

OBSERVER

GEAR UP FOR SUMMER SIGHTS!

THE PINWHEEL GALAXY (M101) IN URSA MAJOR

This face-on spiral galaxy is 70 percent larger than our Milky Way Galaxy and lies about 21 million light-years distant from Earth. Alan shot this image at last month's Texas Star Party using his QSI 540wsg camera on a 7-inch Maksutov-Newtonian telescope with an AP Mach1 mount: 120 min. L, 90 min RGB, 60 min. Ha.

Image © Alan Erickson

Calendar

- 8.....New moon
- 16..... First quarter moon
- 21.....Summer Solstice
- 23..... Full moon
- 29..... Last quarter moon

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JUNE SKIES

by Dennis Cochran

This month our meteor shower is little-known but offering a “very favorable possible return” according to Guy Ottewell’s *Astronomical Calendar 2013*. These are the Gamma Delphinids on Tuesday June 11—they’ll actually be best about 1:30 in the morning of that day, so you might think of them as belonging to the previous night. NASA expects that we in North America might get a burst with this one as the radiant rises after midnight. Later in the month, on Thursday the 20th, Venus and Mercury will be conjuncting in the twilight. She is the goddess of love, after all. You may need binoculars to make out the innermost planet so near to the brightest planet.

Scorpius rears his head east of Libra on Wednesday the 3rd. His heart, red Antares, will be below the huge constellation Ophiuchus, the Serpent-

Bearer. Surprisingly hard-to-find M4, a globular cluster, is snug west of the big, red star. Of the 150-plus globulars, M4 is the closest to Earth of such spherically symmetrical clusters around our galaxy. I know that the biggest one, Omega Centauri, is slightly squashed in appearance, but that is not the norm for globular clusters. Who is responsible for this travesty?

Even closer to Antares, a smidgen northwest, is the fainter globular NGC 6144. The *Peterson's Field Guide to the Stars and Planets* (actually Menzel and Pasachoff; Peterson did birds), recommends high power to find this one. Also in that region a bit north of M4 and the next star up the scorpion's body, ζ (sigma) Sco, are the two nebulae ICs 4603 and 4604, that may be too faint for visual observa-

PRESIDENT'S MESSAGE

by Ron Hranac

A few years ago a friend and I gathered up our telescopes and headed for the mountains. The destination, about a three-hour drive from Denver, promised dark nighttime skies and, we hoped, some great observing. We arrived and started unpacking our gear, and it was at that moment I realized I had left some crucial adapters at home. The missing parts meant that my 130-mm refractor would have to stay in its case the rest of the weekend. Fortunately, I had also brought along a smaller 85-mm refractor, so all was not lost. The little scope looked out of place atop a Losmandy G-II mount and tripod, but there were no concerns about a jiggly setup.

That experience proved to be a good teacher. I later came up with a way to organize the pieces and parts for my telescopes, putting scope-specific accessories and adapters in one case, the mount and its accessories in another case, eyepieces in yet another case, and so on. But there is one case that is a catchall for a variety of miscellaneous items. In some respects the latter case is the most important. I'd like to share with you the following partial checklist of items that are in that case, which is a canvas carpenter's bag I picked up at a local hardware store.

- ✓ **Compass**—Useful for verifying whether the scope's mount is oriented more or less north. The alignment can be fine-tuned once the stars are out, but the compass works well for initial setup during the day or twilight. Be sure to account for magnetic declination, which can be calculated for any location at

<http://www.ngdc.noaa.gov/geomag/declination.shtml>.

✓ **Level**—I like my tripod and mount to be level. The G-II's mount has built-in bubble levels, but I like to carry a small bubble level, too.

✓ **Electrical tape**—Make this a roll of good-quality vinyl electrical tape. It's great for temporary electrical repairs.

✓ **First aid kit**—Handy for tending to the cut finger you got while making electrical repairs.

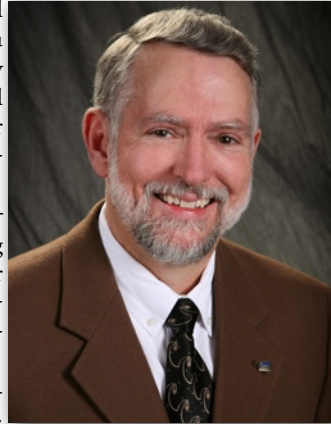
✓ **Hand sanitizer**—Many of us observe out in the boondocks where there may not be any running water nearby, so keep a small bottle of hand sanitizer in the bag.

✓ **Sunscreen**—Use this whenever you're outdoors during daylight. Our higher elevation brings a higher risk of sunburn and skin cancer.

✓ **Insect repellent**—Self-explanatory, but don't get it on the optics.

✓ **Batteries**—Keep a spare set of batteries for flashlights, illuminated reticules, and anything else that uses one.

✓ **Duct tape**—Good for temporary repairs of all sorts. Some prefer gaffer tape, since it may leave less adhesive residue than duct tape.



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DAS SCHEDULE

JUNE

- 4-8 Rocky Mountain Star Stare
- 7-9 EGK Dark Sky weekend
- 15 Open House at Chamberlin Observatory (Begins at 8:30 P.M.) Saturn!
- 21 General Membership Meeting at Olin Hall (Begins at 7:30 P.M.) Speaker: Doug Duncan
- 28 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)

JULY

- 4 Independence Day
- 5-7 EGK Dark Sky weekend
- 13 DAS Picnic (4 P.M.) and Open House at Chamberlin Observatory (Begins at 8:30 P.M.) Saturn!
- 19 General Membership Meeting at Olin Hall (Begins at 7:30 P.M.) Speaker: J. McKim Malville, *Archaeoastronomy of the Southwest*.
- 26 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)

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

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|----------------------------------|----------------|
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| Chuck Habenicht | Dan Wray |

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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

JUNE SKIES

(CONTINUED FROM PAGE 1)

tion but available to our astro-imagers. They are around $16^{\text{h}}30^{\text{m}}-24$. Another gas cloud above these, too faint to be mentioned in my references, is IC 4592, shaped like the California Nebula. It surrounds ν (nu) Sco to the left of β (beta) Sco, the left-hand-claw of the scraggly arachnid. Remember that these same wriggly-scriggles will be crawling up your ankles when the weather gets warmer—although after fifteen years in Colorado I've yet to see one. We used to get vinegaroons in Las Cruces, a type with no stinger but a whip-like tail for squirting acetic acid at small critters.

Still around the rising scorpion is another globular, M19, 8 degrees east of Antares. If you're feeling lucky look a bit east of M19 near $17^{\text{h}}10^{\text{m}}$ for NGC 6293. We are in globular cluster country, with more NGCs all around the lower left leg of Ophiuchus—or is this vertical straggle of stars one end of his serpent? Anyway, look for NGCs 6325, 6342, 6356, 6401, 6355, 6316, 6304, M9 and M62. Finally, still with reference to the scorpion, the compact globular M90 lies 40% of the way up from Antares towards the Beta left-claw star.

Let's duck west to find an obvious target: Saturn. It's still there, perfectly placed for public outreach events, now at a time of year when it is nice to be out at night. Farther up, the zenith is marked by the top of Boötes kite at $15^{\text{h}}+40$. Drift east to about $16^{\text{h}}05^{\text{m}}+41$ to find the planetary nebula NGC 6058. While you're there, drop southeast to find the big globular M13 along the west side of Hercules's keystone-shaped middle asterism (See above photo). Another planetary, then, NGC 6210, lies way south at $16^{\text{h}}47^{\text{m}}+24$, a bit brighter than 6058.

I was blown away by the magnificent image of spiral galaxy M106 on page 9 of the June *Astronomy* magazine, one of the best detail-packed pix of a galaxy I've ever seen. Toward the bottom of the image it looks as if a reddish part of a spiral arm is lofting up above the plane of the disk; do I see this wrong? M106 is north of the west end Beta star of the two-star



GLOBULAR CLUSTER M13 IN HERCULES

Packing approximately 300,000 stars, M13 (NGC 6205) lies about 5,100 light-years away from Earth. It's easily observable in small scopes and on a clear, dark night may be visible with the naked eye as a fuzzy patch. Darrell shot this beauty on May 12, 2013 at the EGK Dark Site. He used his Honis-modified Canon 450D through an AT8RCF f/8: 24 x 120 seconds, captured with Nebulosity 3.0 and processed with CS5.

Image ©: Darrell Dodge

constellation Canes Venatici lying west of the tip of Boötes kite and getting up near Ursa Major at about $12^{\text{h}}20^{\text{m}}+47$.

The next time you come down to Chamberlin for an Open House look at Ron Hranac's meteorite display, where he now has three fragments of the recent Russian meteoroid that exploded above Chelyabinsk. You can peruse these under the stereo microscope. Even more exciting: in a bag in the back of my car I have the mummified head of a green alien from Roswell! Oh, except now I can't find it. Hecky-pool! ★

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.

BEGINNERS BITS—THE SUMMER MILKY WAY

by Lisa Judd



THE MILKY WAY RISES OVER BALANCED ROCK, ARCHES NATIONAL PARK

The awesome view of Balanced Rock in Arches National Park, Utah, is dwarfed by the rising galactic center of the Milky Way. In the distance are the snow capped La Sal Mountains. The sky background appears striped red and green from airglow, molecules in the Earth's atmosphere excited by solar ultraviolet radiation. The galactic center is the bright region to the right of Balanced Rock, above the mountains, and is in the constellation Sagittarius.

Roger used his Canon 1D Mark IV 16-megapixel digital camera with a 24 mm f/1.4 lens at f/2, ISO 1600. He made a combination of four exposures: Three tracked 30-second exposures were averaged for the sky, and one 2-minute exposure fixed for the landscape. He then combined the sky and land exposures. Tracking was accomplished by hand cranking a barn-door mount. See more of Roger's images at: <http://www.clarkvision.com/>.

Image © Roger Clark

During the summer months, the southern part of the sky is known by many that aren't dedicated telescope nuts—just enjoyers of naked-eye viewing from campgrounds or boats. The beauty of the Milky Way in that area is not only striking, but contains a lot of Messier objects within easy reach of even the most modest binoculars.

For those learning constellations, Scorpius and Sagittarius will appear just above the southern horizon at Denver's latitude, so make sure you have no light pollution or treeline obstruction in that direction. The Scorpion is S-shaped, with a red heart and a T-shaped head with the two stinger stars at the other end; Sagittarius looks like an unmistakable teapot. Easy abbreviation—S-shaped Scorpion and Sagittarius in the South in

Summertime (SSSSS). The thickest, richest part of the Milky Way looks like steam coming out of the teapot's spout, and there are many things to see in the steam.

To start, find M7 left of the scorpion's stinger tail—a nice round open cluster that marks one of my favorite examples of an object that's great in binoculars but boring (in my opinion) in a scope (along with M41 next to Sirius in winter). M6 is northward, though still around the scorpion's tail; this is the Butterfly Cluster. Just above and to the right of the heart of the teapot's steam, the Lagoon Nebula (M8) is probably the largest, easiest object to see; in fact it looks much like the Andromeda Galaxy in the fall. Many people mistake this for the Trifid (M20), when in fact the Trifid is

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NASA'S Science News

A WHIFF OF DARK MATTER ON THE ISS

by Dr. Tony Phillips

Science at NASA

April 15, 2013: In science fiction, finding antimatter on board your spaceship is not good news. Usually, it means you're moments away from an explosion.

In real life, though, finding antimatter could lead to a Nobel Prize.

On April 3rd, researchers led by Nobel Laureate Samuel Ting of MIT announced that the Alpha Magnetic Spectrometer, a particle detector operating onboard the International Space Station since 2011, has counted more than 400,000 positrons, the antimatter equivalent of electrons. There's no danger of an explosion, but the discovery is sending shock waves through the scientific community.

"These data show the existence of a new physical phenomenon," wrote Ting and colleagues in an article published in the *Physical Review Letters*. "It could be a sign of dark matter."

The Alpha Magnetic Spectrometer (AMS) was delivered to the ISS by the space shuttle Endeavour on its final flight in May 2011. In its first 18 months of operations, from May 19, 2011 to December 10, 2012, the AMS analyzed 25 billion cosmic ray events. Of these, an unprecedented number were unambiguously identified as positrons.

Cosmic rays are subatomic particles such as protons and helium nuclei accelerated to near-light speed by supernova explosions and other violent events in the cosmos. Researchers have long known that cosmic rays contain a sprinkling of antimatter. Italy's PAMELA satellite detected high-energy positrons in 2009, and NASA's Fermi gamma-ray observatory confirmed the find two years later.

But where do the positrons come from? The Universe is almost completely devoid of antimatter, so the positron fraction of cosmic ray electrons—as much as 10%—is a little surprising.

One idea is dark matter. Astronomers know that the vast majority of the material Universe is actually made of dark matter rather than ordinary matter. They just don't know what dark matter is. It exerts gravity, but emits no light, which makes it devilishly difficult to study.

A leading theory holds that dark matter is made of a particle called the neutralino. Collisions between neutralinos should produce a large number of high-energy positrons, which the AMS should be able to detect with unprecedented sensitivity.

"The accuracy of our measurements is 1%, which is excellent, and we have statistics unmatched by any other spacecraft," says Ting.

"So far the evidence supports the hypothesis of dark matter. But," he cautions, "it does not rule out another possibility—pulsars."

Pulsars are strongly-magnetized neutron stars formed in the aftermath of supernova explosions. They can spin on their axes thousands of times a second, flinging particles into space with fantastic energies that accelerators on Earth can't match. Among these particles are pairs of electrons and positrons.

AMS can distinguish between pulsars and dark matter—but not yet. "We need more data at higher energies to decide which is the correct explanation," says Ting. "It is only a matter of time, perhaps months or a few years."

Built by scientists from 16 countries with support from the US Dept. of Energy, the Alpha Magnetic Spectrometer will continue operating for the rest of the life of the space station – at least until 2020. Between now and then, the mystery of dark matter could be solved, once and for all.

Credit: Science @ NASA. ★



The Alpha Magnetic Spectrometer mounted outside the International Space Station.

Image courtesy: Science @ NASA

JUNE MEETING SPEAKER: DR. DOUGLAS DUNCAN



Dr. Douglas Duncan is a faculty member in the Department of Astrophysical and Planetary Sciences of the University of Colorado, where he directs the Fiske Planetarium. Duncan earned his B.S. at Caltech and his Ph.D. from UC Santa Cruz. He began his career at the Carnegie

Observatories where he was part of a project which found sunspot cycles on other stars. Subsequently he joined the staff of the Hubble Space Telescope. In 1992 he accepted a joint appointment at the University of Chicago and the Adler Planetarium,

beginning a trend of modernization of planetariums which has spread to New York, Denver, and Los Angeles.

Dr. Duncan is the author of "Clickers in the Classroom," a guide to the powerful new technology that enables teachers to know what all of their students are thinking—not just the ones that raise their hands. He has served as National Education Coordinator for the American Astronomical Society, the society which represents the 7,000 professional astronomers in the US. In that capacity he led efforts for better teaching and public communication for astronomers throughout the United States. From 1997-2002 he did science commentary on the Chicago Public Radio station WBEZ. He has appeared on television programs such as the History Channel and BBC Horizon.

Duncan has authored over 50 refereed publications and his work has been funded by the National Science Foundation, NASA, the National Oceanographic and Atmospheric Administration, the Smithsonian and the National Geographic Society. He often works with the group at the University of Colorado, founded by Nobel Prize winner Carl Wieman, which researches better ways of teaching science.

In 2011 he received the prestigious Richard Emmons award presented to the "Outstanding Astronomy Teacher in the US."

Dr. Duncan has led educational trips throughout the world to watch total eclipses of the sun and to see the northern lights. In 1991 he travelled to the North Pole and was elected to "The Explorer's Club" of New York City. His home page is at <http://casa.colorado.edu/~dduncan..> ★

SPACE DAY IN PICTURES

Photos and captions by Chuck Habenicht



The DAS participated in the Space Day event at the Denver Museum of Nature & Science on May 11, 2013. The weather forecast called for clouds and rain all day, but the skies were clear and blue until mid-afternoon which allowed DAS volunteers to set up their solar telescopes on the west patio of the museum. They showed the public their favorite star of the day—the Sun. And what a sun it was! More sunspots than I’ve seen in a long time, along with a lot of great prominences and plages, and even a solar filament or two. We all had a great time and the entire effort was well received by hundreds of inquisitive members of the general public we were able to share it with.—*Chuck Habenicht*. ★



Photos clockwise from upper left: Past president Ron Pearson shares views through his scope; the next two photos showcase John Anderson’s setup, including his array of solar telescopes and award winning homemade spectrohelioscope which is always a crowd pleaser; and DAS president Ron Hranac and Dave Tondreau (in the background) with solar scopes.



Photos clockwise from upper right: Not all the action happened outside—several DAS members volunteered to man the DAS table inside the museum including Eileen Barela and Digby Kirby, seen here. They answered questions and handed out literature from the Night Sky Network, as well as information about the DAS; Ron and Neil Pearson explain the physics behind the Hydrogen-alpha filter; Cliff Simpson and a future space explorer safely view the Sun in Hydrogen-alpha light.



PRESIDENT'S MESSAGE

✓ Clamps—Small adjustable plastic spring clamps work well for keeping star charts on a table, or temporarily holding things together.

✓ Scope cover—Get a cover that matches your scope. If dew starts to win the battle or precipitation interrupts an observing session, a cover will help keep the scope dry. A cover also is useful for protecting the scope during the day at star parties.

✓ Garbage bags—A couple large heavy duty contractor-style garbage bags can be used as an emergency cover for the scope and tripod/mount, the table, a cover for the ground, or even to haul out the trash after an observing session.

✓ Red light—My preference: Dedicated red flashlights or small pocket-type lights suitable for protecting one's night vision.

✓ Flashlight—A headlamp that is held on with an elastic band is perfect for astronomy. It frees up one's hands, and some models have both white and red lights.

✓ Tool set—A small set of some sort is a must-have. Make sure the set includes tools to fit the major fasteners on your mount and tripod. Toss in a Swiss Army Knife for good measure.

(CONTINUED FROM PAGE 2)

✓ Velcro strips—These are available at hardware and big box stores, and are a great alternative to plastic tie wraps and tape, since they are reusable. I keep a small roll of these in my bag in addition to the previously mentioned electrical and duct tape.

✓ Gloves and cap—Stay warm.

✓ DC power distribution strip—I use Anderson Powerpole connectors on my DC cables, and the strip provides a way to connect multiple devices to the main battery. More on Anderson Powerpole connectors in a future column.

✓ Vibration suppression pads—Yes, they work. I keep a set for smaller tripods.

✓ Dovetail plate—A spare for the tripod/mount in use.

✓ Star charts—Also self-explanatory.

Clearly, this list is far from comprehensive, and you may find that your own accessories case includes items that aren't shown here. If you don't already have a bag or case for miscellaneous items, I hope you'll find this list to be a good starting point. ★

BEGINNER'S BITS

(CONTINUED FROM PAGE 4)

much smaller and slightly above the Lagoon. Returning to the steam trail, there's the large Sagittarius Star Cloud (M24), about 3 moon-widths thick and shaped like a fat peanut. In a scope, there are two dark nebulae on the edge that look like footprints.

Farther up the steam are Ms 16, 17 and 18. M18's a nice star cluster, although it doesn't have a name, and M16 is the Eagle Nebula featuring (in a larger telescope) the "pillars of creation" made famous by an early Hubble photo by J. Jeffrey Hester. M17 is known either as the Swan Nebula or the Omega Nebula—if you can imagine two kissing swans, one bright and one a very dim reflection, together they might look like the capital Greek letter Omega. Continuing into the dim constellation Scutum you'll find a large cloud that could almost cover the teapot, with the impressive Wild Duck cluster within it.

If you follow the Milky Way across the sky, through Aquila and Cygnus (along the stem of the Northern Cross), northward of the whole Summer Triangle into Cetus and Cassiopeia, you may notice it comes back down through Perseus and—if you wait long enough in the year—down through Auriga and Gemini and Orion. This is the Winter Milky Way, somewhat tamer than the summer but full of just as many Messier clusters and an impressive network of

nebulae. With a little thought and constellation knowledge, you can compare the plane of our galaxy's disk against the ecliptic (the plane of the solar system) and the celestial equator (the plane of just planet Earth). Outside of the plane of the Milky Way you'll find smatterings of galaxies, concentrated during the spring in Leo/Virgo and during the fall in Sculptor/Fornax, but our own Milky Way is clusterland.

As with anything I contribute, addenda, questions, comments and corrections are welcome. My email address is lm_judd@hotmail.com. ★

WELCOME NEW DAS MEMBERS!

Marc Castells
Chantal deFelice
Alice Hinkle
Tim McAnally
John Russo
Kenneth Sturrock
Jeff Tropeano



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