The Objective View

September 2009

Newsletter of the Northern Colorado Astronomical Society

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Next Meeting: September 3 7:30 pm

A Tour of the Solar System and Beyond
by Dr. William Possel

Director of Mission Operations and Data Systems
Laboratory for Atmospheric and Space Physics
University of Colorado at Boulder

Club Business at 7:15 pm

Fort Collins Museum, 200 Mathews St
Fort Collins

http://www.fcgov.com/museum/

Club Brochure: http://www.ncastro.org/Contrib/2009_Brochure.pdf

NCAS Programs

Oct 1 Dr Suzanne Metlay NEOs et al., Secure World Foundation
Nov 5 TBA
Dec 3 Dr Jack Harvey Remote Imaging on Two Hemispheres

City of Fort Collins Natural Area Program at Sunset

Bobcat Ridge: Sep 24, Oct 22

Dark Site Observing Dates

Sep 18, 19 Keota or RAC site, ask FRAC

Other Events

Little Thompson Observatory, Berthoud 7 pm Sep 18 TBA
http://www.starkids.org

CSU Madison Macdonald Observatory Public Nights
On East Drive, north of Pitkin Street
Tuesdays after dusk if clear, when class is in session

Cheyenne Astronomical Society 7 pm Sep 18
http://home.bresnan.net/~curranm/
http://home.bresnan.net/~curranm/wuts.html

Chamberlin Observatory Open House, 7 to 10 pm
Sep 26, Oct 21, Nov 21 303 871 5172
http://www.du.edu/~rstencel/Chamberlin/

Longmont Astronomical Society 7 pm Sep 17 Bryan White
Nitescapes 3D http://www.longmontastro.org/

Aug 6 Program: The Journey to Palomar
By Todd and Robin Mason

George E. Hale was born during the boom in development in Chicago after the Great Fire in 1871. He persuaded his father to build an elaborate observatory with a spectroscope and discovered carbon in the Sun's spectrum. On his honeymoon he and his wife visited Mount Hamilton's Lick Observatory, then the largest. Turned down by other Chicago patrons, Hale appealed to the notorious Charles Yerkes to support the world's largest refractor for the University of Chicago. American progress and power were on display at the Worlds Fair in 1893, and included the tube and mount for the telescope. Yerkes threatened to pull out when he learned his telescope was destined for a site at Lake Geneva Wisconsin. The dedication of the observatory was delayed by the collapse of its movable floor. At it's completion, Hale was 29 years old and the director of the most sophisticated observatory in the world. Star distance measures were an early task. The nebulae remained out of reach, and Hale knew a larger telescope would be needed to measure their range. Flexure would compromise performance of a larger lens. Hale had a 60 inch mirror blank. No further funding would come from Yerkes. Hale suffered return of headaches and stomach disorders and lost his parents in the two years after the observatory opened. He then learned that Andrew Carnegie had dedicated 10 million dollars for scientific research. Hale proposed an elaborate observatory for Mount Wilson, California. He was turned down by senior astronomers and Carnegie. Hale took a chance and moved his family. A mule train took a day to haul one instrument up the mountain. Between days of winter rain, he exploited the world-class conditions to obtain the best solar images to date. His work and energy so impressed the committee, they agreed to fund his entire observatory. The project endured delays with the 1906 San Francisco earthquake, and the perils of the mountain roads. 500 trips were needed for completion. The 60 inch

mirror allowed Harlow Shapley to measure variable stars and determine the Sun's position in the outskirts of Milky Way galaxy. The nebula in Andromeda appeared to be a separate island universe. Hale refounded Pasadena as a center of science and culture. He discovered that the Sun had a magnetic field. He was soon promoting a larger telescope and proposed an 84 inch to hardware merchant John D. Hooker, who replied, "Make it 100 inches and I will pay for it." The St. Gobain Glass Works struggled to produce the 9,000 lb blank. When it was unpacked in the US, it was revealed to contain millions of bubbles and was initially pronounced unusable. Hooker pulled out. Carnegie paid a visit but was clouded out Hale suffered nervous exhaustion and started seeing a little demon. He made a trip to Europe to recover, and was in Italy when he caught news of Carnegie's announcement for support to complete the telescope. After 10 years, the mirror was hauled up the mountain while Hale was in Washington as an advisor for WW I. Hubble and Humason were soon imaging the Andromeda Nebula. They found a dim Cepheid variable star which placed it a million light years beyond the Milky Way. The expansion of the universe was revealed. It became clear that a much larger telescope would be needed to progress. Hale was 60 and emotionally exhausted when he wrote an essay proposing the 200 inch telescope. He made a 6 million dollar proposal to the Rockefeller Board, and succeeded. It was the biggest grant in the history of science. The telescope required new technology and engineering. Thompson proposed fused quartz for the primary, for thermal stability. A 60 inch test blank took $500,000 to produce, then cracked when the mold was opened too early by mistake. The new miracle glass Pyrex was retasked from pie plates and baby bottles. After 2 years, a cracked 30 inch disk and success with a 120 inch, the 200 inch was poured. It was ruined when pieces of the mold bobbed to the surface. The second pour survived its 1 year of cooling and was shipped to Pasadena by rail over 2 weeks, to massive public attention. The structure for the mount was unique in needs to support a million pounds yet move freely without vibration. It rides on a film of oil under pressure. The project endured Hale's death in 1938, but was suspended for 3 years for WW II. Dedication was in 1948 as the Hale Telescope. After a year of waiting, astronomers appropriated the instrument from the seemingly endless tweaking by the opticians. The scale of the universe, the expansion of the universe, and the discovery of quasars followed. Jim Gunn added electronic detectors in the 1970s and extended the capability over 100x. Planned successors to the Hale Telescope range up to 1,000 inch aperture. But his observatories remain a monuments to the best that humans can achieve.

Journey to Palomar is available on iTunes. For more info:

http://www.journeytopalomar.org/

August 6 Club Business

President Bob Michael called the meeting to order. This was our second meeting in the main gallery at the Fort Collins Museum, 200 Mathews St. Event dates were announced. Treasurer John Caldwell reported on the club account Next outreach events are at Bobcat Ridge, Soapstone Prairie and Rocky Mtn Natl Park. The Anthony impact scar on Jupiter was announced and Roger Appeldorn brought images.

Jupiter Impact Feature Report from Mike Prochoda

Early this morning (8/4/09) I managed to obtain some pretty good observations of the recent Jupiter impact feature in the deep southern Jovian atmosphere. I began a routine observing session late on the evening of 8/3/09, and was amazed at the sub-arcsecond seeing through my TEC 140 mm apo refractor. I got some amazing views of the waxing gibbous moon using my 3 mm Radian eyepiece (327x)with almost no movement of the image and very crisp detail. Turning to Jupiter, the moons were easily resolved into tiny discs with Ganymede and Callisto appearing significantly larger than Io or Europa, even at lower powers. The moons were nice round large discs in distinct contrast to the tiny diffraction disc of 6th magnitude 45 Capricorni which was a temporary "moonlet" of Jupiter this morning. By 1:00 AM, the GRS was in mid-transit and I could make out considerable internal detail in the spot itself using my 3 mm Radian and 3.5 mm Nagler eyepieces. The views were super-crisp and steady most of the time. I estimated the seeing at Pickering 8 or 9. Trying some double stars on such a steady night, I was able to widely split Delta Cygni (Mag. 2.9 and 6.3 with a separation of 2.5") using my 6 mm Radian (163x). Attempting a real challenge, I tried the "test double" Beta Delphini (Mag. 4.0 and 4.9 with a separation of only 0.5"). Using the 3 mm Radian (327x) I could see this very close double as a distinctly elongated Airy disc in the correct position angle. Amazing seeing!

Checking my SkyTools 3 program, I saw that there was a predicted transit of the new impact feature near 3:10 AM. I set my alarm and napped for about 1.5 hours, getting up at the appointed time. My refractor waited outside the whole time, remaining thermally equilibrated to the night air. Beginning at 3:00 AM and using various eyepieces including my 6 mm Radian (163x), 4 mm Radian (245x), 3.5 mm Nagler T6 (286x), and 3 mm Radian (327x), there were times I felt that I could see the feature during moments of very steady seeing. By 3:10 AM, I was disappointed that it was not more obvious. However, about 10-15' later (past transit) the atmosphere steadied even more, and the impact feature became quite easy to see (clearly visible about 50% of the time). It has become quite elongated and I estimated it's longitudinal length to be close to the width of the GRS. Though much darker than the surrounding atmospheric bands, barges, belts, etc., I did not feel that the impact feature was anywhere near as dark as a shadow transit of a Jovian moon (as described by others). Transits always appear jet-black to me, while the impact feature was more of a dark grey in color. The feature was clearly visible until about 3:35 AM, at which time it was rotating fairly far away from the central meridian making it more difficult to see, and some intermittent cumulus clouds started slowly passing overhead which obscured Jupiter about 2/3 of the time. Overall an amazing view, though not in the same league as the Shoemaker-Levy impacts I observed 15

years ago using my 8" F/7 Newtonian (those were VERY EASY to see at low power and very dark).

I agree with Dan Laszlo's post of a couple days ago that the impact feature is most easily observed after transit and not before or when it is directly on the Jovian central meridian. I wonder if the reflectivity of the feature may change with the angle of the reflected sunlight, making it easier to see after transit. I suspect the feature will be "smeared" to nothing in the next 1-2 weeks, so look soon!

Clear Skies,
Mike Prochoda (Estes Park)

Nebraska Star Party 2009 Report by Rick Sipin

2009 Nebraska Star Party Observation Report

My family and I decided to attend this year's NSP, at Merritt reservoir, which is about 30 miles SW of Valentine NE. Touted as a truly dark site event, the week did not disappoint at all with plenty of quality observation time. We arrived a day early on Saturday, set up with some other early attendees, and enjoyed a good but short night of observing, after the long drive.

On Sunday, most of the attendees arrived, about 240 in all, most hailing from the Lincoln and Omaha clubs and surrounds. There were a few attendees from CO, MO, SD and Texas, with a couple from the east coast – NJ, NC and Virginia. We met some nice people and enjoyed our visits.

Stargazing was thwarted on Sunday, after a noisy, wet and windy storm came through the campground. Monday looked to be a repeat after a large front roared through right after the organized dinner, but the Nebraska skies opened up around 11:30 to some spectacular views. We were treated with naked eye limits well into the 7's – I heard of some 7.6 claims, but my eyes aren't good enough any more to validate that. After spending a number of nights at Denver's Deer Trail site, I can say it was comparable to some of the better nights there, with absolutely no light domes in any direction, and better clarity at low elevations. Tuesday, Wednesday and Thursday nights were also filled with excellent seeing. We were treated to 2 spectacular flyovers of the shuttle, one of which I followed at 80X in my scope, right up through Zenith. It was amazing to watch the details reveal themselves as the shuttle passed almost directly overhead. To be able to see the truss work and structure of the solar arrays in bright gold which turned to bronze was a sight I won't soon forget. Tuesday night we had a fairly extensive aurora spanning the complete northern horizon to about 10 degrees above. It was mainly a dull green, but flashed a little detail from time to time, and lasted the entire evening. It put a small damper on viewing to the north. For an excellent snapshot, see the following URL, which includes some other pictures of the NSP.
http://www.howardedin.com/photos/nsp-20090722.html
Howard Edin's picture of the aurora was posted on Spaceweather.com for a few days.

I was lucky enough to log 72 Messier objects Monday - Wednesday night, plus an more than a dozen other NGC objects. It was a true delight to be able to open my pocket sky atlas, select a target, and rapidly be able to find it in the sky. Caught my first couple of Barnard Dark Nebulas (B92 & 93) which really do require such a dark site to appreciate. Some of my favorites were M11, NGC 869/884 and the Saturn and Blue Snowball nebulas (NGC 7009/7662). Thursday was a short night, but fun to just open the chart to Coma Berenices and pick off the galaxies. We heard about the impact on Jupiter, but the timing of the transits wasn't clear. Watched a few nice shadow transits on Jupiter, and got decent views of all the planets as well.

Other highlights, although we were at a very primitive and remote site, the catered meals were really excellent, there were LOTS of door prizes, the couple of vendors were good, and the reservoir and surrounds made for some nice activities for the family during the day. The day in Valentine at the high school had a couple of talks and another chance to see 400 years of the telescope. All in all a relaxing and enjoyable time. If you don't mind primitive and can carry all your essentials, please consider it when you plan next year's excursions.

Rick Sipin
new NCAS member
Orion SkyQuest 10" XTi Dobsonian

The Very Long Mystery of Epsilon Aurigae, by Robert Stencel

See Sky and Telescope, May 2009
http://mysite.du.edu/~rstencel/epsaur.htm

WUTS at Foxpark Aug 2009

A huge thanks to the CAS and LASSO crews for seeing to our basic creature comforts and observing needs. What a pleasure to have the company of dozens of observers, superb dark skies, and freedom from bonfires. We are so in your debt for reserving this accessible site.

Aug 20-21 was great for collecting globular clusters, M 10, M 12, M 13, M 15, M 22. Good views were had of M 8 and M 20, M11, M 16, M 17, M 51, M 101, the NGC 7331 region, and NGC 891. Really tough to quit staring at the Crescent Neb NGC 6888, the Veil and M 27. A little paranoia re dark adaptation kept me from checking out Jupiter when the seeing was best. The predawn skies were good for Southern specialties NGC 253 and NGC 246. Good to catch up with DSMs Brian Simpson, Tom Teters and Dave Dunn. Apologies to the other voices in the dark I've spaced.

The Friday Sun sprouted some low shrubbery in H-alpha views. The sunspot drought continues. It was good to see more of the NCAS crew arrive for the best night for dark skies: Greg Halac, Jon Caldwell, Dave and Deanna Chamness,

Nate Perkins. The local array of scopes then ran from 7" to 25" including sculptural ATM projects: Nate's 16 ultralight Dob and Jon's homeground 12 inch mirror in a horseshoe eq mount recalling the Mt Palomar icon. Best views of Jupiter early were in Greg's 17.5 Telekit. The dark and starry night featured the dusty Milky Way arching over the evening observers. Dark nebulae ran from the Pipe Neb in Ophiuchus to mottling in the Perseus-Auriga region, sign of a really dark night. These popped in binoculars. The Sky Quality meter maxed at 21.69 pointed NW, with some Milky Way interference. Dave narrowed down Pluto to a little 14th mag triangle, and it declared itself by shift next night. Early evening was binary hour, for Eta Cas, Iota Cas, Cor Caroli, Mizar, Epsilon Boo, Albireo. A galaxy and galaxy cluster run was next with Seyfert's Sextet showing 4, M 51 with bridge, M101, NGC 7331 and Stephen's Quintet, M 33. Later the NGC 704 group. Ladder climbers were rewarded with brilliant M13 and dim attendant galaxies, M27 great even unfiltered and NGC 6888. The Veil was a balancing act to sweep the length. Paul Robinson tracked down Comet Christensen by Sagitta and later the very diffuse 22/P Comet Kopff. Paul alerted us to the 2122 Iridium flare and 2200 Jovian sat eclipse. Seeing looked decent so we ran up the power to 450x on M57 for a pretty comfortable view of its central star. Mike Prochoda, Max and Ray Moe stopped in and Max pointed out the hotspots in NGC 246. Other PN were NGC 6210, NGC 6826, a mottled NGC 6781, NGC 7662, a field-filling NGC 7293, and 7009 with its dim ansae. Max pointed out the FLIERS emit H-alpha and don't get help from an OIII filter. Other PN looking good later were NGC 7008, NGC 1514 and NGC 1535. We cranked up the power on NGC 253 and NGC 891, and M 2. Mike P and I were able to faintly trace the zodiacal band from the East's zodiacal light to the Jupiter region, where it was overwhelmed. A low power sweep caught M 38, the Alpha Per region and NGC 457. M 42 made a wavy appearance at the treetops.

Saturday showed little change in quiescent prominences on the Sun. Dan Rey stopped by for a chat about his refractor projects and Max filled us in on his summer at Virginia and AGN. Bill Possell gave impressive specs on the scope of the Kepler mission and Chip K fleshed out the WIRO story. Sat night started with the cloud waiting game, then a race to spot one of every type before we got socked in. We got a few binaries, then the Double Cluster, Veil, M 11, M22, M57, B86, Jupiter which later had a GRS transit. Max suggested the very dim Abell 39, barely there in the OIII filter. Dave Chamness logged Pluto. NGC 6543 had its central star apparent. Clouds extended from the West to shut us down around midnight, leaving only Jupiter and the brighter stars.

Thanks to all for the enlightening weekend, and hope to see a few at Mills Canyon NM in the coming months.

Dan Laszlo, NCAS

Greg Halac, Jon Caldwell, Nate Perkins, and Gene Schmidt in recovery from nocturnal photon overdose at WUTS 2009.

From Rob Grover: Weekend Under the Stars 2009 offered two excellent nights of observing. I devoted one of those nights - Friday, August 21 / Saturday, August 22 to collecting some images. For those interested, my imaging setup consists of the following: Celestron C8N-GT - 8 inch Newtonian (1000mm f/l f5) on the ASGT (CG-5) Go-To Mount

KWIQ Guider - a QHY5 guide camera (similar to the Orion Starshoot Autoguider), attached to a modified 50mm finderscope Canon XSi (450D) camera - unmodifiedGuiding Software – PHD. Image Capture, Camera Control, Aligning, Stacking and all Processing - Nebulosity 2 Mount Control Software – NexRemote w/ NexGPS. All run through an HP laptop running Windows XP, powered by a Die Hard deep cycle marine battery. I began learning how to image about 6 months ago and am finally getting some images I am willing to share. Limiting flexure and getting the guider settings correct were the most difficult and time consuming chores in this process. The single frame of M16 has me itching to get out to a dark sky site the next clear night so I can spend a couple hours collecting photons from that target.

M20 - The Trifid Nebula. Stack of twelve 4 minute exposures @ ISO 1600. 7 dark frames stacked & subtracted.

No flats or bias frames. Color Background Adjusted. Digital Development: Color Scaling to boost red a bit

M27 - The Dumbell Nebula. Stack of twelve 5 minute exposures @ ISO 1600. 7dark frames stacked & subtracted. No flats or bias frames. Color Background Adjusted. Digital Development: Color Scaling to boost red a bit.

M16 – The Eagle Nebula. A single 5 minute exposure @ ISO 1600. 7 dark frames stacked & subtracted. No flats or bias frames. Color Background Adjusted. Digital Development: Linear Stretching.

Robert Grover

WUTS Serendipity from Andrew Planck

Hello all,

I had a wonderfully serendipitous thing happen at WUTS this year. In addition to having some fantastic viewing all three nights, on Saturday morning a young fellow dropped by my site (he had just arrived) and started speaking to me. He definitely seemed a newbie, and was asking me about my telescopes and what the WUTS weekend was all about. He spoke with an instantly identifiable French accent, and since I am a French teacher I sprang into action--shifted the conversation into French, and we became instant best friends.

Antoine had had no experience with astronomy and had never even looked through a telescope. He lives in France but was in Denver on business. He got an adventurous bee in his bonnet and wondered if anything was happening in the astro world while he was here. Three clicks of the computer brought him to WUTS. He googled "astronomy Denver" which got him to a calendar of astro events which got him to WUTS. He thought it looked interesting so he rented a car and and drove up without a clue about what he was getting into. He was also totally unprepared. He had no sleeping bag and bought a thin blanket from the Salvation Army for $1.00. He was planning to sleep sitting up in his car. He had no idea how cold it could get at Fox Park and I told him, "Mon ami, tu vas mourir"--my friend, you're gonna die! I fortunately had an extra sleeping bag and told him he could sleep "upstairs" in my Eurovan camper. (I had to insist because he was being polite. I probably saved his life!)

In Antoine I saw a delicious and irresistable opportunity to "Pay it Forward." When my wife and I lived in France several years ago we were treated with extraordinary kindness and generosity by everyone we met, but especially by two of our neighbors. One neighbor rented a TV for us for the year ("so that we could improve our French") and the couple that owned the fish market down the street actually gave us their extra car to use for the year. So I abandoned all of my personal viewing plans for the evening and I devoted all of my attention to giving Antoine the best possible tour of the universe that I was capable of. It was just him and me for the whole night, and we hopped from one astonishing sight to the next. He was so blown away by what he saw that he could hardly see straight, and just flat out ran out of superlatives! I mean, imagine you've never seen through a telescope and all of a sudden you find yourself under very dark skies with a 14 1/2" dobsonian entirely at your disposal, and one after the other you're introduced to M31, M13, Albireo, the Wild Duck, the Dumbbell, M57, the Whirlpool, the Double-Double, the Blinking Planetary, the Swan, the Lagoon, the Veil, the Double Cluster, the Pleiades, Jupiter, etc., etc! He was also an incredibly gifted student and blew me away when he was able to take my green laser and point to, and name, most of the things we had seen (with correct Messier numbers)!

It was, I believe, a memorable evening for both of us and I had the gratification of being able to repay France for at least a small portion of a long-standing debt.

-Andrew Planck

A Mysterious Motionless Object at Dusk Aug 29, from the SeeSat-L List

>> On Monday 31 August 2009 22:19, Christian F. Ackermann wrote:> Location of observation: Mannheim, Germany +49.5055 -8.4712> Time of observation: Saturday

August 29 2009, 20:30 local time (18:30 UTC; according to my wife ± 10 minutes because it was already too dark to read her watch precisely). Looking straight up, approximately at the zenith, there was a bright white star-like spot that did not scintillate and was clearly in the negative magnitude range. It didn't appear as bright as Jupiter did that night (-2.8 mag) against a black sky but against the civil twilight sky it appeared maybe half that bright. I could observe the object for several minutes (2 to 5) and during that time I could not notice any movement (I did not have visible references like a roof or other stars in close vicinity to that object) or change of brightness. Finally I looked up again and the object was gone. I checked the sky periodically for 5 to 10 minutes after that but it did not appear again. <<

What you have observed was a weather balloon. This time of the year the illumination is just right for your location to see this phenomenon. Every day such a balloon is launched some 100 km away from your place at 16:45 UT and depending on the wind it may drift toward you. At 18:30 UT the sky is already dark enough and the balloon high enough to see it.

I had a spectacular view of it yesterday (31-AUG-09) through a scope with 60x magnification. It appeared with about 1 arcmin diameter and there was a specular reflection at one spot. At 18:37:01 UT it exploded having by now reached an altitude of probably some 35 km or so. I could clearly see the debris flying into different directions. One larger part (the instruments?) was coming down faster.

I think you can look for this balloon for another two weeks or so.

Gerhard HOLTKAMP
Darmstadt, Germany

Best Looks

Moon By Jupiter Sep 2,3 and 28, 29; by Mars Sep 13
By Venus Sep 16; By Antares Sep 23

Mercury Difficult in E dusk, after Sep 28
Venus In E predawn. By M44 Sep 1, 2; by Regulus 20th
Mars In E predawn
Jupiter In SE in evening
Saturn Lost in glare
Uranus In SSE in Pisces
Neptune By Jupiter all month in Aquarius

WUTS Aug 21 2009 North Telescope Field Composite by Tom Teters

International Space Station Passes for Loveland – Fort Collins September 2009

Check on times due to STS 128 Mission

Date	Mag	Starts			Max. altitude			Ends		
		Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
1 Sep	-0.9	04:38:40	14	NNW	04:40:21	22	NNE	04:42:42	10	E
2 Sep	-2.7	05:03:20	17	NW	05:05:21	55	NE	05:08:12	10	ESE
3 Sep	0.0	03:56:47	13	ENE	03:56:47	13	ENE	03:57:12	10	E
3 Sep	-2.9	05:28:21	18	WNW	05:30:08	39	SW	05:32:51	10	SSE
4 Sep	-0.5	04:22:09	14	ESE	04:22:09	14	ESE	04:22:39	10	ESE
4 Sep	-1.2	05:53:45	11	WSW	05:54:41	12	SW	05:55:47	10	SSW
5 Sep	-0.7	21:08:06	10	SW	21:08:27	13	SSW	21:08:27	13	SSW
6 Sep	-1.5	19:58:59	10	S	20:00:42	15	SE	20:02:08	11	E
6 Sep	-0.6	21:32:53	10	WSW	21:33:42	17	WSW	21:33:42	17	WSW
7 Sep	-3.2	20:22:28	10	SW	20:25:16	51	SE	20:27:01	20	ENE
7 Sep	0.3	21:58:27	10	WNW	21:58:33	11	WNW	21:58:33	11	WNW
8 Sep	-2.3	20:47:18	10	WSW	20:50:03	43	NNW	20:51:33	22	NNE
9 Sep	-3.2	19:36:50	10	SW	19:39:38	55	SE	19:42:27	10	ENE
9 Sep	-0.7	21:12:54	10	WNW	21:15:03	19	NNW	21:15:49	17	N
10 Sep	-2.1	20:01:41	10	WSW	20:04:25	41	NNW	20:07:10	10	NE
10 Sep	0.0	21:39:04	10	NW	21:39:53	12	NNW	21:39:53	12	NNW
11 Sep	-0.7	20:27:17	10	WNW	20:29:25	18	NNW	20:31:33	10	NNE
12 Sep	-0.2	20:53:29	10	NW	20:54:36	12	NNW	20:55:43	10	N
13 Sep	-0.8	19:41:40	10	WNW	19:43:46	18	NNW	19:45:50	10	NNE
14 Sep	-0.3	20:07:53	10	NNW	20:08:56	11	NNW	20:09:58	10	N
16 Sep	-0.3	19:22:16	10	NNW	19:23:14	11	N	19:24:13	10	N
16 Sep	-0.4	20:58:46	10	N	20:59:20	11	N	20:59:20	11	N
17 Sep	0.0	21:22:47	10	NNW	21:22:57	11	NNW	21:22:57	11	NNW
18 Sep	-0.5	20:12:57	10	N	20:13:46	11	N	20:14:35	10	NNE
19 Sep	-1.0	20:37:00	10	NNW	20:38:45	16	NNE	20:38:45	16	NNE
20 Sep	-0.6	19:27:08	10	N	19:28:00	11	N	19:28:54	10	NNE
20 Sep	-0.8	21:01:16	10	NW	21:02:25	19	NNW	21:02:25	19	NNW

http://www.heavens-above.com/main.aspx?lat=40.4997&lng=-105.05736&loc=Fort+Collins+CO+USA&alt=0&tz=MST

President Bob Michael and Educator Deb Price at the Bobcat Ridge Aug 27 Starwatch