The Denver OBSERVER

MAY 2011

A RIPPING BEAUTIFUL GALAXY

A violent portrait of star formation is revealed in the tortured core of M82, where suns are being created at a rate ten times faster than in our own Milky Way. Tidal interaction with nearby M81 is the cause, much in the same way that similar forces are trying to rip Jupiter's moon, Io, to shreds, creating volcanic crustal tears and allowing new "surface" to form. The drama of NGC 3034 unfolds on a celestial stage 12 million light-years away, just west of the inverted dipper of Ursa Major.

Details: C-11 Schmidt-Cassegrain @f/6.3, Honis-modified Canon 450D camera, LRGB exposure totaling 99 minutes.

Image © Darrell Dodge

Calendar

3..... New moon

10..... First quarter moon

17..... Full moon

24..... Last quarter moon

Inside the *Observer*

MAY SKIES

by Dennis Cochran

Colorado is in the astro-news! On the last page of the May *Sky & Telescope* (*S&T*) is a pic 'n blurb about Rocky Mountain Star Stare (RMSS)—a rather nice pic, actually—YOU may be in it! This year's RMSS is June 29 through July 3 (Salida's Art Walk is the weekend before. I used to combine these two). After RMSS, one could hop over to the Great Sand Dunes National Park, west across the Sangre de Cristo Mountains, or take the time to go down to Antonito and experience the old steam train to Chama (get reservations on the web) —as good a ride as the Durango one.

OK, to business! Saturn is up at sunset as it was last year, but with wider rings. It's getting fainter, however, as we pull away from it in our faster inside orbit. Oh, and Mars is as big as the moon! Or was that a couple of months ago? Anyway it is larger in diameter, but some dumbo webster meant that it would appear as big as the moon; not likely—maybe in Velikovsky's wildest dreams. Actually the Red Planet is hard to see right now, and most other planetary activity is pre-dawn. So, hunt galaxies instead because they are in season! New moon is Tuesday the 3rd, so the weekends before and after will be good for deep-sky objects.

The Virgo galaxy cluster is hovering o'erhead, south of the zenith. Look between Arcturus in Boötes and the triangular tail region of Leo, and then down a bit to get into the bowl-shaped northwest end of Virgo. This bowl holds galaxies like popcorn! If you have a *Peterson's Field Guide to the Stars and Planets,* 2nd Edition, look at charts 27 and 27A. The trio of elliptical galaxies M84, 86 and 87 that mark

Continued on Page 3

PRESIDENT'S CORNER

by Ron Pearson

Our spring season is well underway here in the Denver area, and while we may not have had many April showers, we're still hoping for May flowers, like the Sunflower Galaxy. This spring many of the seeds the DAS has planted over the past year or more are beginning to show.

As of this writing final plans and components are coming together to build the DAS Brooks Observatory at our dark-sky site. Our observatory may be built or be underway by the time you read this. The observatory will be complete when we receive a long-awaited Celestron 14-inch Schmidt telescope back from Celestron. If the C-14 does not bloom right away we will install a C-11 telescope that we received as a generous donation last year in the observatory. The work of many DAS members has gone into the dream of our own observatory at our own dark site, conceived some 14 years ago. Ted Cox, builder and deep sky observer, gets immediate recognition for taking on the task of construction manager to get our "mushroom dome" up out of the ground!

At Chamberlin Observatory, renovation work on the Saegmuller mount for the 20-inch Clark telescope should also be underway in mid to late May. In late March the new DAS E-Board members and officers voted to approve the request from DU's Dr. Bob Stencel for a 50/50 cost-share of the mount renovation work. DAS will provide half of the funding for this work which is expected to cost slightly under $26,000. The grant will be paid out over a year from the DAS General Fund. This work will involve disassembly and repairs to the main right ascension housing and bearings, as well as other components of the mount. The project will be headed up by antique telescope specialist and mechanical engineer Dr. Fred Orthlieb. This will be the first and much-needed major renovation work on the mount since the early 1900s and, we hope, will keep the priceless telescope operational for many decades into the 21st century. This action is the latest in the DAS's 61 years of support for Humphrey Chamberlin's telescope and observatory, which continue to draw thousands of people to learn about and enjoy the night sky.

In keeping with the new seeds of the 21st century, we are beginning to "broadcast" astro-video images to the World Wide Web via the 20-inch Clark-Saegmuller telescope! We've attached the DAS's Stellacam astro-video camera to the 20-inch's 6-inch Grubb finder– we use this setup during Open House nights. The DAS first purchased and used a small video camera on the 20-inch telescope in 1993, but image quality suffered because the camera required a long cable strung across the dome room and had no exposure controls. The new camera is smaller than many eyepieces, and we have a wireless video transmitter and power on the telescope to send video to a laptop in the Ready Room. The video is captured there and put on the LCD monitors in the dome room. The video can also be sent to web sites with live video streaming around the world. The websites we will be broadcasting to are *AstronomyLive.com* or the Night Skies Network, *http://www.nightskiesnetwork.com/*. Since the camera is small and easily removable, there is no change to the historic integrity of the telescope itself, but it has the capability

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DAS SCHEDULE

MAY

6-8 EGK Dark Sky weekend
7 DMNS Space Day - DAS Solar Observing. (Begins at 10:00 A.M. on the west patio of the museum).
14 Open House at Chamberlin (Begins at 8:00 P.M.) Saturn viewing!
20 DAS General Membership meeting (Begins at 7:30 P.M.). Speaker: Clark Chapman (See Page 5).
27 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)

JUNE

3-5 EGK Dark Sky weekend
11 Open House at Chamberlin (Begins at 8:00 P.M.) Saturn viewing!
17 DAS General Membership meeting (Begins at 7:30 P.M.). Speaker: TBD
24 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)
29-2 ALCON
29-3 Rocky Mountain Star Stare

Public nights are held at Chamberlin Observatory every Tuesday and Thursday evenings beginning at the following times:
March 9 - April 14 at 8:00 p.m.
April 15 - September 1 at 8:30 p.m.
September 2 - March 8 at 7:00 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.

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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

MAY SKIES *(CONTINUED FROM PAGE 1)*

the center of this gigantic gravity well can be found by gliding eastward along the bottom of the Leo triangle and then going a triangle-length farther into the middle of the Virgo cluster.

Last month we talked about bunches of galaxies centered about Leo, some as far afield as the region northeast of Corvus, where we looked for M104, the Sombrero galaxy. That region, south and slightly east of the main Virgo cluster and one Corvus-diagonal northeast of the Crow, is packed with galaxies. Sombrero is on the edge of this group nearest Corvus, so if you can find it, wander farther east and north for more galaxies in this southern bulge of the Virgo cluster.

The sky at this time of year harbors two cup-shaped constellations besides the bowl of northwest Virgo. Four-sided Corvus is below that end of Virgo, and just west of it is Crater, an east-leaning arc that represents the cup of the gods spilling onto the heavenly banquet table. The lower rim-of-the-cup star is Eta, and down to the left of it are the interacting Antennae galaxies, NGCs 4038 and 39, which we found last month by sliding west down the canted top of Corvus past its Gamma star. The other celestial cup is Corona Borealis (CrB), actually a crown, way up past Arcturus. Straight east of Leo and north of the east end of Virgo, Arcturus is at the bottom of the kite shape of Boötes the Herdsman, who is credited with inventing the plow.

If one ventures up the east side of Boötes to pass his Epsilon and Delta stars one will notice CrB east of that. CrB's arc of stars, and Boötes himself, include some double stars: ϵ (epsilon) Boötes between Arcturus and Delta is a widely-spaced green and orange pair with a period of 153 years. Go on up to Delta and farther north and a bit east to the fainter star Mu; it's an orange-white pair, each of which has faint companions. To Mu's east over into CrB's territory is the wide blue double of ζ (zeta) CrB. Then come down to the first two stars of the right-hand end of CrB's arc to find, just west of them, η (eta) CrB, a pair with a 43-year period. In the bottom of the cup, Gamma, the star to the left of CrB's brightest Alpha star, is a close double. Continue up the east side of the cup to the ϵ (epsilon) and ι (iota) CrB stars and continue farther up an Epsilon-Iota distance to get to Sigma, a wide double.

Go back to Arcturus now and drift down towards Spica in Virgo, but stop 2/3 of the way at ζ (zeta) Virgo, a medium-bright star at the waist of the maiden. Now go east along her upper leg past her Tau star to the easternmost star, which one supposes is her foot, unnamed on *Peterson's* Chart 24. On the *S&T* map you will see the globular cluster M5 a bit farther east, well-placed for a good, long look. Imagine what it would be like living near a star in its outer reaches with the bulk of the cluster filling the sky, or living near a star in the interior where the night sky might never be very dark. Back at the foot star of Virgo, between it and M5 are spiral galaxies NGC 5746 (edge-on) and 5740, its companion. Even fainter ellipticals lie farther east, still between the foot star and M5.

Bad Things: with the weather getting warmer it is time to reconsider the bad things that will, I mean might happen to you as you observe, especially those that creep up on you in the Stygian darkness. Review past Monthly Skies for details, or stay tuned. Meanwhile we've got meetings galore in May: the evening of Saturday the 14th is Open House at Chamberlin Observatory, then the next Friday the 20th at 7:30 P.M. is the General Meeting at DU's Olin Hall, while the last Friday, the 27th, is the E-Board meeting at Chamberlin again. RTMC starts the same day in Big Bear, California, and Jack Eastman will be there for sure.

FAREWELL TO A WINTER ICON

There is, perhaps, no finer or more observed deep-sky object than the "Sword of Orion"-- the complex of M42, M43 and the "Running Man," (NGC-1977). A vast star-forming region, this portion of the Orion Molecular Cloud Complex contains hundreds of "proplyds," fetal stellar systems drawing material from the surrounding medium to build themselves. Visible to all, even from severely light-polluted skies, the Orion Nebula bids a fond adieu until late next Autumn. *Details: Astro-Tech 72mm ED refractor @ f/6, Honis-modified Canon 450D camera, LRGB exposure totaling 61 minutes from Littleton, Colorado. Processed with Nebulosity and PhotoShop CS2.*

Image © Darrell Dodge

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 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. To contribute, please see the bottom of the membership form for details (found on the DAS website: thedas.org).

More information about the DAS, its activities and the special tax-deductible funds is available on the DAS website at *www.denverastro.org.*

THE CLEANING OF A CLASSIC *(Part Two of Two)*

Article by F. Jack Eastman
Photos courtesy of Chris Ray and Dr. Robert Stencel

This article is continued from the April 2011 Observer.

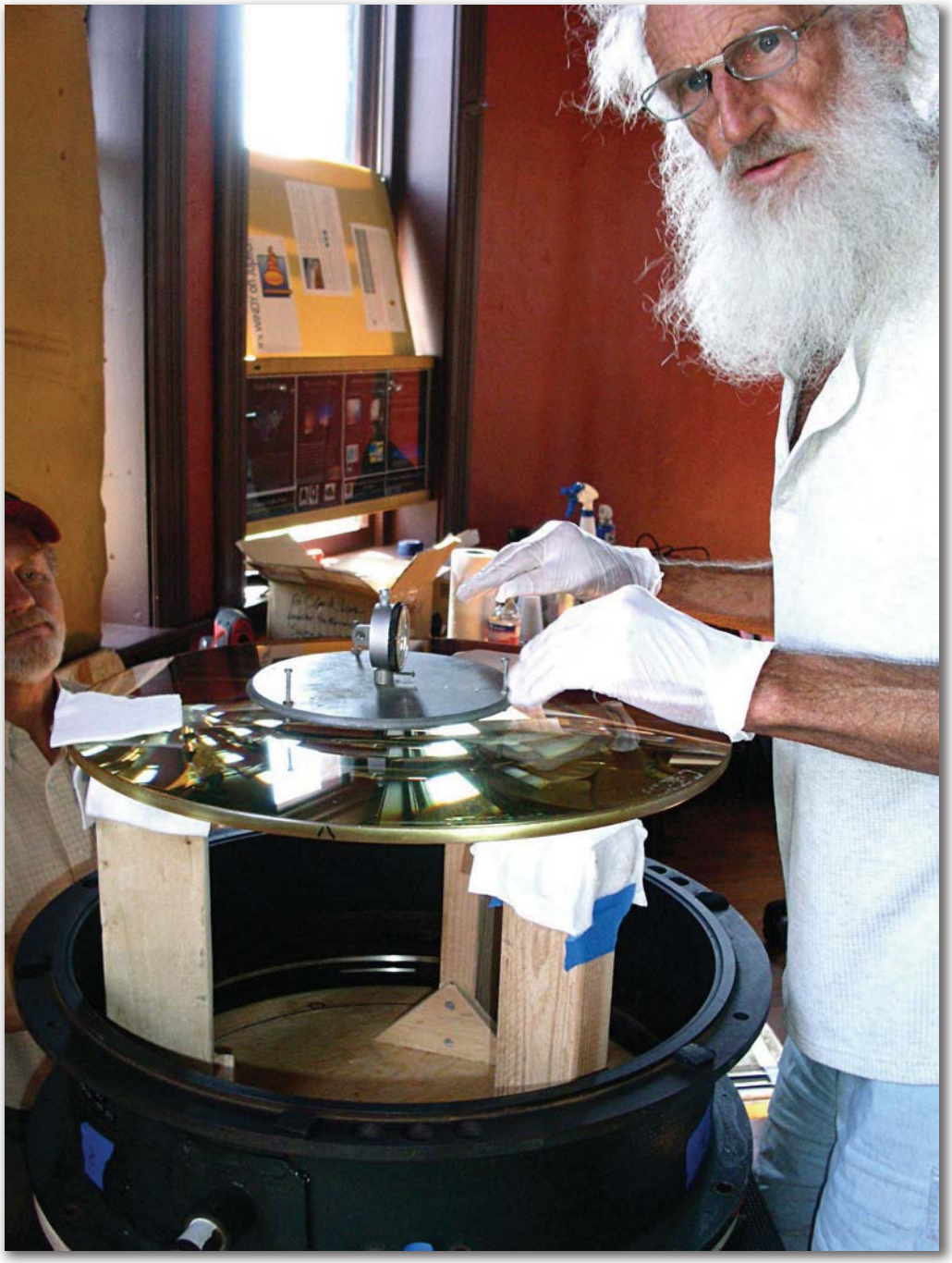
Once the glass was cleaned we marveled at the beauty of the polished surfaces—nary a blemish of any kind, no sleeks or other evidence of mistreatment in its 116 years of existence. There were a number of small bubbles in the glass, the largest being 2mm across; most of the rest were less than a millimeter.

After we were all done with the cleaning and measurements, the lenses were replaced in the cells, making very sure they went in the right way! There was no doubt about the flint, but we re-measured the radius on the front of the crown to be doubly sure we didn't get it backwards. The cells were replaced on the telescope, the telescope released from the tie-down and aimed at Venus. The image was very good, even in spite of marginal seeing. The collimation was checked with a Cheshire eyepiece and deemed good enough for the moment. The telescope was checked further that evening and pronounced in excellent condition. The collimation was further tweaked by Chris and deemed perfect.

FINDERS:

In a way, we goofed. Only after the telescope was secured to the pier in preparation for removal of the objective did we decide to clean the finders. Alas, their lenses were out of reach, now near the top of the dome! (At this point, I took advantage of some down time while Aaron was scraping rust out of the front cell to bring in my 6-inch Clark and give it "the treatment").

After we were done with the 20-inch, we removed the lens from the 6-inch Grubb, disassembled it and gave it a thorough cleaning. Although there was some confusion about how the elements were assembled, it made no difference, as the curvatures on the crown element were the same. We did find several arrows on the edges of the lenses (one with my initials from 30 years ago)! The flint was plano-concave, a true Littrow configuration, and there were very faint remnants of some pencil marks on the edges of the elements. I had disassembled this lens in the 1970s and noticed, on the edges of the lenses, "Spencer Lens Works 1926" (on the crown) and "Spencer Lens Works 1936" on the flint. Sometime later the lens was again cleaned, I think by Mike Ditto, who said he didn't see any notations on the glass. Ivan Geisler, Pat Ryan and I disassembled the lens (I think this was in 1980—my initials were on one of the arrows) with a view to documenting any notations that might be present. Sure enough, there was little left of those notes from before.



Jack carefully (very carefully) sets the spherometer on the lens surface to measure the radius of curvature of the Crown lens element.

As with the main lens, we measured all the parameters for the Grubb lens, and as mentioned before, it was a Littrow design. The crown is equi-convex (a good thing, as it cannot be assembled backwards) and the flint, plano-concave. It is interesting that this lens has a very large spacing between the elements, on the order of a centimeter.

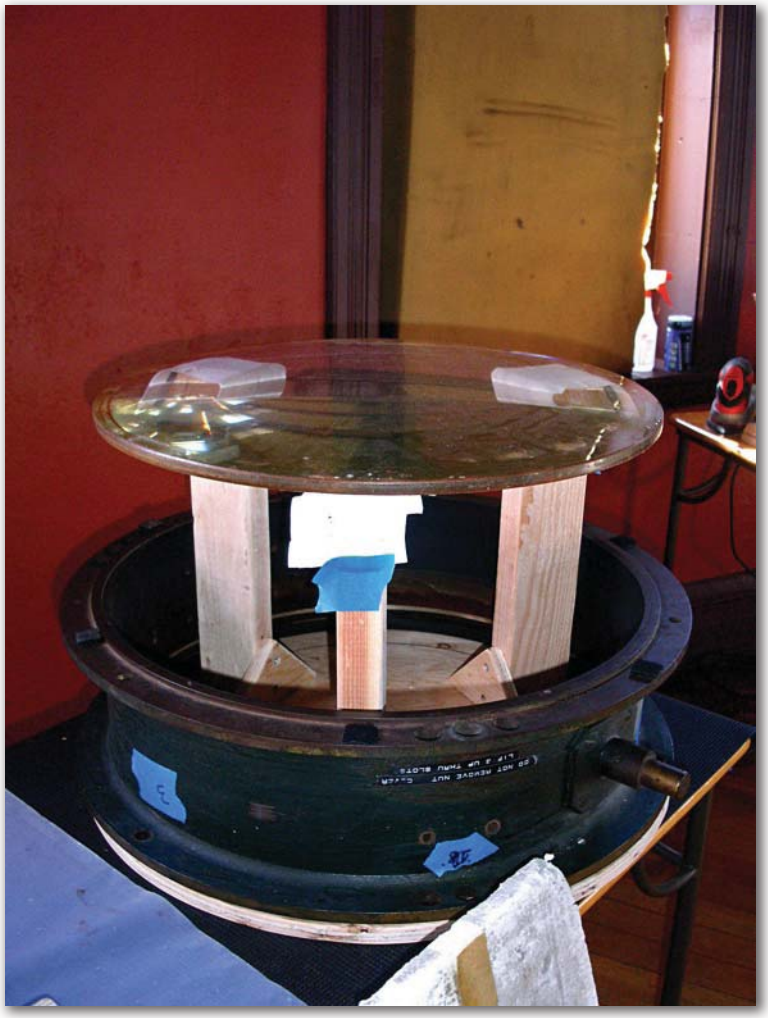
Table 3) 6-inch Grubb Lens Prescription

Surface	Radius(mm)	TH(mm)	Material	Nd	Vd
1	1251.	TBD	Glass	UNK	UNK
2	-1251.	9.4	Air		
3	-1206.	TBD	Glass	UNK	UNK
4	Inf. (flat)		Air		

The 5-inch Clark finder (1882) resisted all attempts to remove the front cell from the tube. This lens really looked awful, and probably was in the most need of a good cleaning (note: Aaron is coming up with some special tooling to attempt to remove the lens so it can be given the good cleaning it so badly needs).

While we were at it, we also disassembled the periscope-eye end from the system for reading the Hour Angle Circle. All the optical surfaces were cleaned except the rear of its objective, due to it being stuck; again,

Crown (convex) lens element removed from cell, preparatory to the cleaning operation.



proper tooling will be needed to remove this lens. After reassembly and subsequent realignment, the numbers on the hour circle could once again be read.

After these operations were completed, I escaped to Oklahoma for a week of observing under truly dark skies. The reports from the users/operators at Chamberlin indicated much improved performance of the 20-inch and the 6-inch Grubb. I can testify my 6-inch Clark showed significant improvement as well; clearly, it had been time for this operation.

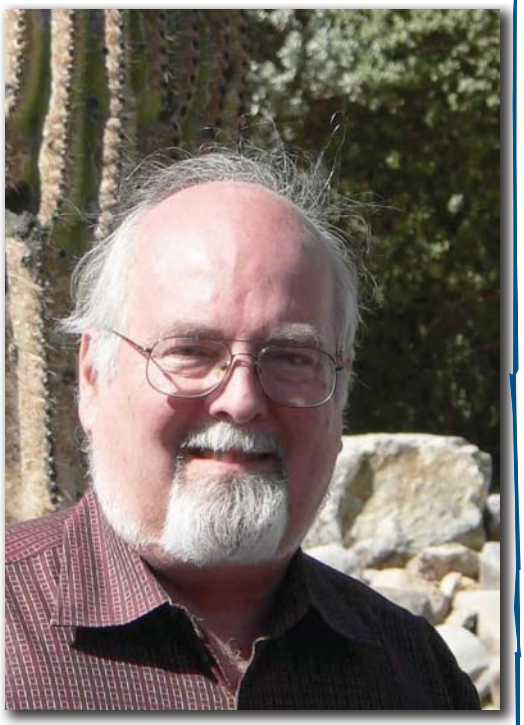
We should establish a realistic schedule for future maintenance of the optics of this fine telescope. I found it much easier than I had expected. The lens assembly was much lighter than I thought, and it can be safely removed and disassembled by four or five people. The cleaning procedure was straightforward, and required only about an hour and a half of actual handling of the lenses. The rest of the time was needed for securing the telescope, removal and cleaning of the cells and reassembly of the system.

All in all, it was a very successful and educational experience. I feel honored to have been included in this operation, and as mentioned, the telescope's performance is much improved.

NOTE: By differentiating (1), y^2/2s, above (See Part One, April 2011 Observer*), with respect to y and s, we can get an estimate of the probable error in these measurements. The uncertainty in y, (dy) the radius of the spherometer feet (due also in part to the tiny flat points of contact of radius 0.3mm), is the order of 0.5mm leading to an uncertainty in the lens radii of the order of 1%. The uncertainty due to the accuracy of the dial probe, uncertainty in s, (differentiate (1) with respect to s, ds~.0005mm) is small compared to that in y, the order of 0.08%. We feel the thicknesses and spacing is good to the order of one millimeter.*

MAY SPEAKER IS DR. CLARK R. CHAPMAN

by Lisa Judd



Our May speaker is Dr. Clark R. Chapman, Senior Scientist of Southwest Research Institute and Adjunct Professor in planetary science at the University of Colorado, Boulder. He will be speaking to us about the early science results from the orbital phase of JHU/APL's Messenger Mission to Mercury, which has recently completed successfully the orbit insertion burn to begin its primary mission orbiting the planet. Dr. Chapman comes to us fresh from the first science team working session post-orbit insertion. To read more about Dr. Chapman, visit his website at *http://www.boulder.swri.edu/~cchapman/#BIO*.

PUBLIC NIGHT 2010 VOLUNTEERS HONORED

by Ron Pearson

At the DAS Annual Banquet on March 18th, our Chamberlin Observatory Public Night 2010 volunteers received Certificates of Appreciation from the NASA Night Sky Network, the DAS and the University of Denver's Dr. Bob Stencel for all the astronomy outreach work they do. Our Public Night and Open House Special pins from the Night Sky Network (NSN) were also presented to team members Bill Ormsby and David Shouldice for all of the extra nights they put in at Chamberlin Public and Open House nights, and Keith Pool received a NSN pin for heading up our External Outreach Program to schools and other organizations in 2010. Darrell Dodge also received a DAS "President's Constellation Award" plaque for all the duties and roles he has performed for DAS over the past several years.

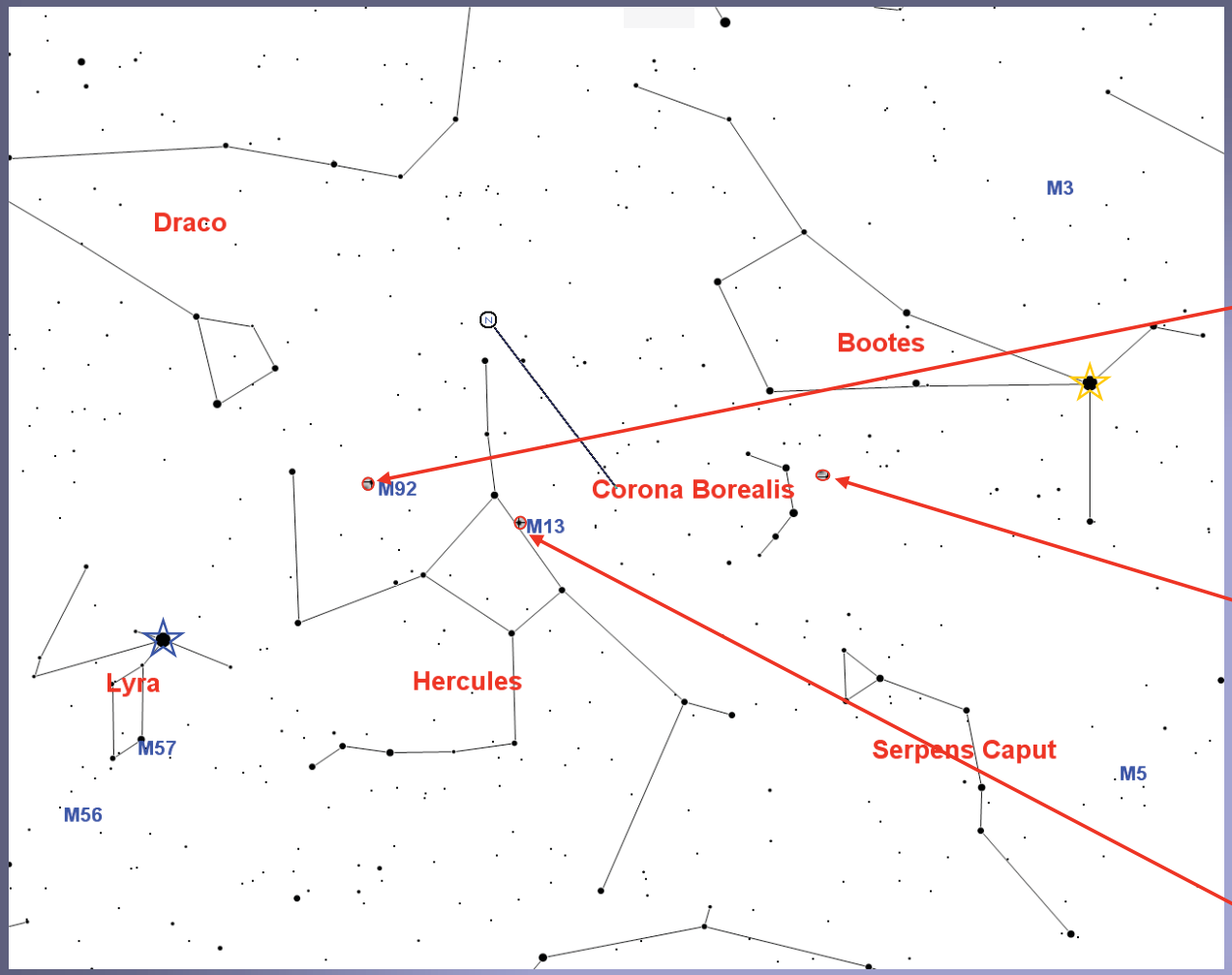
The awards were presented by Dr. Bob Stencel and DAS President Ron Pearson. If you are on a Public Night team and did not attend the banquet, you can pick up your certificate in the DAS office at Chamberlin. It was a great pleasure to provide this recognition to our team members and extend part of the "give-back" that the DAS received after joining the NASA Night Sky Network in late 2010.

Shown from left to right: Dr. Bob Stencel, Darrell Dodge, David Shouldice, Brad Gilman, Bill Ormsby, Frank Mancini, Keith Pool, Ron Mickle, Aaron Reid and Ron Pearson.

PRESIDENT'S CORNER *(CONTINUED FROM PAGE 2)*

to greatly extend the astronomy outreach capability of Chamberlin Observatory. The image quality of the new camera is far better than that of our old one.

However, don't sit at home staring at your computer screen, as the video still cannot beat the exquisite views of Saturn or the moon as seen by your human eye looking through the eyepiece of the telescope! Details and developments of using our observatory and viewing astro-video broadcasts will be developing, so watch for them. I hope you'll come out to our dark sky site or Chamberlin Observatory and enjoy the new flowers the galaxy has to offer this spring and summer!



Northeastern Sky — 9 p.m.

NEW ASTRONOMER'S DEN

May, 2011

Legends of Dragons, Champions and Herdsman Abound

A definite "first" for those new to globular clusters should be Messier 92, NGC-6341. At a distance of ~27,000 light years, it ranks as one of the brightest in the night sky, visible to the naked eye under excellent conditions.

Up for a challenge? The Corona Borealis Galaxy Cluster, Abell 2065, will tax your averted-vision observing skills. If you can spy the tiny hazy patches, know that you are gazing back in time over a billion years.

Messier 13 is one of the favorites of the spring and summer skies, easy to find and with a bright central region. Humankind's first message to proposed alien life was beamed in this direction in 1974 as a demonstration of new technology.

By now, nighttime temperatures are more pleasant for observing. If you've not been introduced, this is a great time to begin your search for the fuzzy circlets of luminous diamond dust known as **globular clusters**. These mammoth systems inhabit the outer fringes of the Milky Way's halo, and can contain from 50,000 to over a million stars. In the above chart, all but M-57 are globulars—enjoy the show. The constellation ***Lyra the Harp*** heralds the arrival of summer stars, particularly the bright disk of our home galaxy and the myriad of nebulae to be found in it, so now is an especially good opportunity to hone your star-hopping skills to take advantage of the celestial feast just over the horizon.

denverastro.org

Star chart courtesy *TheSky6* astronomy software suite.

BLOOMS IN THE HUNTING DOGS

Messier 63, the "Sunflower Galaxy" in Canes Venatici, actually belongs to a grouping of spiral galaxies that include M51, six degrees to the north. A distance of 37 million-light years separates Terra from NGC 5055. *Details: 18-inch f/4.5 Newtonian, ST 2000XM CCD camera, HaLRGB exposure totaling 1.25 hours.*

Image © Joe Gafford

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