The Denver OBSERVER

JULY 2014

SMOKIN' HOT!

On an early May morning, the Milky Way rose over Mesa Arch in Canyonlands National Park, Utah, making a stunning nightscape. The center of the Milky Way and the constellation Sagittarius are on the right side of the arch, and the constellation Cygnus is above the left side of the arch, with the red "North America Nebula."

This scene is all natural light: the light of the night sky includes stars and nebulae shining on the landscape. Other light is red and green banded airglow, most prevalent near the horizon on each side of the arch. The red+green airglow imparts a warm yellowish light on the landscape. No artificial lights were used to illuminate the arch. Please contact Roger for technical info and see more images at *clarkvision.com.*

Image © Roger Clark

Calendar

5.....First quarter moon
12.....Full moon
18.....Last quarter moon
26.....New moon

Inside the *Observer*

JULY SKIES

by Dennis Cochran

The days are hot and the nights short and pleasant, so, do everything at night! Well, except for shopping, which is done in air-conditioned surroundings. Outside, the nucleus of our galaxy, the **Milky Way,** wafts over the southern horizon above Sagittarius the Archer and Scorpius, the constellation that looks like its namesake. Our galaxy is the second-largest in the Local Group, second only to M31 (the Andromeda Galaxy), that will be visible to the naked eye in late summer. We have a view of our galaxy unlike that of any other: from the *inside.*

Every star you see is a house in our star-city. And many, perhaps most of them, have planets! This exciting news is very recent in our old science and will keep astronomers busy for hundreds of years, assuming there are astronomers in hundreds of years. A few years ago the exploration of the solar system spawned GeoPhysics and Planetary Science and a hopeful but data-starved ExoBiology, a science we may someday be able to flesh out with data regarding alien life. Think of the ambitious chemistry of Earth's life and then imagine what new chemistry we may learn from the far-flung planets of faraway stars. With luck we may end up with new sciences like ExoPsychology and Comparative Civilizations. Here we are at the beginning of all this, with little to study except star-wiggles and planet-transit light curves.

Saturn is west of direct south and still in the triangle at the top of Libra. Fading **Mars** is farther west; the moon will cruise through this stretch of the ecliptic around the 6th of the month. **Jupiter** is facing the far side of the sun and is unavailable for consultation. **Uranus** rises at midnight while **Neptune** comes up at

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PRESIDENT'S MESSAGE

by Ron Hranac

a·ni·ver·sa·ry (an´ ə vʉr´ sər ē) ***n.***, *pl.* **-ries** [< **L.** *annus*. year + *veriere*, to turn] the yearly return of the date of some event —***adj.*** of an anniversary.

Saturday, July 19th, 2014 is a special date for the University of Denver, DU's historic Chamberlin Observatory, and Denver Astronomical Society. On that date we're teaming up with DU to celebrate the 120th anniversary of Chamberlin Observatory. The next time you visit Chamberlin, pause for a moment, take a look around, and think about what that means. The Earth has made 120 trips around the Sun since the observatory was first open for business.

According to the book *Denver's Great Telescope*, by Claire M. Stencel and Robert E. Stencel (© 2006, Astronomy Program, University of Denver, ISBN #0-9762017-2-0), "Trial observations began on July 14, 1984, with 'first light.' This initial use of the telescope by Howe included observations of stars in the famed cluster M13 in Hercules and Earth's moon."

The ceremonial groundbreaking at the Simpson's Grove site took place on June 13, 1888, and digging for the foundation at what is now called Observatory Park got underway November 28th of the following year. Construction of the observatory itself occurred over the next couple of years or so, and was mostly finished by 1892. The optics arrived in May of 1894, and first light was on the aforementioned July 14th, 1894. Chamberlin Observatory and the 20-inch refractor remain in use 120 years later.

The final cost of the telescope in 1894 dollars was $4,185.00, a not insubstantial amount of money back then.

DAS President Ron Hranac during Solar Day at the Denver Museum of Nature & Science.
Photo courtesy: Jeff Tropeano

The total included $3,000.00 for the telescope itself, $1,000.00 for the lens, and $185.00 for transportation costs. In 2014 dollars, that works out to a bit more than $110,000.00. Whether one could actually get a new 20-inch refractor these days for $110,000.00 is another question. For that matter, Alvan Clark-Saegmuller telescopes are no longer being manufactured, so one could argue that the scope is – in the words of the credit card commercial – priceless. For comparison, Telescope Engineering Company in Golden, Colorado recently offered a limited production 10-inch (250 mm) f/8.2 apochromat refractor for $49,000.00, and that's half the diameter of Chamberlin's 20-inch f/15 refractor.

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DAS SCHEDULE

JULY

4 Independence Day
11 DAS General Membership Meeting at Olin Hall (Begins at 7:30 P.M.). Speaker: Michael Carroll (See Back Page)
18 E-Board Meeting at Chamberlin
19 120th Anniversary Celebration and Open House (See Page 7.)
25-26 EGK Dark Sky weekend

AUGUST

2 Open House at Chamberlin (Starts at 8:30 P.M.)
8 DAS General Membership Meeting at Olin Hall (Begins at 7:30 P.M.). Speaker: TBD
15 E-Board Meeting at Chamberlin
22-24 EGK Dark Sky weekend

Open House costs: If the skies are clear, $2 per person ($5/family), and $1 per person in the event of inclement weather.
Public nights are held at Chamberlin Observatory every Tuesday and Thursday evenings beginning at the following times:
March 10 - September 30 at 8:30 P.M.
October 1 - March 9 at 7:30 P.M.
Costs to non-members are: $3.00 adults, $2.00 children and students with ID.
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:
Stuart Hutchins
vp@denverastro.org
Secretary:
Dena McClung 303-564-8630
secretary@denverastro.org
Treasurer:
Luis Uribe 720-231-9036
treasurer@denverastro.org

Executive Board Members

Jack Eastman — Ed Scholes
Joe Gafford — Sorin
Chuck Habenicht — Jeff Tropeano
Digby Kirby — Dan Wray

Past President, Ron Pearson
President Emeritus, Larry Brooks

Committees

Van Nattan-Hansen Scholarship Fund:
Tim Pimentel (Chair)
PO Box 100621
Denver, CO. 80250-0621
EGK Dark Site Committee:
Darrell Dodge, Interim Chair
Email: darksite@denverastro.org
IDA Representative:
Dr. Robert Stencel
Email: *coloida@hotmail.com*

Volunteers or Appointed Representatives

ALCor:
Darrell Dodge (303) 932-1309
Newsletter:
Editor: Patti Kurtz (720) 217-5707
Email: *p_kurtz@comcast.net*
Proofreaders: Darrell Dodge, Ron Hranac
The *Observer* is available in color PDF format from the DAS website.
Website:
Darrell Dodge
Email: *webmaster@denverastro.org*
IT Coordinator:
Scott Leach
External Outreach Coordinator:
Naomi Pequette *external@denverastro.org*
Public Night Coordinator:
Hugh Davidson (303) 679-0629
Librarian:
Phil Klos
DAS Information Line: (303) 871-5172
DAS Correspondence:
Denver Astronomical Society
Chamberlin Observatory c/o Ron Hranac
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

JULY SKIES

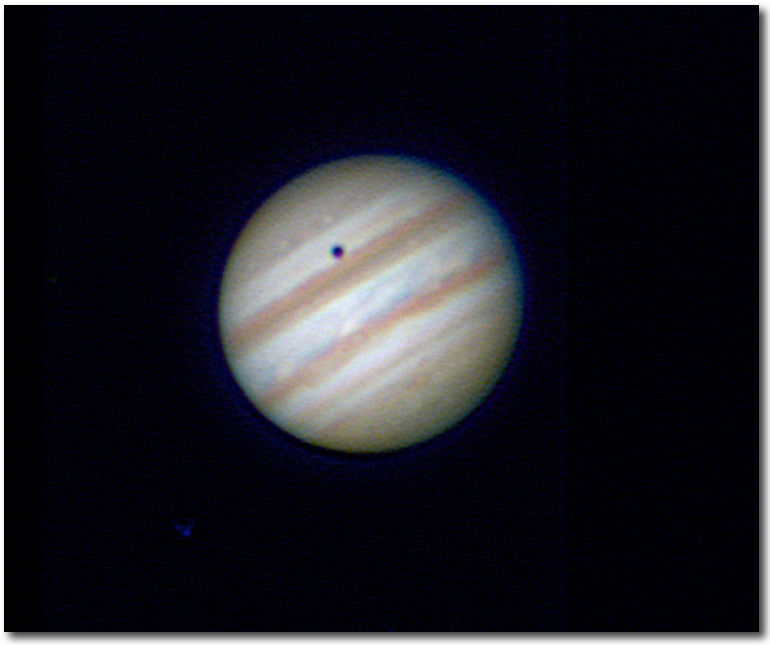
(CONTINUED FROM PAGE 1)

10 P.M., getting earlier every night. No big meteor streams, but mid-August around the 13th brings the **Perseids**, one the the year's biggest swarms.

If we're at a dark-sky site we can see the Milky Way from Deneb in Cygnus, south to the bottom of Scorpius. This reminds us that we live in a spiral galaxy. Look east of Antares for **M19**, a globular cluster at about 17^h 03^m -26°, and south of that at 17^h 0^m -30° is another— **M62**. At Antares look for **M4** and **NGC 6144**, globulars that are just west and northwest of that bright star.

Instead of, rather than, as well as, the usual nebula and star cluster hunt through the Summer Milky Way, we could do a wide-looping round of **double stars**. Start with **α (alpha) Hercules** situated well south of his keystone and just WNW of α (alpha) Ophiuchus at 17^h 17^m +14.5°. Continue clockwise to **α (alpha) Capricorn** low in the southeast—it sticks up above the eastern ecliptic on the tip of the joker's-grin shape of that constellation at 19^h 16^m -12.5°. Now, go northwest a ways to everyone's favorite, **Albireo**, at the nose of Cygnus the Swan. Albireo has a beautiful color contrast of pale orange and blue at 19^h 25^m +28°. While you're there, bop over northwest to see **M57—the Ring Nebula**—at the bottom of Lyra, and on the way pass globular cluster **M56** at 19^h 18^m +30°. After the Ring we'll go for ϵ (epsilon) Lyr at 18^h 44^m +39°, just northeast of Vega. From the zenith, then, we'll cross way north to ψ (psi) Draconis at 17^h 42^m +72°, about six degrees southeast of Ursa Minor's dipper bowl star, η (eta) UMi. An easy dive southwest takes us to **Mizar/Alcor** at the break in the handle of the Big Dipper. As always, try to see all four stars in that double-double system. Now, south to the **"Heart of Charles," Cor Caroli,** a very red system, also known as α (alpha) Canes Venatici at 12^h 56^m +38.5°. Then, south we go into Boötes where we'll find ϵ (epsilon) Boo halfway up the eastern side of the kite, an orange and green pair.

After all this, we might feel doubled out, but it's a good feeling.★



JUPITER

New member Jon Martin shares this wonderful shot of Jupiter—the shadow is the Ganymede transit on March 23, 2014.
He made about 1,500 frames taken at 30 FPS with a DFK 21 Imaging Source color camera. Ask him for more information.

Image © Jon Martin

M4

(Photo at left) The lines and curves of stars characteristic of globular cluster M4—including the straight line through its core—are clearly visible in this image, taken by Darrell early on the 20° morning of March 13, 2010 at the EGK Dark Site. He used an 8-inch f/4 imaging Newtonian and a modified Canon 450D. M4 is one of the closest globular clusters, at a distance of only 7,200 light years, and also one of the easiest to find, in Scorpius near the bright red star Antares.

Image © Darrell Dodge

SAVE THE DATE!

DAS Picnic
August 10 at Bear Creek Lake Park!
See Back Page for Information.

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's 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 Chamberlin Observatory and its telescope in cooperation with the University of Denver.

The DAS is 501 (c)(3) tax-exampt 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.*★

MEET YOUR FELLOW ASTRONOMER

by Dena McClung

This month's member profile features Mike Hotka, a seasoned amateur astronomer, writer of astronomy articles, teacher, telescope builder and outreach volunteer.

Mike found his appetite for astronomy at age ten, during the heyday of the Gemini space program in the mid 1960s. His small Tasco refractor gave him his first views of the planets and stars while growing up in Iowa. He particularly recalls the thrill of seeing the spectacular Comet West in 1976.

Mike attended the University of Iowa starting in 1972 and was fortunate to be a student of Dr. James Van Allen, who, as Mike recalls, had a dry, geeky sense of humor. Mike is still inspired by him. Mike's plan to major in music fell victim to his strong interest in math and science; he graduated with a degree in Physics and Computer Science.

After writing computer programs in the telephone industry, Mike earned a masters degree in Computer Science from the University of Texas in 1992. He and his family then moved to Colorado, where he first worked for AT&T. He eventually landed his current dream job with Ball Aerospace, where he writes programs that support the integration and testing of spacecraft. While there, he also has earned a masters degree in Mission Operations and Space Management, which enabled him to fulfill another dream by teaching astronomy at Front Range Community College in 2009.

Over the years, Mike has owned, modified, and built a series of telescopes ranging from the little Tasco to his current 12.5" Dobsonian. He inherited a mechanical aptitude from his father, which is apparent in the long string of telescope and mount projects that he's undertaken over the years, always seeking to improve the performance and ease of use of his equipment. When he goes into a hardware store, he sees a wide range of potential telescope parts. He has incorporated anything from window weights to 4" gas pipe to toilet flanges (which briefly caught the attention of John Dobson, sidewalk astronomy pioneer, at a star party) in his designs. He strives for portability, and can break down his eight-foot-long telescope so as to fit into his Prius.

Mike built his own darkroom in which to process astronomical images he'd captured on film. But Mike's greatest passion is setting and achieving observing goals. To date, he has observed more than 3800 individual objects. He has collected many of the Astronomical League's observing awards; the ones he has not yet earned can be counted on one hand! Some of those would require Mike to do some observing from the southern hemisphere. He has also seen the Aurora Borealis, from the deck of a cruise ship while off the coast of Nova Scotia.

While Mike's observing accomplishments might seem daunting to a new amateur astronomer, he has some advice to get them started: Seek out other experienced club members who have interests aligned with yours, and use them as a resource to minimize your learning curve and get to the enjoyment of the hobby more quickly. He also recommends setting goals and using the Astronomical League's programs (such as the Messier object series) to give structure to your observing.

MIKE HOTKA,
THIS MONTH'S "FELLOW ASTRONOMER."
Photo courtesy: Mike Roos

In addition to the DAS, Mike is also a member of the Longmont Astronomical Society and volunteers at least twice a month at the Little Thompson Observatory. He likes to tailor his presentation to each individual audience. If the group is a science class, for instance, he will ask about their homework assignment and make it the topic of the night. He has made a number of "How-To" presentations at a variety of star parties and is slated to speak at the 2017 Astrocon in Casper, Wyoming. Mike has documented his astronomical adventures at *http://www.mikehotka.com/*.

Mike has a weekly date with his wife of 39 years, Barbara; their daughter is an Adams County deputy, and their son is an automobile dealer mechanic. ★

PRESIDENT'S MESSAGE

(CONTINUED FROM PAGE 2)

Things have certainly changed a lot since Chamberlin Observatory was built and the 20-inch telescope saw first light. Six decades ago the observatory and nearby university were out in the boondocks, relatively speaking. Today Observatory Park is surrounded by a metropolis of more than 2,599,504 million people (2011 population estimate), with the unfortunate accompanying light pollution. Even with the sky glow of the Denver Metro area, DU's historic Chamberlin Observatory continues to be used for hundreds of hours of public outreach annually, along with use by scientists and students.

The anniversary celebration is being held Saturday morning, July 19th, from 9:00 A.M. to 1:00 P.M. at Chamberlin. We'll reopen the observatory at 8:30 P.M. that evening for our monthly open house.

Continuing a longstanding tradition of outreach, the public is invited to the anniversary celebration, which will feature a professional photo shoot with the 1894 Alvan Clark-Saegmuller 20-inch refractor telescope. Period or steampunk costumes are encouraged. The family-friendly event will include kids' activities, and astronomy lectures and workshops. A donation of $5.00 to $10.00 is suggested, which will go toward Chamberlin Observatory, ensuring that the historic facility and its outreach programs will continue to dazzle and delight the public for years to come.

In 1891, Humphrey B. Chamberlin, patron and namesake of the observatory, spoke with Professor Herbert A. Howe about his desire to create an endowment for the observatory. A variety of factors – including the boom and bust of silver mining and a nasty economic downturn in the late 1800s – put the brakes on Chamberlin's endowment idea. Fast forward to today: The Denver Astronomical Society's E-Board will, in a special ceremony at the 120th anniversary event, present a check for $5,000.00 to the University of Denver to help enable DU establish an endowment fund for Chamberlin Observatory. DAS and DU have worked together for several decades to bring astronomy to the public, and we look forward to continuing that tradition for many more.

Mark your calendar for the July 19th celebration. Information about the event is available at *http://www.denverastro.org/120/* ★

STARLIGHT FESTIVAL REPORT

Article and photos by Donald S. Lynn

After about 40 years of the Riverside (California) Telescope Makers Conference, later called the RTMC Astronomy Expo, a bunch of the astronomy vendors apparently got tired of getting their equipment (and personnel) dusty while set up in a field, and they decided this year to have their own astronomy festival in town, that is, Big Bear Lake village, about 10 miles from the RTMC location. It was scheduled for the Saturday and Sunday of RTMC, which ran from Thursday to Monday (Memorial Day) morning. It was thought that the Starlight Festival might steal participants away from RTMC, but the websites for both events seemed to be at peace with each other. To quote one of them, "These two events serve different audiences," and "Come join the fun and learn about the universe your way." Therefore, the First Annual Starlight Festival set up in the paved lot in front of the Northwoods Resort, in tents providing protection from the sun and wind, with no dust in sight. Talks and a few exhibits were located in conference rooms inside the resort. Admission to the Starlight festival was free whereas RTMC charges an admission fee.

My opinion, which was shared by a few others who attended both RTMC and Starlight, was that Starlight aimed at kids and rank beginners, so likely did not take away much, if any, of RTMC's audience. Popular booths at Starlight were ones making compressed air rockets and building planets from balls and glitter. People liked getting their pictures taken with an "alien" that looked right out of Roswell. There was a bounce house (astronomical relevance not clear), robots from NASA and solar viewing. There were telescopes set up for viewing after dark, but I did not stay through sunset. I was impressed by a view of Jupiter during the daytime. There was a very short line, so I assumed the rest of the crowd was unimpressed by seeing an ordinarily night-time object in the daytime.

There were a number of talks, including one titled "Astronomy Without Borders." Seth Shostak talked about the search for extraterrestrial life, David Levy spoke about comets and astronaut Story Musgrave also spoke.

Both Starlight and RTMC had tributes, provided by the Sidewalk Astronomers, to John Dobson, who died this past year.

RTMC had a booth at Starlight, encouraging those unfamiliar with RTMC to go visit it. It took me about a half an hour each way to drive between the two events, so perhaps that distance discouraged many. The original plan was to have a shuttle bus traveling between RTMC and Starlight but negotiations with bus companies fell through.

Three of the major telescope vendors had booths at both RTMC and Starlight: OPT (Oceanside Photo and Telescope), Explore and Woodland Hills Telescope. The other major vendors, such as Televue, Celestron, Lumicon, Planewave, and Lunt only set up at Starlight. I did not see Meade at either place.

It is possible that vendors may rethink things for next year, since sales at Starlight seemed to be just inexpensive stuff, with little interest being shown in the high-end telescopes. No one even seemed to be looking at eyepieces at Starlight. Some interest was shown in binoculars. By comparison, RTMC attendees generally show strong interest in high-end telescopes.

I heard second-hand, but did not verify, that the Starlight attendance was more than 3,000 people. It appeared to me to be mostly people shopping at Big Bear Village who stumbled on the event.

Starlight had arranged for tours of the Big Bear Solar Observatory every few hours. All openings were signed up for by early Saturday morning, so either that was very popular, or the group size was very small. Though I had toured the solar observatory before, I would have liked to see it again, since they have installed a new solar telescope since I was last there. The new one is 1.6 meters in aperture and has adaptive optics. It appears to be producing the finest resolution solar images ever.

A local boat cruise company offered discounts on their starlight dinner cruises on Big Bear Lake and a few other local businesses had tie-in activities.

Further information on Starlight is found at *starlightfestival.com* and on RTMC at *www.rtmcastronomyexpo.org.*

It will be interesting to see the Second Annual Starlight Festival. Will the sponsors change things to better fit the audience? Will any of the major vendors return to RTMC? I intend to go and see. ★

NASA'S Space Place

A GLORIOUS GRAVITATIONAL LENS

by Dr. Ethan Siegel
A Space Place Partners' article

As we look at the universe on larger and larger scales, from stars to galaxies to groups to the largest galaxy clusters, we become able to perceive objects that are significantly farther away. But as we consider these larger classes of objects, they don't merely emit increased amounts of light, but they also contain increased amounts of mass. Under the best of circumstances, these gravitational clumps can open up a window to the distant universe well beyond what any astronomer could hope to see otherwise.

The oldest style of telescope is the refractor, where light from an arbitrarily distant source is passed through a converging lens. The incoming light rays—initially spread over a large area—are brought together at a point on the opposite side of the lens, with light rays from significantly closer sources bent in characteristic ways as well. While the universe doesn't consist of large optical lenses, mass itself is capable of bending light in accord with Einstein's theory of General Relativity, and acts as a gravitational lens!

The first prediction that real-life galaxy clusters would behave as such lenses came from Fritz Zwicky in 1937. These foreground masses would lead to multiple images and distorted arcs of the same lensed background object, all of which would be magnified as well. It wasn't until 1979, however, that this process was confirmed with the observation of the Twin Quasar: QSO 0957+561. Gravitational lensing requires a serendipitous alignment of a massive foreground galaxy cluster with a background galaxy (or cluster) in the right location to be seen by an observer at our location, but the universe is kind enough to provide us with many such examples of this good fortune, including one accessible to astrophotographers with 11-inch scopes and larger: Abell 2218.

Located in the Constellation of Draco at position (J2000): R.A. 16^h 35^m 54^s, Dec. +66° 13′ 00″ (about 2° North of the star 18 Draconis), Abell 2218 is an extremely massive cluster of about 10,000 galaxies located 2 billion light years away, but it's also located quite close to the zenith for northern hemisphere observers, making it a great target for deep-sky astrophotography. Multiple images and sweeping arcs abound between magnitudes 17 and 20, and include galaxies at a variety of redshifts ranging from z=0.7 all the way up to z=2.5, with farther ones at even fainter magnitudes unveiled by Hubble. For those looking for an astronomical challenge this summer, take a shot at Abell 2218, a cluster responsible for perhaps the most glorious gravitational lens visible from Earth!

ABEL 2218

Image credit: NASA, ESA, and Johan Richard (Caltech). Acknowledgement: Davide de Martin & James Long (ESA/Hubble).

Learn about current efforts to study gravitational lensing using NASA facilities: *http://www.nasa.gov/press/2014/january/nasas-fermi-makes-first-gamma-ray-study-of-a-gravitational-lens/*

Kids can learn about gravity at NASA's Space Place: *http://spaceplace.nasa.gov/what-is-gravity/*★

A TWO-PART MOSAIC OF RHO OPHIUCHUS AND SAGITTARIUS REGIONS

Imaged at the Texas Star Party in May 2014, Alan use a modified Canon Rebel XS 1000D, a Canon 50mm f/1.8 II "Nifty Fifty" lens at f/4.0 on an Optron SkyTracker mount. There were five hours total exposure time, using three-minute sub-exposures. He processed in Adobe Camera Raw and Adobe Photoshop CC.

Image © Alan Erickson

DAS OUTREACH OPPORTUNITIES: 120 YEARS STRONG!!

by Naomi Pequette

First of all, thank you to all who helped at our many events in June! July is a much quieter month for events, and our focus is on the 120th Anniversary Celebration for the University of Denver's Historic Chamberlin Observatory. **We are still looking for volunteers to help at the event as well as club members to provide a few supplies.** If you are able to help with the following, please send an email to our public outreach coordinator, Naomi, at ***m63.sunflower.galaxy@gmail.com*.**

Before the event, we need volunteers to distribute flyers and posters to local libraries, recreation centers, or anywhere that is willing to have them.

We are hoping with many volunteers we will be able to reach a large part of the Denver Metro area. If you are willing to help with this, please include the area you can distribute flyers in your email so we do not duplicate efforts.

It is going to be a hot morning, so we are looking for club members to provide a couple insulated water dispensers that we can have outside. We are thinking of something like the Igloo brand water dispensers so the water stays cool.

We can always use more volunteers for the event itself as well. We are looking for club members to provide solar telescopes for public viewing on the lawn at Chamberlin. If you do not have a scope to bring down, we would also like volunteers to help with crowd control during the event. We have had a great response so far to the event, but still do not know how large the turn out will be. Therefore, the more volunteers the better.

This is shaping up to be a very exciting event. We hope to see many of you there! ★

JOB JAR

Merchandise Salesperson

The DAS has a new goal for 2014. There's a supply of small club merchandise, such as mugs and pins and possibly t-shirts (in the future), that we'd like to sell at Open Houses. Technically they've been available at the ticket desk, but it's time to advertise them more openly on their own table, as a means to support our non-profit organization. If you're looking for a way to participate in Open House, mingling with club members and the public in a lighted room with very little physical activity required, this spot is for you! Let any of your officers know if you'd like to man the "trinket table" for the club, and perhaps work with quartermaster Ed Scholes whenever we need to get some new stuff made.

Finance Committee Member

A volunteer is needed to become the third member of a new finance committee which provides financial oversight and guidance to DAS.

If you would like to volunteer for any of these positions, please contact *president@denverastro.org*.

WELCOME NEW DAS MEMBERS!

- Peter Armstrong
- Daniel Beckman
- Marna Dowling
- Greg Hackett
- William Hooper
- Aimee Jennings-Sesker
- Martha Lucas
- Jon Martin
- Graham Nagi
- Jeffrey Smith
- Pete Turner

120TH CHAMBERLIN OBSERVATORY ANNIVERSARY CELEBRATION

The University of Denver's Historic Chamberlin Observatory 120th Anniversary Celebration

Saturday, July 19, 2014
Observatory Park
2930 E. Warren Avenue
Denver, CO 80210

Join us to celebrate 120 years since Chamberlin's magnificent telescope saw first light in 1894.

9 A.M. – 1 P.M:

- Professional photo shoot with the telescope
- Period or steampunk costumes encouraged!
- Kids activities
- Astronomy lectures and workshops
- $5-$10 suggested donation

After dark (8:30 P.M.), come back to see the stars!

- Monthly Open House and Public Star Party
- Viewing through the Chamberlin Telescope

At left with Chamberlin's 120 year-old telescope, DAS Outreach Coordinator Naomi Pequette is in costume gearing up for the anniversary celebration.

Photo courtesy: Zachary Singer

JULY SPEAKER:

MICHAEL CARROLL

What would it be like to skim over the rings of Saturn, or trek among the ice pillars of Callisto? Come join the DAS as author/science illustrator Michael Carroll takes us into the future. His topic will be the eventual human exploration of the outer planets beyond Mars. He has been working on a new book on the subject, and will share some exciting ongoing research on the subject, including late-breaking news about the gas and ice giants and their moons. He'll also share some new paintings done for the project, and will be selling some of the sketches he worked on preliminary to the book *Living Among the Giants* due out in summer of 2015. He will also have a few of his other books on hand.

Michael Carroll's art and articles frequently appear in *Sky and Telescope, Astronomy, National Geographic, Smithsonian*, and other sites. He has written more than twenty books on science and space.★

DAS PICNIC—AUGUST 10TH AT BEAR CREEK LAKE PARK, MORRISON, CO

Come join us for the club picnic August 10th at Bear Creek Lake Park. *http://www.lakewood.org/bclp/*:

- Meet at the Pelican Point shelter which is reserved all day, 6:00 A.M. to 10:00 P.M.
- Come in the morning and enjoy the park for the day. Set up your Solar telescope.
- Official picnic at 1 p.m. Bring your own food and drink. Alcohol permitted up to 6%.
- You might want to bring food for a second meal and spend the whole day. The club will furnish charcoal for the grills.
- DAS has reserved a large covered shelter (76' X 34') that accommodates 300 people, located on the west side of the park near Bear Creek Reservoir. 24 tables and 3 grills, running water (no electric), three port-a-lets on site and access to ample parking
- Activities: sand volleyball court and horseshoe pits. camping, swimming at Soda Lake, fishing, hiking, bike riding, horseback riding, boating and archery.
- Cost: Gate fees are $7 per car, $5 senior.
- Bring: food and drink, solar telescope, swim suit, fishing pole, volley ball, horse shoes, bicycle, and. . . boat!

Directions: Entrance,15600 W. Morrison Rd, Morrison, CO.

- If you are traveling west on Morrison Rd. the entrance is just east of C-470.
- If you are traveling on C-470, exit at Morrison and go east on Morrison Rd.
- Once in the park take the first right and go past the visitor center and swim beach.

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