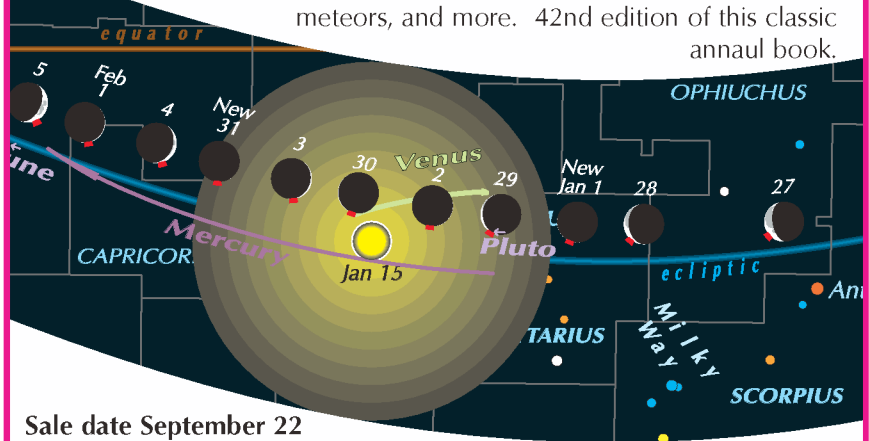
Are these reasons enough for you? Well, here's one more: Experience the great camaraderie you'll find among people who enjoy what the sky offers. Star parties are made for amateur astronomers. They are made for you.

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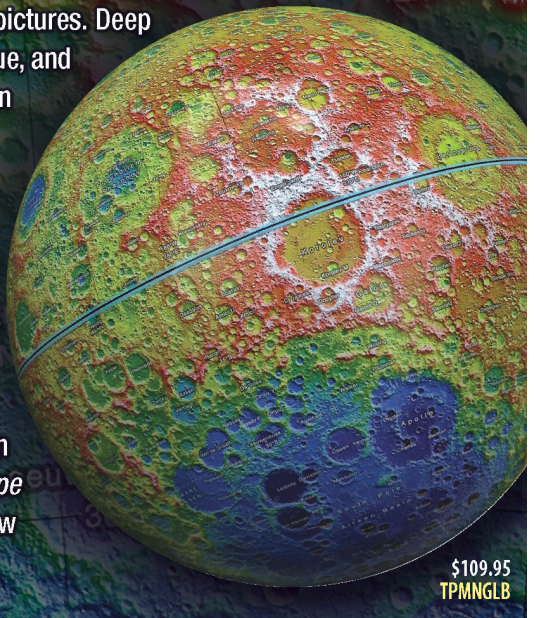
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# Coming Events

Compiled by John Wagoner. To have your star party or event listed, please send the details, including dates, sponsors and website, to: [astrowagon@verizon.net](mailto:astrowagon@verizon.net).

## January 24

### Regional Meeting of Amateur Astronomers 2015

Gardner–Webb University, Ritch Banquet Hall  
Boiling Springs, North Carolina  
[www.ccastro.org](http://www.ccastro.org)

## February 11–15

### Orange Blossom Special XXI

#### International Star Party

Withlacoochee River Park

Dade City, Florida

[www.stpeteastronomyclub.org/obs.php](http://www.stpeteastronomyclub.org/obs.php)

## February 16–22

### Winter Star Party

West Summerland Key, Florida

[www.scas.org/winter-star-party](http://www.scas.org/winter-star-party)

## February 27–28

### 12th Annual Dark Sky Festival

Harmony, Florida

[www.darkskyfestival.com](http://www.darkskyfestival.com)

## March 18–22

### Hodges Gardens Star Party

Hodges Gardens State Park

Florien, Louisiana

[www.brastro.org/hgsp.html](http://www.brastro.org/hgsp.html)

## April 15–18

### Mid-South Star Gaze and Astronomy Conference

French Camp, Mississippi

[www.rainwaterobservatory.org](http://www.rainwaterobservatory.org)

## April 17–24

### The 12th Annual OzSky Star Safari (a.k.a. Deepest South Texas Star Safari)

Coonabarabran, New South Wales, Australia

[www.ozsky.org](http://www.ozsky.org)

## April 18–19

### Northeast Astronomy Forum

Suffern, New York

[www.rocklandastronomy.com/neaf.html](http://www.rocklandastronomy.com/neaf.html)

## New at League Sales!

Get your solar eclipse glasses for the 2017 Total Eclipse visible across much of the USA — Solar safe viewing glasses suitable for direct viewing of the Sun and solar eclipses. The Astronomical League is offering these in anticipation of the 2017 Total Eclipse, and with League clubs in mind! The pricing structure will be designed to allow clubs to purchase these glasses at very low rates. Glasses should be available starting January 15, 2015. Check the League Sales web store at [www.astroleague.org/store](http://www.astroleague.org/store) for pricing, availability, and more info. Discounts will be available for various quantities, starting for as few as 10 and for as many as 1000. Stock up early for all your outreach and viewing events!

## ADVERTISING RATES

The following is a listing of the advertising rates for the *Reflector*. If you are interested in promoting your products, consider placing an ad with us. With a circulation of 16,000 astronomers, we offer a highly targeted market.

Rates for the inside front cover, inside back cover, and back cover are negotiable.

The rates below are for B&W ads; color ads are 10% additional.

Number of Issues	Full Page 7-1/2" H x 10" V	1/2 Page 7-1/2" H x 5" V	1/3 Page 5" H x 4-1/2" V or 2-3/8" H x 10" V	1/6 Page 2-3/8" H x 5" V or 4-1/2" H x 2-3/8" V	Mini-Ad 2-3/8" H x 2-3/8" V
1	\$1,000	\$500	\$400	\$200	\$150
2	\$900 each	\$450 each	\$350 each	\$175 each	\$125 each
4	\$800 each	\$400 each	\$300 each	\$150 each	\$100 each

H = Horizontal  
V = Vertical

Deadlines:

March issue: January 15

September issue: July 15

June issue: April 15

December issue: October 15

To submit advertisements or for further information, please contact: Mary Riley, *Reflector* Advertising Representative  
P.O. Box 221094, Chicago, IL 60622-1094  
[advertising@astroleague.org](mailto:advertising@astroleague.org)

Note: Ad pricing is subject to change without notice.

## The Astronomical League's Youth Awards 2015—Prepare Now!

Wouldn't it be great to be young again and to be entering amateur astronomy! Now is the time to start considering the Astronomical League's youth awards for 2015: the National Young Astronomer Award, the three Jack Horkheimer Youth Service Awards, and the Horkheimer/O'Meara Journalism Award.

If you know a young person who has been involved in an astronomy-related research project—either of his or her own doing or through an educational institution—please consider nominating that person for the National Young Astronomer Award. He or she must be between 14 and 19 years of age.

If you know a League member, 18 years old or younger, who has brought amateur astronomy to your club or to the public through outreach, presentations, writing, or observing, please consider nominating that person for one of the four Horkheimer Service Awards. One of these awards is more specialized than the others—the

Horkheimer/O'Meara Journalism Award. It requires a person who is 8 to 14 years of age to compose a 300- to 500-word essay on any science-related topic.

Since the deadline for the National Young Astronomer Award is January 31, 2015, and for the Horkheimer Awards is March 31, 2015, now is the time for potential candidates to work on their projects and to participate in various astronomy activities.

If you are a club officer, nominate them. **If you don't, no one else will!** Complete information about each award can be found at [www.astroleague.org/allawards/awards.html](http://www.astroleague.org/allawards/awards.html).

**For those of you who are not aware of it, the Astronomical League is now on Facebook. We continue to build followers week by week, and we are becoming better known as the word spreads. We are also on Twitter: @AstronomyLeague**

## Staunton River Star Party - Spring 2015

### March 19 -22, 2015

Staunton River State Park  
Scottsburg, VA (near South Boston)

For more information or to register  
[www.stauntonriver-starparty.org](http://www.stauntonriver-starparty.org)

Full party: \$35

Sponsored by: CHAOS

## Astronomical League Membership-at-Large Program

What does the League offer you as Members-at-Large?

- Full voting privileges at AL meetings. • A subscription to the *Reflector*.
- Book Service offering astronomy-related books at a 10 percent discount.
- Optional subscriptions at discounted rates to the following publications:  
*Astronomy* magazine \$34.00; 2 years \$60 • *Sky & Telescope* magazine \$32.95  
*RASC Observer's Handbook* \$27.00 • *StarDate* \$19.50  
(Foreign rates are higher; see website)

- Free Astronomical League Observing guide with membership.

To join the Astronomical League as a Member-at-Large, send a check for \$40.00, \$50.00 foreign, made payable to the Astronomical League, to:  
Astronomical League National Office, 9201 Ward Parkway, #100, Kansas City, MO 64114  
Phone: 816-333-7759; Email: [leagueoffice@astroleague.org](mailto:leagueoffice@astroleague.org)  
Or join online at: [WWW.ASTROLEAGUE.ORG](http://WWW.ASTROLEAGUE.ORG)



# League Sales are online!

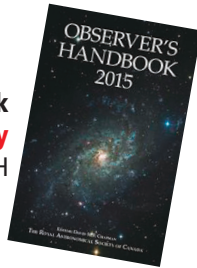
The League's online store is available at the website, [www.astroleague.org](http://www.astroleague.org). Click on the link on the left side of the home page. The online store includes the latest shopping cart technology and accepts credit cards. Shipping & handling (S&H) is calculated at checkout. Merchandise is also available by mail order, payable by check. Please select your items, add the applicable S&H fee, and mail your order to:

Astronomical League Sales  
9201 Ward Parkway, Suite 100  
Kansas City, MO 64114



If you have questions about the merchandise, or discounts on bulk orders, please call the League office, 816-DEEP-SKY, or email [leaguesales@astroleague.org](mailto:leaguesales@astroleague.org).

**RASC 2015 Observer's Handbook**  
**Limited Quantities—Order Early**  
\$27 plus \$4.15 S&H



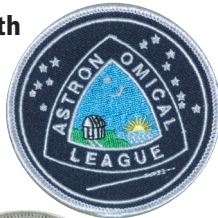
**RASC 2015 Calendar**  
**Limited Quantities—Order Early**  
\$20 plus \$6 S&H



**Astronomical League travel mug**  
\$10: travel mug plus \$1.50 S&H



**Astronomical League full color cloth patch (three-inch diameter)**  
\$7 plus \$1.05 S&H



**Astronomical League blue and white cloth patch (three-inch diameter)**  
\$6 plus \$1.05 S&H



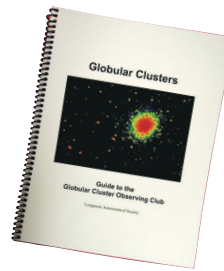
**Astronomical League lapel pin (one-inch diameter)**  
\$8 plus \$1.20 S&H



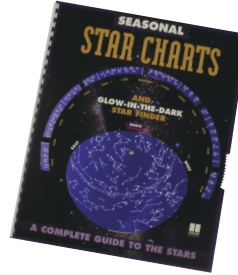
**"Guide to the Stars" 16" Planisphere**  
\$21 plus \$3.15 S&H



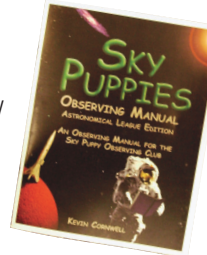
**Globular Clusters**  
\$14 plus \$2.10 S&H



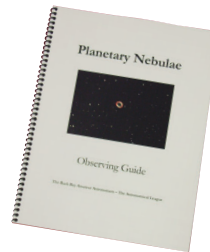
**Seasonal Star Chart**  
\$24 plus \$3.60 S&H



**Sky Puppies Observing Manual—**  
For the Sky Puppy Observers Club  
Regularly \$15,  
**Sale price \$8**  
plus \$2.25 S&H



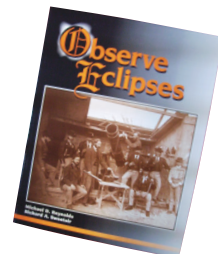
**Planetary Nebulae**  
\$14 plus \$2.10 S&H



**Messier Objects: A Beginner's Guide**  
\$8 plus \$1.20 S&H



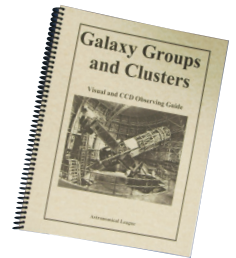
**Observe Eclipses**  
Regularly \$18,  
**Sale price \$9**  
plus \$2.70 S&H



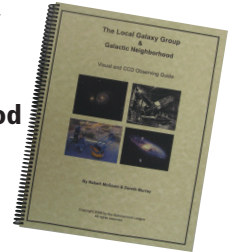
**Universe Sampler**  
\$10 plus \$1.50 S&H



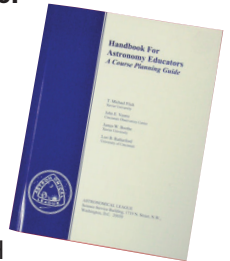
**Galaxy Groups and Clusters**  
\$18 plus \$2.70 S&H



**Local Galaxy Group and Galactic Neighborhood**  
\$21 plus \$3.15 S&H



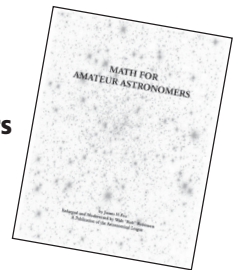
**Astronomy for Educators Handbook**  
A Course Planning Guide  
5.5" x 7.25"  
Regularly \$12,  
**Sale price \$6**  
plus \$1.80 S&H



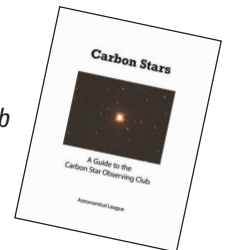
**Observe the Herschel Objects**  
\$6 plus \$1.20 S&H



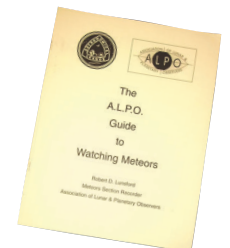
**Math for Amateur Astronomers**  
\$10 plus \$1.50 S&H



**Carbon Stars**  
A guide to the Carbon Star Observing Club  
\$10 plus \$1.50 S&H



**The A.L.P.O. Guide to Watching Meteors**  
\$3 plus \$1 S&H



**Membership Secretary**  
**Astronomical League**  
**National Office**  
**9201 Ward Parkway, Suite 100**  
**Kansas City, MO 64114**

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Taken by Laura Cowles, this image of the solar eclipse on October 23, 2014, is a great example of the minimal equipment necessary for astrophotography. She used a Motorola smartphone, held up to a 3-inch Meade refractor with solar filter attached, set up in her backyard in Dallas, Texas.



The Astronomical League invites its members to submit astrophotography for publishing in the *Reflector*. When sending photos, please include a brief explanation telling us when and where the photo was taken, your club affiliation, what equipment was used, and any computer processing that was involved.