

OBSERVER



STELLAR SUMMER SIGHTS

NC 6960 THE WITCH'S BROOM ON FIRE IN HA-OIII

Spanning 35 light-years, the Witch's Broom Nebula (NGC 6960) is the most startling region of the Veil Nebula, a huge expanding remnant of a supernova that lit the night sky 10,000 years ago, located 1,400 light-years away in the direction of the constellation Cygnus. The colors in this image represents the ionized gases hydrogen (red H₂) and oxygen (blue OIII) which are excited as the powerful shockwave from the explosion tears through the interstellar medium. Additional portions of the the nebula are located to the north and west of the Witch's Broom—easily found by locating the foreground star 52 Cygni, 3 degrees south of the star forming the western arm of the Northern Cross. Philip used Astrodon Narrowband Filters on an SBIG STT-8300M CCD camera on a Stellarvue SV127DF APO, on an AP Mach1 GTO mount: 14 Hours of Ha (3nm), 14 hours of OIII (3nm) in 30-minute subframes.

Image © Philip Good

Calendar

6.....	New moon
11-13.....	Perseid meteors peak
14.....	First quarter moon
20.....	Full moon
28.....	Last quarter moon

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AUGUST SKIES

by Dennis Cochran

“A good year for the Perseids,” according to Fred Schaaf writing in Guy Ottewell’s *Astronomical Calendar 2013*, “. . . best from August 11 through 13.” The same publication tells us that the Perseids will be “moonless near their peak” (Alastair McBeath). This peak he pinpoints more precisely to occur on the 12-13th, Monday-Tuesday. The moon will be approaching 1st quarter in the evening as Perseus rises in the east. The swarm will be coming out of the inner reaches of the solar system, having passed the sun at a distance between that of Mercury and Venus.

Get out the lawn chairs! Get out the kids and dogs! Prepare for meteors as big as, well, as space rocks! Our armor against this onslaught will be our thick, breathable, cloud-supporting atmosphere.

We astronomers prefer that these beautiful clouds decorate the day and leave the night alone.

As amateur astronomers discover, their pleasure at seeing the night sky is enhanced by thousands of years of background knowledge. Ancient men as well as our farmer ancestors knew the night sky better than we do. However, the recent implementation of overwhelming nighttime light has robbed us of this heritage. Of course nighttime light has a charm of its own, especially when seen, say, from the outer walkway of the Griffith Observatory in Los Angeles and similar sites, with the lights of the principal roads converging in the distance. Whenever I saw this sight I was torn between loving it and regretting it.

Okay. Saturn sets in the southwest. See the most beautiful planet in the solar system in the early part

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PRESIDENT'S MESSAGE

by Ron Hranac

en·thu·si·asm (in thoo' zē az' m) *n.* [*< Gr. enthous, inspired*] intense or eager interest; zeal — **en·thu·si·ast** (-ast') *n.* — **en·thu·si·as'tic** *adj.* — **en·thu·si·as'tic·al·ly** *adv.*

That definition of the word “enthusiasm,” from Webster’s *New World Dictionary of the American Language*, clearly is applicable to many members of the Denver Astronomical Society. Indeed, a lot of the regulars at our Tuesday and Thursday public nights, general meetings, and monthly open houses would agree that they are enthusiasts who are enthusiastic about the hobby, and enjoy sharing their enthusiasm with others. Okay, maybe my enthusiasm is getting a bit carried away here. But you get the point.

When does or even should the enthusiasm end? When we head for the Village Inn after wrapping up a night of public outreach? When we unload our scopes at home and put them away? When we hang up our DAS badges until the next get-together? For some folks, sure. For others, the enthusiasm often continues outside the realm of DAS activities.

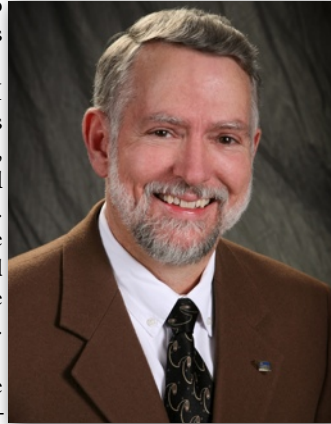
My wife and I recently returned from vacation travel to Idaho and Washington that racked up more than 2,300 miles on the car. As you probably guessed, there were some astro goodies stashed in the trunk with our luggage: A telescope, tripod, mount, eye-



pieces, the miscellaneous accessories bag, and a few other odds and ends. Several family members with whom we visited were willingly subjected to some of my amateur astronomy enthusiasm.

One of our destinations was my sister-in-law’s farm in south-

east Idaho. Nieces and nephews who live in the region, and who are now adults with their own kids, have been enjoying Uncle Ron’s yes-I-brought-a-telescope visits since they were kids. Now they bring their own kids to my sister-in-law’s place when my better half and I stop by. The farm is east of Pocatello, outside the small town of Bancroft. Night skies are very dark, and make for some great observing. Get chilly? Step inside and have some of my sister-in-law’s delicious hot chocolate.



After driving all day from Denver to the farm, we unloaded our luggage, and shared lots of hugs. Then it was time for the stargazing enthusiasm. Yep, even after nearly 600 miles and 10 hours in the car. Out came the telescope and accessories, set up near the front porch of the farmhouse.

Later that night and on a couple subsequent evenings, family members enjoyed views of the Moon and Saturn (lots of “Wow!” factor from those two), the Hercules globular cluster (M13), the Ring Nebula (M57), the colorful double Albireo, the double-double in Lyra, Polaris (my second favorite double), M4 in Scorpius, and other night sky treats. The laser pointer proved to be a lot of fun, both from the perspective of pointing out in the sky what we were looking at, and shining a spot on my niece’s house

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DAS SCHEDULE

AUGUST

- 2-4 EGK Dark Sky weekend
- 17 DAS Open House at Chamberlin Observatory (Begins at 8:00P.M.)
- 23 General Membership Meeting at Olin Hall (Begins at 7:30 P.M.) Speaker: Yuri Petrunin, *Antique Telescopes*.
- 30 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)

SEPTEMBER

- 6-8 EGK Dark Sky weekend
- 14 DAS Open House at Chamberlin Observatory (Begins at 7:00P.M.); Yom Kippur
- 20 General Membership Meeting at Olin Hall (Begins at 7:30 P.M.) Speaker: Chris Peterson, *Meteorite/all-sky cam happenings*.
- 22 Autumnal Equinox
- 27 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)
- 28-6 Okie-Tex Star Party

Public nights are held at Chamberlin Observatory every Tuesday and Thursday evenings beginning at the following times:

*April 9 - October 1 at 8:30 P.M.
October 2 - April 8 at 7:30 P.M.*

Costs to non-members are: \$3.00 adults, \$2.00 children.

Please make reservations via our website (www.denverastro.org) or call (303) 871-5172.

Society Directory

President:
Ron Hranac 303-790-0893
president@denverastro.org

Vice President:
Lisa Judd (626) 487-8515
vp@denverastro.org

Secretary:
Dena McClung 303-564-8630
secretary@denverastro.org

Treasurer:
Brad Gilman (720) 488-1028

Executive Board Members

John Barela	Digby Kirby
Jack Eastman	Scott Leach
Joe Gafford	Ed Scholes
Chuck Habenicht	Dan Wray

Past President, Ron Pearson
President Emeritus, Larry Brooks

Committees

Van Nattan-Hansen Scholarship Fund:
Tim Pimental (Chair)
PO Box 100621
Denver, CO. 80250-0621

EGK Dark Site Committee:
Darrell Dodge, Interim Chair
[Email: darksite@denverastro.org](mailto:darksite@denverastro.org)

IDA Representative:
Dr. Robert Stencel
[Email: coloida@botmail.com](mailto:coloida@botmail.com)

Volunteers or Appointed Representatives

ALCor:
Darrell Dodge (303) 932-1309

Newsletter:
Editor: Patti Kurtz (720) 217-5707
[Email: p_kurtz@comcast.net](mailto:p_kurtz@comcast.net)
The *Observer* is available in color PDF format from the DAS website.

Website:
Darrell Dodge
[Email: webmaster@denverastro.org](mailto:webmaster@denverastro.org)

IT Coordinator:
Scott Leach

Librarian:
Phil Klos
DAS Information Line: (303) 871-5172

DAS Correspondence:
Denver Astronomical Society
Chamberlin Observatory c/o Ron Pearson
2930 East Warren Avenue
Denver, Colorado 80210

The Executive Board conducts the business of the DAS at 7:30 p.m. at Chamberlin Observatory. Please see the Schedule of Events for meeting dates. All members are welcome.

www.denverastro.org

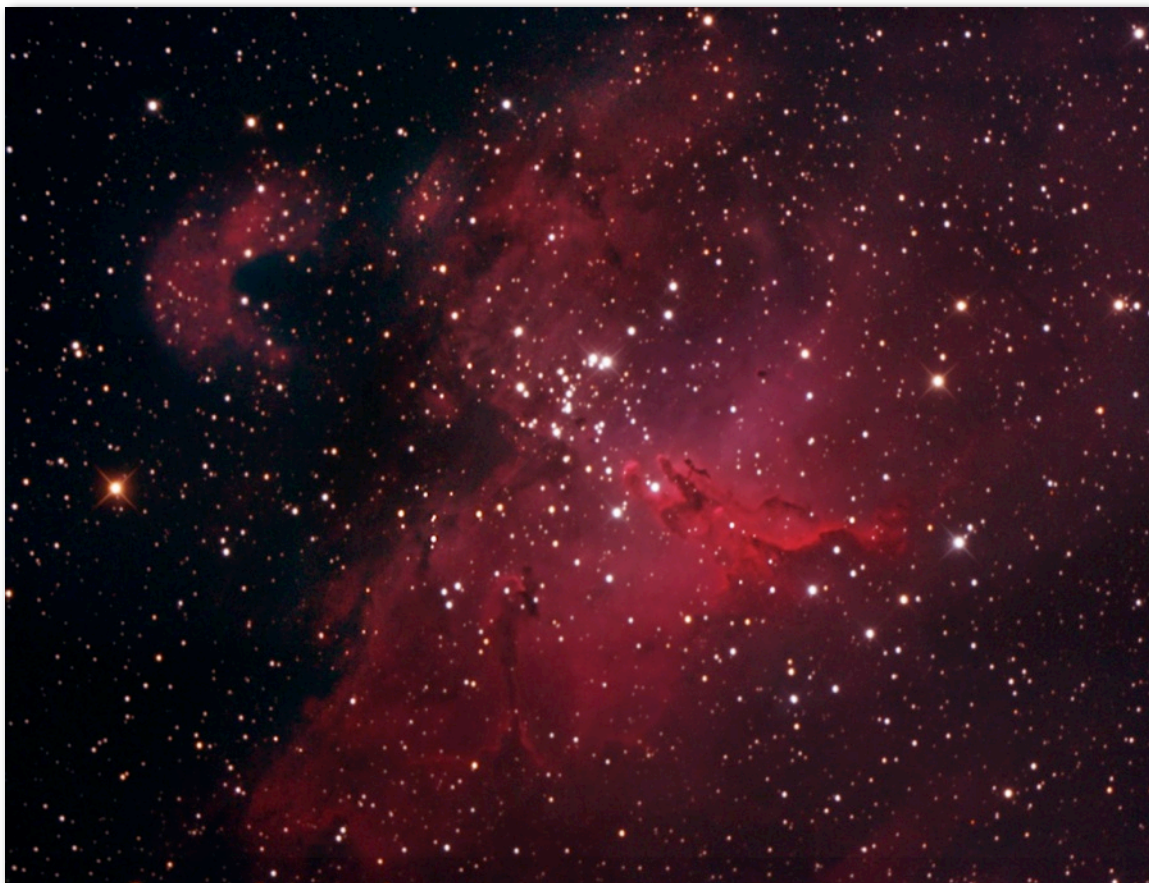
AUGUST SKIES

(CONTINUED FROM PAGE 1)

of your observing session. In fact, at the time of the Perseid meteor shower the moon will be near to Saturn at 1/3 full, so maybe we can see both at the same time with just a nudge of the telescope. Venus may be there as well, setting ahead of Saturn. Next month Venus and Saturn will conjunct on the 20th, and you may want to show the kids the sky again at that time. Imagers will get a photo-op (imagers are our postcard creators and our log keepers).

The now-most-distant planet Neptune will be in the region below the moon on the 21-22nd of August east of easy-to-spot Capricorn the Goat. Capricorn looks like a giant Cheshire-Cat grin. The Helix Nebula (NGC 7293), an exploded star known as a planetary nebula for obscure historical reasons, is east of Capricorn and a bit down, or above and a bit west of bright star Fomalhaut in Pisces Austrinus, which you may be able to see rising in the southeast. Closer to the eastern edge of the Goat's grin is M30, a globular cluster, at $21^{\text{h}} 44^{\text{m}} -23^{\circ}$. West of the western side of Capricorn is the faint globular cluster M75 at $20^{\text{h}} 07^{\text{m}} -21^{\circ}$, while lower than this, at $19^{\text{h}} 40^{\text{m}} -31^{\circ}$ is the brighter, looser globular cluster, M55. You might want to compare this star city to the best-known one in the northern sky, M13, which is on the western edge of the keystone asterism at the center of Hercules. I used to call this trapezoid the "Chinese Take-Out Box," but those containers have probably been replaced by Styrofoam ones of a different shape. Hercules is just west of the meridian and almost overhead, east of cutie-pie Corona Borealis and big old Boötes.

Another always-look-at object in the amateur astronomer's repertoire is just east of Hercules, and that is in the compact but shapely constellation of Lyra the Lyre, home of the bright star Vega. Next to Vega, just to the northeast, is Epsilon Lyrae, a double star. Check it out. And, of course, at the bottom of Lyra's skinny parallelogram, between the two bottom stars



M16 - EAGLE OR THE STAR QUEEN NEBULA IN SERPENS

Messier 16 consists of the cluster of hot young (2 MY) stars in the top center of this image, which was discovered in 1746 by de Cheseaux, and a nebula, discovered by Messier in 1764, consisting mostly of hydrogen and oxygen ionized by the cluster as it forms from a large molecular cloud. The moniker "Eagle Nebula" was apparently inspired by the upward-projecting central figure, while Burnham thought it looked more like a Star Queen and Hubble ST images led to the name "Pillars of Creation" because of the many protostars emerging from vast dust columns. The nebula also features "elephant trunk" figures, Bok globules, and numerous shock wave fronts created by the massive central stars. The M16 nebula is located 7,000 light years away in the constellation Serpens Cauda. It is best viewed with an OIII filter. Darrell made this image July 8-9, 2013 at the EGK Dark Site with a modified Canon 450D through AT8RCF, on an f/8 8-inch Ritchey-Cretien telescope: 100 minutes RGB at ISO 1600, processed with Nebulosity 3.1 and CS5.

Image © Darrell Dodge

is the famous Ring Nebula, M57, the one planetary nebula that every astronomer can find. The material blown off of its surface surrounds it like a celestial Cheerio. There's more to be seen here—Cygnus follows Lyra—but we'll pick it up next month. Wait—let's mention M56, a concentrated globular cluster below-east of M57, right on the -30° line at about $19^{\text{h}} 15^{\text{m}}$. Enjoy! ★

ABOUT THE DAS

Membership in the Denver Astronomical Society is open to anyone wishing to join. The DAS provides trained volunteers who host educational and public outreach events at the **University of Denver's Historic Chamberlin Observatory**, which the DAS helped place on the National Register of Historic



Places. First light at Chamberlin in 1894 was a public night of viewing, a tradition the DAS has helped maintain since its founding in 1952.

The DAS is a long-time member in good standing of the **Astronomical League** and the **International Dark Sky Association**. The DAS' mission is to provide its members a forum for increasing and sharing their knowledge of astronomy, to promote astronomical education to the public, and to preserve Historic Cham-

berlin Observatory and its telescope in cooperation with the University of Denver.

The DAS is 501 (c)(3) tax-exempt corporation and has established three tax-deductible funds: the Van Nattan-Hansen Scholarship Fund, the DAS-General Fund and the Edmund G. Kline Dark Site Fund.

More information about DAS activities and membership benefits is available on the DAS website at www.denverastro.org ★

THE MAJESTY OF YESTERYEAR'S PLANETARIUM

by F. Jack Eastman

First, I'd like to thank Anthony Cook, Griffith Observatory in Los Angeles, California, for his help acquiring the accompanying photographs; also Ron Oriti, my boss at Griffith back then, as well as Carla Johns and Arthur Johnson, colleagues at Griffith, for reviewing this article.

I have spoken before of the things that got me hooked on astronomy, my view of the moon with Dad's 8 × 30 binoculars when I was a second grader, our subsequent move to Southern California and the encounter with Knott's Berry Farm's 9-inch reflector that gave a truly captivating view of Jupiter and its moons. We soon discovered the Griffith Observatory not long after and began making regular trips, in particular, for the monthly shows in their planetarium. These were truly inspiring events, and this article is an attempt to relay some of my impressions and recollections of those early planetarium experiences. My tenure there was from September 1959 to September 1969. I had to give it up due to the move here, to Colorado.

The Griffith Observatory (see the *Denver Observer*, October 2010, page 10) was finished in 1935, and was a small part of a gift from Colonel Griffith J. Griffith who wanted to have an observatory and planetarium for the purpose of public education. The celebrated firm of Carl Zeiss of Jena, Germany, supplied the 12-inch refracting telescope (see the *Denver Observer*, January 2012, page 4) and the Mark II planetarium projector (Figure 1). This projector was truly a state of the art machine for its time. The 29-inch diameter balls at either end of the 12-foot long structure contain 1,000 watt lamps and 32 separate projectors that fill the planetarium sky with more than 9,000 stars, all accurately placed on the sky and of the proper brightness. The Milky Way is also realistically reproduced, and the sun, moon and naked-eye planets are all in their proper locations in the sky. It's a truly striking and beautiful night sky—an experience not soon forgotten! The stars are made from tiny holes, 0.023 mm–0.452 mm in diameter, in 64 different sizes, carefully punched into copper foil that is 0.0152 mm thick. These are projected on the dome from the 32 star projectors on the spherical ends of the instrument. In the cages supporting these “star balls” are the projectors for the sun, moon and naked-eye planets. These projectors are all geared so that they may be run forward and backward in time, and manage to keep the sun, moon and naked-eye planets in the right places amongst the

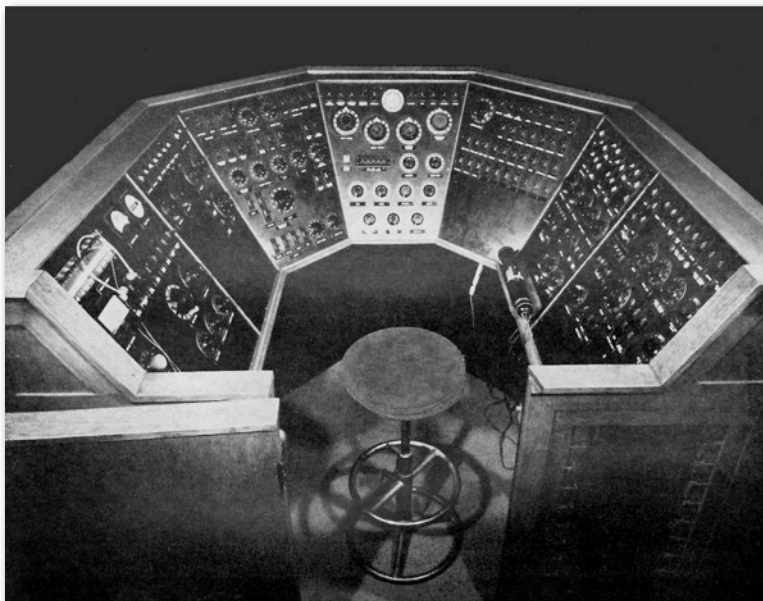


Figure 2. The Control Console of the Zeiss projector. This controlled the projector as well as the dozens of special effects projectors and sound system.

Courtesy, Griffith Observatory

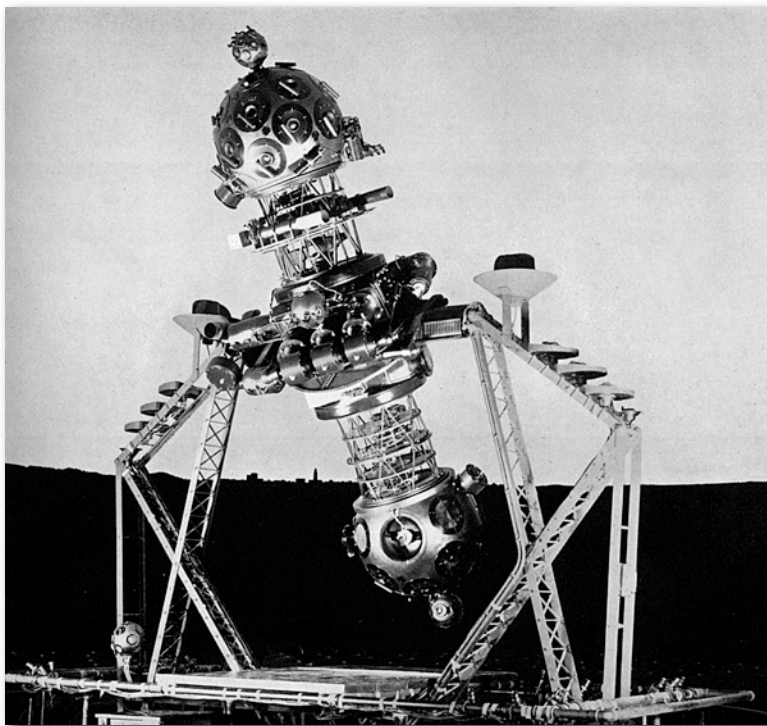


Figure 1. The Zeiss Mark II planetarium projector. Note the Los Angeles skyline in the background.

Courtesy, Griffith Observatory

stars. The instrument, 2,000 pounds of moving parts (6,000 pounds overall), will also reproduce the effect of the precession of the equinoxes accurately over thousands of years in the past and future. It's truly a monumental example of the machinist's art—purely mechanical via complex gear trains. No software involved! The “sky” is a dome 75 feet in diameter onto which the stars and all are projected. At the base of the dome is the horizon, cut out of thin metal accurately showing the Los Angeles skyline as seen from the observatory. Even a truly flat black paint would still show brighter objects setting below the horizon before the shutters on the projector cut them off. At Griffith, a short distance behind the thin cutout are glossy black slats, inclined at 45-degrees which reflect any stray stars down behind the wall—it's a very effective light trap.

In addition to the Zeiss, there are many dozens of special projectors—sunset and sunrise, coordinates on the sky, constellation outlines, very realistic meteors, aurorae (my favorite), a five-stage zoom system for travel to the moon, planets and much more. Most of these special instruments were built in the observatory's own shops. The lecturer, in addition to keeping the talk going, might be operating almost all of these instruments—and in the dark to boot! There is no automatic control!

All of this is controlled from the lecturer's console, which resembles the flight deck of an advanced spacecraft (Figure 2). This is how it was done before the now ubiquitous computer.

Now, let's take in a show or two.

ONE ENTERS THE “STAR THEATER”

The visitor first sees 650 or so seats arranged in circular rows centered around the “monster”—the Zeiss projector (Figure 1). In the background, classical music—Holst, Mozart or maybe Gilbert and Sullivan—is playing. With the bluish dome overhead and the L.A. skyline around the horizon, one could imagine being outside on a nice clear day.



Figure 3. At the Planetarium Console. Dr. Dinsmore Alter (Left) was the Director and Clarence H. Cleminshaw, Associate Director. The "flashlight" is the "Green Arrow" pointer, long before the days of the laser pointer.

Courtesy, Griffith Observatory

The lecturer arrives and climbs into the console (Figure 2). "Welcome to the Griffith Observatory and Planetarium," he says, and announces the subject of the program—"The seasons and how they work," "The constellations of Spring," or maybe a "Trip to Jupiter and Saturn." The lights are lowered and a number of slides, diagrams and such are shown to introduce the subject at hand, as everyone's eyes become adjusted to the dark.

LET'S STEP OUTSIDE

A brilliant and glorious sunset graces the Western sky. "What a nice sunset," the lecturer says, "I'm told those clouds will be gone as darkness falls." Softly, the music begins: Claude Debussy's "Claire de Lune," or "Prelude to the Afternoon of a Faun," or maybe Igor Stravinsky's, "The Round of the Princesses" from the *Firebird Suite*. Stars begin to appear, perhaps preceded by a bright planet or two as the sunset colors fade into the night, and finally the sky fills with stars, the Milky Way and even a few naked eye nebulae. "Shooting stars" are seen streaking across the sky. One had to be careful not to program too soothing a selection of music, lest some of the audience start to snore!

The show proceeds with this evening's subject—perhaps the Solar System, how the planets move in the sky, the reason for the seasons, or perhaps the constellations of the season. Maybe we'll hear the story of King Cephus, Queen Cassiopeia, and their daughter Andromeda with her hero Perseus on his winged horse, Pegasus. The Zeiss projector, which faithfully reproduces the motions and positions of the planets over a simulated year or two is stationary while the outlines of the constellations are added to the sky. Perhaps

tonight's presentation is all about sky colors—rainbows, various weather effects, sunsets, sunrises, why the sky is blue, etc. We had a great demonstration regarding the blue of the sky and why sunsets are red. A roughly 5-inch diameter clear plastic tube, six feet long was aimed straight up and filled with Sodium Thiosulfate (photographer's "hypo" or "fix"). A bright light shone through this, putting a bright, white spot on the dome overhead. At the appointed moment we'd dump in a few ounces of sulphuric acid. Tiny particles of sulphur would begin to precipitate out, the tube would begin to glow blue (the blue of the sky) and the light overhead would turn red as the shorter wavelengths were scattered out (red of the sunset/sunrise). However, the real highlight of this show was the aurorae.

LET'S HEAD TO NORTHERN CANADA, AND IF WE'RE LUCKY, WE'LL SEE THE NORTHERN LIGHTS

We travel north by moving the latitude motion of the Zeiss until we are about 60° northern latitude. We demonstrate how the sky moves at different latitudes and explain the aurorae, solar activity and charged particles in the magnetosphere. But, 1,000 or so years ago, what did the Norse and Vikings make of these? We'll talk about the Valkyries, handmaidens of the god Oden (Wotan) riding their fiery steeds across the sky to collect the fallen warriors and carry them back to Valhalla. The lecturer says, "So as we look to the north, let's be very quiet and see if we can hear those Valkyries as they ride across the sky." The aurorae start to appear, and the Valkyries do, indeed, ride. We hear Richard Wagner's "Ride of the Valkyries" and "Magic Fire Music" from the final act of his opera, *Die Walküre*. This is the one that hooked me on classical music forever after. The aurorae projectors were incredibly simple. Hand-painted slides were projected through 38mm Erfle eyepieces—the spherical aberration added to the diffuse character of the images. Disks of plastic, 1/2-inch thick and slightly warped, were turned by motors just behind the lenses which created movement and shimmering effects. It was one of

the best effects in the planetarium! As the aurorae fades it's time to head back south.

BLAST OFF

Before we are finished, let's look at another one of the shows—"A Trip to Jupiter and Saturn." This used the 5-stage zoom projector. We "travel" (latitude change, again) to an equatorial island for our launch. At this point the lecturer explains the fine points of space travel and shows why we will get a bit more of a boost if we leave from Earth's equator. We would also show some of the more prominent constellations visible in the Southern sky. We "step inside our spaceship" and then blast off with a roar, amidst flashing lights and all manner of what one would imagine blasting off would be like. A tiny Jupiter appears in the viewing screen and steadily grows in size, to the tune of, perhaps Debussy's *La Mer, 3rd movement*: "Dialogue of the Wind and the Waves." When we get close, we step outside and see a huge Jupiter, majestically rotating against the starry background. This is accomplished by a powerful opaque projector, with a ping-pong ball sized Jupiter (or Earth, Mars, etc. depending upon the subject of the particular show) projected on the dome. As the lecturer talks about Jupiter he's resetting the travel projectors, changing the image—he's hoping that all five of them change, if not he'll have to talk about space-time warps should things go awry—and then riding on the notes of Otterino Respighi's *Pines of Rome*: "Pines of the Appian Way," we're off to Saturn. This will involve a landing on Titan. Chesley Bonestell painted a great landscape for this, looking much like the Canyonlands in Utah—red rock formations coated with "snow," and a huge Saturn hanging in a dark blue sky (we knew Titan had an atmosphere, but being a "small" moon, we thought it couldn't be much. Did we ever get a lesson about that when Cassini's Huygens Probe landed on Titan in 2004). Upon our landing we listen to Vaughan Williams's *Sinfonia*

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Photo right: Later Griffith Director C. H. Cleminshaw (center) and planetarium lecturers Arthur Johnson (R) and F. Jack Eastman, from the 1960s.

Courtesy, Arthur Johnson

NASA'S Space Place

INVENTING ASTROPHOTOGRAPHY: CAPTURING LIGHT OVER TIME

by Dr. Ethan Siegel

A Space Place Partners' article

We know that it's a vast Universe out there, with our Milky Way representing just one drop in a cosmic ocean filled with hundreds of billions of galaxies. Yet if you've ever looked through a telescope with your own eyes, unless that telescope was many feet in diameter, you've probably never seen a galaxy's spiral structure for yourself. In fact, the very closest large galaxy to us—Andromeda, M31—wasn't discovered to be a spiral until 1888, despite being clearly visible to the naked eye! This crucial discovery wasn't made at one of the world's great observatories, with a world-class telescope, or even by a professional astronomer; it was made by a humble amateur to whom we all owe a great scientific debt.

Beginning in 1845, with the unveiling of Lord Rosse's 6-foot (1.8 m) aperture telescope, several of the nebulae catalogued by Messier, Herschel and others were discovered to contain an internal spiral structure. The extreme light-gathering power afforded by this new telescope allowed us, for the first time, to see these hitherto undiscovered cosmic constructions. But there was another possible path to such a discovery: rather than collecting vast amounts of light through a giant aperture, you could collect it over time, through the newly developed technology of photography. During the latter half of the 19th Century, the application of photography to astronomy allowed us to better understand the Sun's corona, the spectra of stars, and to discover stellar and nebulous features too faint to be seen with the human eye.

Working initially with a 7-inch refractor that was later upgraded to a 20-inch reflector, amateur astronomer Isaac Roberts pioneered a number of astrophotography techniques in the early 1880s, including "piggybacking," where his camera/lens system was attached to a larger, equatorially-mounted guide scope, allowing for longer exposure times than ever before. By mounting photographic plates directly at the reflector's prime focus, he was able to completely avoid the light-loss inherent with secondary mirrors. His first photographs were displayed in 1886, showing vast extensions to the known reaches of nebulosity in the Pleiades star cluster and the Orion Nebula.



GREAT NEBULA IN ANDROMEDA, THE FIRST-EVER PHOTOGRAPH OF ANOTHER GALAXY

Image credit: Isaac Roberts, taken December 29, 1888, published in A Selection of Photographs of Stars, Star-clusters and Nebulae, Volume II, The Universal Press, London, 1899.

But his greatest achievement was this 1888 photograph of the Great Nebula in Andromeda, which we now know to be the first-ever photograph of another galaxy, and the first spiral ever discovered that was oriented closer to edge-on (as opposed to face-on) with respect to us. Over a century later, Andromeda looks practically identical, a testament to the tremendous scales involved when considering galaxies. If you can photograph it, you'll see for yourself!

Astrophotography has come a long way, as apparent in the Space Place collection of NASA stars and galaxies posters at <http://spaceplace.nasa.gov/posters/#stars>. ★

PRESIDENT'S MESSAGE

about a mile down the road. We got to see an International Space Station pass, an iridium flare, several other satellites, and a meteor or two.

This year I brought a Herschel wedge along for the scope so we could take a gander at the Sun and look for sunspots. Oh Sol didn't disappoint, and there was plenty of amazement when I explained that several of the sunspots were as big as or bigger than the Earth.

In an effort to spark some enthusiasm among my 11-year-old grand-niece and her 7-year old

twin siblings, I drew circles on a few blank sheets of paper and asked the three kids to draw the sunspots that they saw through the eyepiece. They did a pretty good job of getting them in the right part of the disc, and even got the count fairly close. My 7-year-old grand-nephew really impressed, though. His renderings included the umbra and penumbra of the larger spots. That got a "Wow!" from me.

We repeated the sunspot sketching exercise the next day, and the kids were surprised to see

that one of the spots was no longer visible because it had rotated out of view, there were some new ones, a few appeared to be different sizes, and many of those they saw the day before had moved relative to each other.

Did my astro-enthusiasm during this summer's vacation rub off on family members? It sure did. A thank-you note from my niece said in part, "It was a great time! The kids are looking at the Moon from a whole different perspective."

Enthusiasm at work! ★

(CONTINUED FROM PAGE 2)

JOB JAR

Now that our new administration has settled in, we've identified volunteer opportunities for our club's most pressing needs. These are important jobs - though not necessarily difficult or time-consuming, they're certainly rewarding, and we need some help PDQ. Thanks to Amanda Parry for her brief service as previous outreach coordinator before a sudden injury, and to our current loaner program coordinator Chuck Carlson who has served DAS in many different roles throughout the years. If you've got the time and talent for the activities below, please contact one of your officers to volunteer!

Did you know that as a DAS member you can train to operate the University of Denver's historic 20" Clark-Saegmuller telescope at Chamberlin Observatory?

Well, you can, and in doing so you would participate in the society's public night partnership with DU.

For more information contact Lisa Judd at vp@denverastro.org

EXTERNAL OUTREACH COORDINATOR: DAS has two types of public outreach—internal (centered at Chamberlin) and external. We need someone to coordinate requests from schools and other community venues that ask us to bring scopes to their events. There are some we've supported for years, but of late they've been popping up all over and DAS members have enjoyed sharing their eyepiece views on an as-you-hear-it basis. Most clubs do this in a more organized way, so some may be experienced already. But if you'd like to give it a first try, call your veep Lisa for elaboration on the tasks below:

At a minimum, the coordinator should:

- Be accessible by email from our webpage
- Develop a list of club members that like to volunteer, and where they live
- Coordinate with event requesters for participants' astronomical needs (outdoor lighting, setup area, age of the visitors, food, rain date); verify an appropriate event theme
- Learn about the events that DAS supports regularly, like DMNS Astronomy Day
- Keep the pulse of local astronomy besides ours, like Forest Service or scouting
- Carefully monitor our ability to support, and don't overextend our resources
- Make donation requests as appropriate, per DAS' policy depending on venue
- Attend some of the events to see how they go (no need to drop in on every one)
- Be available to other club members that would like help to organize events
- Attend e-board meetings frequently, or if you need any help.

DAS PROPERTY QUARTERMASTER: We have an urgent need to police our inanimate objects that sometimes grow an unhealthy sense of wanderlust, and a comprehensive inventory is badly needed. Your board is looking into storage and security to cage them, but we need a go-to person for anyone that wants to borrow things. Naturally, this person should be a long-time club member and be able to work with our librarian, webmaster (for classifieds), and observatory director as we keep most of our belongings at Chamberlin. Our club's long-time Scope Loaner program, run by our dearly missed friend Bill Ormsby, is also part of the job - and may involve other equipment besides telescopes such as our photometer or various accessories that are so in need of a catalog.

PUBLIC NIGHT VOLUNTEERS: As usual, our spots available on the teams that handle Tuesday and Thursday internal outreach at Chamberlin tend to come and go—and now there are a few that have opened up.

YESTERYEAR'S PLANETARIUM

Antartica, his 7th symphony, adapted from his score for the movie, "Scott of the Antarctic." The section with the wind machines, vibraphone, celesta, pianoforte and organ within a large orchestra did evoke a feeling of cold and desolation.

One of the truly positive aspects of this form of presentation is that they were given live, by a real astronomer that could answer questions, and then after the show further discuss the topics presented.

My favorites, perhaps, were the sunrise sequences and the music that went with them. Usually during the last four minutes or so we'd listen to Maurice Ravel's "The Fairy Garden" from his *Mother Goose Suite* or the "General Dance or Day-break" from *Daphnis et Chloe*. Sometimes we'd hear Stravinsky's "Vanishing Palace," the finale of his

Firebird Suite, or Richard Strauss's *Tod und Verklärung (Death and Transfiguration)*. Now and then we'd hear Wagner's "Liebistod" (Love's Death) from *Tristan und Isolde*, or even better, his "Pilgrim's Chorus" from *Tannhauser*.

Sometimes things don't go as they should. I vividly recall a show involving radio astronomy. Out on the eastern horizon was a huge radio dish, the likes of Goldstone or Canberra, illuminated by spotlights. As the sunrise began, the lecturer had forgotten to fade out the dish. As the sunrise developed, the radio telescope morphed into a striking silhouette against the sunrise colors. It was just a little thing, but that is one, of many "little" things that made these shows a class act.

The show is almost over. Please accept our apologies for getting us home in the wee hours of

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the morning. The stars before the dawn majestically drift overhead.

LET'S RELAX AND AWAIT THE COMING OF THE NEW DAY

A glow is seen in the east, the "false dawn," or Zodiacal light. A soft note from the French horn is heard. The east begins to brighten and the music builds. A glorious sunrise begins to develop and the music builds to a powerful fortissimo as the sunrise blazes forth. The colors slowly fade as the sky brightens, another fortissimo as the orange football-shaped sun pops above the horizon, turning white and round as it rises. The music subsides. "And with the rising of our own star, the Sun . . . may I wish all of you a good morning, and thank you for coming."★

Answers

Non-planetary nebulae crossword



In case you'd like to observe them.....

Snake	Barnard 72	RA, Dec: 17h 21m 0s, 23d 35m S
Cocoon Nebula	C19, IC 5146	RA, Dec: 21h 53m 24.0s, 47d 16m 0s N
Cone Nebula	NGC 2264	RA, Dec: 6h 41m 30.9s, 9d 52m 41s N
Eagle	M16, NGC 6611	RA, Dec: 18h 19m 13.6s, 13d 46m 56s S
Eta Carinae, Keyhole Nebula	NGC 3372	RA, Dec: 10h 44m 4.6s, 59d 54m 20s S
Horsehead	NGC 2023	RA, Dec: 5h 42m 16.8s, 1d 50m 40s S
Rosette	C49/50, NGC 2244	RA, Dec: 6h 32m 48.0s, 4d 51m 47s N
Lagoon	M8, NGC 6523	RA, Dec: 18h 4m 15.7s, 24d 23m 6s S
Thor's Helmet/ Duck Nebula	NGC 2359	
Hubble's Variable Nebula	C46, NGC 2261	
Bubble Nebula	C11, NGC 7635	RA, Dec: 18h 21m 14.1s, 16d 10m 54s S
Swan	M17	
Crescent	C27, NGC 6838	
Tarantula	C103, NGC 2070	RA, Dec: 5h 38m 33.1s, 69d 4m 37s S
Flame	NGC 2024	RA, Dec: 5h 42m 16.8s, 1d 50m 40s S
Foxhead	NGC 6819	RA, Dec: 19h 41m 33.3s, 40d 11m 57s N
Trifid	M20, NGC 6514	RA, Dec: 18h 2m 45.4s, 23d 2m 7s S
Pelican	IC 5067	
Dagger	IC 434	
PacMan	NGC 281	RA, Dec: 0h 53m 13.9s, 56d 39m 29s N
Cirrus	C34, NGC 6960	RA, Dec: 20h 46m 0.5s, 30d 44m 34s N
Crab	M1, NGC 1952	RA, Dec: 5h 34m 57.2s, 22d 1m 25s N
California	NGC 1499	RA, Dec: 4h 1m 11.5s, 36d 38m 22s N
Veil	C35, NGC 6992	RA, Dec: 20h 46m 0.5s, 30d 44m 34s N

AUGUST MEETING SPEAKER: YURI PETRUNIN

Our speaker this month is Yuri Petrunin, who has spoken to us before and is well-known amongst some of our members (and Prez) as a major player in the Antique Telescope Society. Yuri is the owner and president of the Telescope Engineering Company in Golden, where he has found a unique and unexpected hobby in restoring antique telescopes,



as well as his living making modern ones through his opto-mechanical workshop. Though he's been in Golden for two decades, his hometown is—guess what—Chelyabinsk, Russia! For our general meeting, we look forward to seeing Yuri show some of his antiques and all that has gone into them. ★



The Denver Astronomical Society
c/o Chamberlin Observatory
2930 E. Warren Ave.
Denver, Colorado 80210