

Reflector



AL HISTORY HIGHLIGHTS: YEARS AGO
WE ARE ALL HEALTHIER UNDER A STARRY SKY
NSF LAUNCHES 88 CONSTELLATIONS PROJECT
PHOTOELECTRIC PHOTOMETRY
BARNARD'S DARK NEBULAE
CELEBRATING OUTREACH EXCELLENCE
3D PRINTING FOR EDUCATION AND OUTREACH
GARNETS IN METEORITES: GEMS OF THE ASTEROID BELT
OUTREACH PROGRAMS AT OUTDOOR CONCERTS
...AND MORE

Night Sky Network

20 Years of Night Sky Network

NASA's Night Sky Network (NSN) has turned 20! Since launching in 2004, this initiative has thrived thanks to the dedication and passion of amateur astronomers and astronomy clubs across the United States. Clubs like yours have played a huge part in bringing the wonders of the universe to schools, libraries, museums, parks, and places of worship, serving 7.4 million people over the last two decades.

NSN began through JPL's PlanetQuest program, leveraging amateur astronomers' enthusiasm and knowledge to connect the public with current NASA research. By its first year, over 100 clubs had joined. Today, NSN supports over 400 clubs nationwide, from Washington State to Puerto Rico, empowering them to inspire curiosity and expand science literacy.

Central to NSN's success are its outreach toolkits—educational materials and hands-on activities on topics like telescope mechanics and solar science. Although toolkits are based on availability, active clubs still qualify for these free kits by hosting a minimum of two outreach events per quarter. Coordinators can log into their NSN account (nightsky.jpl.nasa.gov/login) and review the number of kits received on their club's dashboard under the "My Club Calendar" section.

The program also offers archived video training, monthly webinars with global scientists, and "Night Sky Notes" for newsletters. In 2007, NSF-funded research enhanced the program's resources with video guides, a national event calendar, and online coordination tools. You can find a list of these resources under the article titled "Full Toolkit Manuals – all 131!" on the NSN site, or visit nightsky.jpl.nasa.gov/club/news/207.

As the Night Sky Network embarks on this third decade, the legacy of connecting communities to the cosmos is brighter than ever. Be sure to celebrate this success – you made it possible!

—Kat Troche

DarkSky Corner

Under One Sky 2024 was DarkSky International (DSI)'s largest and most successful global conference to date. Nearly 1,000 participants from 53 countries registered for the event. The conference had an eclectic group of speakers from around the world. Wildlife ecologists discussed light pollution and marine life, and even tourism experts in the Middle East showed the economic value of dark skies. The conference emphasized

that we rely on the night, and the preservation of the night more than ever relies on us.

Highlights from Under One Sky 2024 are summarized at darksky.org/news/reflecting-on-under-one-sky-2024-a-global-gathering-to-protect-the-night.

Recordings from the conference are available on the DarkSky YouTube channel at www.youtube.com/playlist?list=PLwHEmqG4ZaZoxSYmVXI22f-2CYFYuQ21i.

—Tim Hunter

Full STEAM Ahead

A year ago in June, the Mobile Observatory was taken to an event hosted by Broken Arrow, Oklahoma, with schools from nearby rural areas also invited. Teachers from the town of Kiefer asked if we would consider coming to their school system, to which we replied, "absolutely." Kiefer sits just outside of Tulsa County and the middle, high, and upper elementary school buildings are all next to each other.

This July, their life science high school teacher, Brittany, contacted us, interesting in bringing a different science to her students. Ninety minutes later, Brittany and I had worked out a plan that focused on their middle school's 25 gifted and talented students, a school visit for high school students on black holes, and an art project for their six students with significant challenges. Of course, a discussion on purchasing a telescope ensued, and currently a grant is out to fund an 8-inch Celestron StarSense Dob.

Weekly visits were developed to introduce students to basic hands-on topics like the *Sky & Telescope* star wheel, lunar phases, Hertzsprung-Russell diagram, and meteors and meteor showers. The first event was solar observing, which just happened to be at the beginning of October when the Sun was generating aurora-causing X7 to X9 flares and coronal mass ejections.

Parents arrived to witness students looking through solar scopes and sketching the solar phenomena they viewed through the eyepiece. The students were excited, and all stated that it was the first time they had looked through a telescope. The students were also encouraged to look for the auroras that would show up later that night.

The next day, Brittany called to tell me that one boy was the son of the principal, and the father had recounted what happened on the way home and at dinner. It seems his son could not stop talking about the encounter, viewing the Sun through the scope, and learning about all the sunspots on the surface. In fact, at dinner, the son

continued to talk about it with his siblings and his mom. She also talked about a grandmother who asked if we were returning the next day because of the impact the program had had on her granddaughter, and how she, too, wanted to come look through the telescope.

The best part was how other middle school students came to Brittany and asked if they could join this group. They begged her to open the program (for students who test high in math and science) to include them.

The enthusiasm even spread to the high school students. They arrived for their life science class and saw the *Astronomy* and *Sky & Telescope* magazines and astronomy and physics books that were given to them. Students started to pull books and asked if they could read them, so Brittany started a lending library. However, the academic team seems comfortable fielding astronomy questions, so I purchased the *Oxford Dictionary of Astronomy* and set to work. More to come...

Full STEAM Ahead (with homework),

—Peggy Walker,

AL STEAM and Jr. Activities Coordinator

Deep-Sky Objects

Throw a Ball to the Hunting Dogs

Canes Venatici, Latin for Hunting Dogs, is a small constellation located south of Ursa Major. The constellation was created and named by the Polish astronomer Johannes Hevelius in the 17th century. On many star atlases, the Hunting Dogs are depicted as the dogs of Boötes, the Herdsman. The two dogs are named Asterion and Chara.

Canes Venatici, along with its neighbors Ursa Major and Coma Berenices, contain a plethora of galaxies to observe during spring months. The constellation resides far from the band of the Milky Way in the night sky, so it is essentially devoid of star clusters. The exception is one splendid ball of stars known as the globular cluster M3.

M3 is located in the southeastern region of Canes Venatici, practically on the border where Canes Venatici meets Boötes and Coma Berenices. The star cluster is 12 degrees northwest of the bright star Arcturus. It lies 40 percent of the way along the line from Arcturus to Cor Caroli (Alpha Canum Venaticorum), the latter being the brightest star in Canes Venatici.

M3 was the first object in Charles Messier's catalog that he discovered himself before anyone else recorded it, in 1764. With his small crude refractors, he mistook it for a round nebula. It

wasn't until 1784 that William Herschel resolved M3 into individual stars. Today we know this giant ball of stars contains a half-million members, all gravitationally bound by the cluster's strong gravitational force.

M3 shines at magnitude 6.2, making it an easy find in binoculars. An 8-inch telescope resolves it into an uncountable number of stars. The cluster is located 34,000 light-years away and is approximately 18 arcminutes in size. The physical diameter of the cluster is 336 light-years. M3 is estimated to be more than 11 billion years old. A majority of its stars are old and red, however, it does contain myriad blue straggler stars. They are stars that formed more recently by two stars in the cluster merging, or by mass transfer from one star to another in a binary star system. Either process results in a more massive, hotter star that shines blue.

M3 is known for containing more variable stars than any other globular star cluster (nearly 300). The American astronomer Edward Pickering discovered the first one in 1889 while director of the Harvard College Observatory. Astronomers can use the brightness variations of some classes of variables to estimate the distance to the stars,



and thus the star cluster.

The image of M3 shown here was taken with an 8-inch f/8 Ritchey–Chrétien telescope with a 0.8× focal reducer/field flattener. It was captured with an SBIG ST-2000XCM CCD Camera and a 40-minute exposure. In the image north is up and east to the left. The bright orange star near the lower right corner is magnitude 6.2, the same as the integrated magnitude of the globular cluster.

—Dr. James R. Dine

References

Brosche, P., Odenkirchen, M., and Geffert, M. 1999. *New Astronomy* 4 (2), 133.

Shapley, H., and Sawyer, H. B. 1927. *HCO Bulletin*, 849, 11.

AL History Highlights: Years Ago

10 Years Ago—March 2015

History Highlights revives the format which Mike Stewart, the most recent former AL historian, used (p. 15). Places, people and events as shown in earlier *Reflectors* were featured in that format. The 50-year item was Lehigh Valley Amateur Astronomical Society measuring aspects of a total lunar eclipse in December 1964 with timings and video and still photography. (The next total lunar eclipse is March 15, 2025, for the western hemisphere.) The 25-year item was the opening of the George Observatory and its 36-inch Ritchey–Chrétien design telescope at Brazos Bend State Park by the Houston Museum of Natural Science on October 12, 1989. (This scope, known as the Gueymard Research Telescope, was refurbished and reopened the month after this highlight was printed. It and two other research scopes are still open to the public and used by researchers as well as amateur astronomers in the Houston area.) The 10-year item was the fantastic vivid and varied auroras of November 2005 captured as the cover photo by the late Vic Winter from Kansas City and in an article with Jeffrey J. Green's photography from Cincinnati in the March 2005 issue of the *Reflector*. (We are now at the peak of the current 11-year cycle of sunspot and solar activity with the potential for more aurorae this coming year. Check out www.spaceweather.com for real time info.)

25 Years Ago—February 2000

A popular activity in amateur astronomy at the most recent turn of the century was the discovery and cataloging of near-Earth asteroids, as we were becoming aware of the dangers that an unlikely yet potential impact could pose. There were some professional programs in action at that time, but amateur observers led the way. One of many such groups included members of the Astronomical Society of Kansas City featured in "ASKC Asteroid and Supernova Patrol: Making a Significant Contribution" by Larry Robinson (pp. 4–5). Three different observatories out of Kansas City and others in Kansas networked with other amateurs to position these objects and compute more accurate orbits. This time period was a conjunction of better imaging cameras, go-to telescopes, and the growth of the World Wide Web to facilitate such research. Supernovas and comets were a part of this ad hoc tracking and research across many states and countries. "A

few months into its first year, the ASKC Asteroid Patrol discovered 16 asteroids and co-discovered 14 more." (Amateur tracking efforts have largely been replaced by government, university, and science foundation programs. But ASKC's asteroid tracking program was active for well over a decade and turned into ASKC's Imaging Center. It has recently been redesigned and is soon to reopen as an active special interest group for training, demonstration, and imaging for club members' own astrophotography.)

50 Years Ago—February 1975

Charles I. Gale compares the calculation, prediction and discovery of the (then) planet Pluto with that of Uranus and Neptune (pp. 35–38). Percival Lowell was essential to the calculation of its location for the search. His observatory selected Clyde Tombaugh, a Kansas farm boy, to search for the predicted ninth planet. Unfortunately, Lowell died before the discovery. "More than forty years have passed ... but we do not find ourselves much wiser than we were in 1930. Size, distance and composition of the tiny 23-arcsecond-wide and 15th magnitude dim orb were speculated.... What will those first pictures of Pluto's shadowy surface be like? A dry and rocky moonscape, with craters and dusty rilles? An ice-palace fantasy land of crystalline beauty, glistening faintly as it slowly turns in the pale light of the distant Sun? Or...? Let us hope that we shall soon find out." (Now we know. Pluto became a dwarf planet by IAU definition in 2006 and the New Horizons spacecraft's imaging on its 2015 approach and pass of Pluto revealed both predicted features and surprises.)

—Denise Moser, AL Historian

To the Editor:

I am a member of the Astronomy Enthusiasts of Lancaster County (AELC) club, based in Lititz, Pennsylvania. We have a membership of 70 and meet monthly in the community room of the Lititz Public Library. In reference to the article in the December 2024 issue of the *Reflector*, page 15, on the Library Telescope Program initiated by the New Hampshire Astronomical Society, our club donated a 4.5-inch Orion StarBlast Dob to the library several years ago. This was so successful and the demand so high that we donated another one two years ago.

(cont'd on page 21)