The High Desert Observer

March 2017

The Astronomical Society of Las Cruces (ASLC) is dedicated to expanding public awareness and understanding of the wonders of the universe. ASLC holds frequent observing sessions and star parties and provides opportunities to work on Society and public educational projects. Members receive the *High Desert Observer*, our monthly newsletter, plus membership to the Astronomical League, including their quarterly publication, *Reflector*, in digital or paper format.

Individual Dues are $30.00 per year

Family Dues are $36.00 per year

Student (full-time) Dues are $24.00

Annual dues are payable in January. Prorated dues are available for new members. Dues are payable to ASLC with an application form or note to: Treasurer ASLC, PO Box 921, Las Cruces, NM 88004. Contact our Treasurer, Patricia Conley (treasurer@aslc-nm.org) for further information.

ASLC members receive electronic delivery of the HDO and are entitled to a $5.00 (per year) Sky and Telescope *magazine discount.*

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ASLC Board of Directors, 2017

Board@aslc-nm.org

President: Howard Brewington; President@aslc-nm.org

Vice President: Rich Richins; VP@aslc-nm.org

Treasurer: Patricia Conley; Treasurer@aslc-nm.org

Secretary: John McCullough; Secretary@aslc-nm.org

Director-at-Large: Sidney Webb; Director1@aslc-nm.org

Director-at-Large: Ed Montes Director2@aslc-nm.org

Immediate Past President: Daniel Giron; astrofix@comcast.net

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Grants: Sidney Webb; sidwebb@gmail.com
Librarian: ***OPEN***
Loaner Telescope:Sidney Webb; sidwebb@gmail.com
Membership: Judy Kile; judykile3916@gmail.com
Night Sky Network: ***OPEN***
Observatories:
Leasburg Dam: David Doctor; astrodoc71@gmail.com
Tombaugh: Steve Shaffer, sshaffer@zianet.com
Outreach: Chuck Sterling; csterlin@zianet.com
Web-Site: Steve Barkes; steve.barkes@gmail.com
HDO Editor: Charles Turner; turnerc@stellanova.com

March Meeting --

Our next meeting will be on ***Friday, March 24***, at the Good Samaritan Society, Creative Arts Room starting at 7:00 p.m.
The speaker will be Steve Barkes
Topic: Messier Marathon.

Member Info Changes

All members need to keep the Society informed of changes to their basic information, such as name, address, phone number, or emai address. Please contact Treasurer@aslc-nm.org and jkile3916@gmail.com with any updates.

Events

ASLC hosts deep-sky viewing and imaging at our dark sky location in Upham. We also have public in-town observing sessions at both the International Delights Cafe (1245 El Paseo) and at Tombaugh Observatory (on the NMSU Campus). All sessions begin at dusk.
At our Leasburg Dam State Park Observatory, we hold monthly star parties. Located just 20 miles north of Las Cruces, our 16" Meade telescope is used to observe under rather dark skies.
Please see *Calendar of Events* for specific dates and times.

What's Up ASLC?

March 2017

We had a nice group for our February meeting and a great presentation by club member, Gary Starkweather. Gary's topic was astro-image mosaics, which is very complicated and labor intensive. But, he went into great detail while describing his process. Gary's presentation was well received, and ASLC is fortunate to have members such Gary.

After the meeting, several members, including myself, drove down to the Pecan Grill for a refreshment. Since I'm a home-brewer, I was pleased to find such a nice variety of craft beers on their menu. Our conversations included upcoming star parties in May, but we also talked about our Messier Marathon, which is scheduled for 25 March. This event will be held at the club's observatory at the Leasburg Dam State Park. All members are invited, and we hope to have a nice turnout.

Speaking of turnouts, I'm very impressed with the involvement of our membership. We have great outreach programs headed-up by Chuck Sterling and Steve Shafer. And, many thanks go to Rich Richins and Steve Barkes for the club's webpage. With our newsletter, Charles Turner does a fine job each month with ongoing contributions from Burt Stevens, John Cutney, Alex Woronow, and Jeffery Johnson. This type of dedication is what makes our club great!

During 2017, I'd love to see a few more members come forward to help with ASLC's business and fun. Currently, we need a club librarian and Night Sky Network liaison. Likewise, we can always use an extra scope at one of our many outreach programs. Or, feel free to join us at the Cosmic Campground or Texas Star Party in late May. If there's an idea for a club project, let me know, and I'll see what I can do. Our club was chartered more than sixty years ago, and its longevity is a result of our members' enthusiasm!

Howard Brewington
ASLC President

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Outreach
Outreach is a very important part of ASLC. We are always looking for more volunteers to help us educate the public. Even if you do not have a portable telescope to bring to the events, please consider attending our public outreach programs to help answer questions, share knowledge and point out objects in the sky.

Outreach Events

by Jerry McMahan

Dona Ana Elementary School, February 9, 2017

Some the problems with this event included thin clouds and a nearly full Moon. Some of the good points included a very good crowd and a good turnout of telescopes.

Chuck Sterling set up his 10 inch and sent pictures and information that the teachers passed out to the students. Sid Webb complimented Chuck on his continued hard work to make these school star parties possible. Sid set up his 10 inch Dobsonian and commented on how this school would provide more dark skies, minus a full Moon, than any of the other schools we attend.

Burt V also set up his 8 inch scope as did Tracy Stuart. Ed Montes brought his little, high quality, refractor and I had the 125 ETX scope.

We observed the Moon, Venus and the Orion Nebula as well as which objects were free of the clouds. It did not take a long wait to have the clouds move out from the object being observed.

Desert Hills Elementary, Thursday, February 16

Chuck Sterling, Howard Brewington and Jerry McMahan set up telescopes. We usually have more scopes at this event, but we were able to handle the crowd without much difficulty.

Venus, Uranus and the Orion nebula were seen through the telescopes. A little closer to Earth was a high altitude pass of the International Space Station.

Leasburg Dam State Park, Saturday, February 18

The weather report had indicated that we would probably not be able to have a viewing session, but it was clear when we set up and we had good viewing until the clouds rolled in at about 8 PM.

Sid Webb and Ed Montes operated the 16 inch in the observatory. Chuck Sterling and Jerry McMahan set up scopes on the grass. Chuck had his 10 inch and I brought the 8 inch.

Tombaugh Observatory, Friday March 3

Cloudy. Canceled. Steve Shaffer and I did attend, but none of the domes were opened for observing.

Moongaze, Saturday, March 4

What a difference a day makes. We had a clear night with little or no wind. . Chuck Sterling, Ed Montes, Howard Brewington and Jerry McMahan brought telescopes. John McCullough also stopped by. Venus and Uranus were observed, but we were mostly on the Moon.

At about 8:30 P.M., the Moon occulted the star Aldebaran. We saw the star reappear about an hour and fourteen minuets later. Aldebaran is the brightest star that we see disappear behind the Moon. OK, OK, I know the Sun is a star, but you know what I mean!

We did not have many people stop to look through the scopes. One man was interested in imaging, so he stayed a long time talking to Chuck There may have been more club members present, than people just stopping by to look through the scopes. Besides the Astronomical Society of Las Cruces members, mentioned above, Howard told members of the Radio Club about Moongaze and many of them showed up as well.

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Calendar of Events (Mountain Time - 24 hr. clock)

Mar	01	17:50	Sun Sets
	03	18:30	Mesilla Valley Christian School
	03	19:00	NMSU: Tombaugh Observatory Open House
	04	17:30	OUTREACH; MoonGaze, International Delights Café
	05	04:32	First Quarter Moon
	12	00:00	Daylight Saving Time Begins (“spring forward”)
	12	08:53	Full Moon
	15	21:54	Jupiter Transit: Europa 21:54 to 00:16 (10º to 36º alt)
	16	05:18	Jupiter Transit: Io - 05:18 to 07:29 (37º to 13º alt)
	17	02:48	Jupiter Transit: Ganymede 02:48 to 04:45 (51º to 41º alt)
	17	11:46	Jupiter Transit: Io - 11:46 to 01:55 (32º to 49º alt)
	18	19:00	OUTREACH; Dark Sky Observing at Leesburg Dam State Park
	20	04:29	Spring Equinox - Spring Begins
	20	09:59	Last Quarter Moon
	23	00:11	Jupiter Transit: Europa 00:11 to 02:32 (40º to 51º alt)
	24	19:00	ASLC Monthly Meeting; Good Samaritan Society, Activities Meeting Room
	25	01:30	Jupiter Transit: Io - 01:30 to 03:40 (50º to 46º alt)
	26	19:56	Jupiter Transit: Io - 19:56 to 10:06 05º to 22º alt)
	27	20:57	New Moon
	30	02:27	Jupiter Transit: Europa 02:27 to 04:48 (50º to 33º alt)
Apr	01	03:14	Jupiter Transit: Io - 03:14 to 05:24 (46º to 23º alt)
	01	19:32	Sun Sets
	01	19:32	OUTREACH; MoonGaze, International Delights Café
	02	21:39	Jupiter Transit: Io - 21:39 to 23:50 (22º to 43º alt)
	03	12:39	First Quarter Moon
	06	04:42	Jupiter Transit: Europa 04:42 to 07:04 (29º to 01º alt)
	07	21:00	NMSU: Tombaugh Observatory Open House
	08	04:57	Jupiter Transit: Io - 04:57 to 07:07 (24º to -01º alt)
	09	23:23	Jupiter Transit: Io - 23:23 to 01:33 (45º to 51º alt)
	11	00:09	Full Moon
	15	20:00	OUTREACH; Dark Sky Observing at Leesburg Dam State Park
	16	00:00	Easter - All Day
	16	20:04	Jupiter Transit: Europa 20:04 to 22:28 (16º to 42º alt)
	17	01:07	Jupiter Transit: Io - 01:07 to 03:17 (51º to 35º alt)
	18	19:33	Jupiter Transit: Io - 19:33 to 21:43 (11º to 37º alt)
	19	03:57	Last Quarter Moon
	21	19:13	Jupiter Transit: Ganymede 19:33 to 21:20 (10º to 36º alt)
	23	22:20	Jupiter Transit: Europa 22:20 to 00:44 (45º to 51º alt)
	24	02:51	Jupiter Transit: Io - 02:51 to 05:01 (35º to 10º alt)
	25	21:17	Jupiter Transit: Io - 21:17 to 23:28 (37º to 52º alt)
	26	06:16	New Moon
	28	19:00	ASLC Monthly Meeting; Good Samaritan Society, Activities Meeting Room
	28	22:30	Jupiter Transit: Ganymede 22:30 to 00:42 (49º to 50º alt)

Be sure to visit our web site for ASLC information: *www.aslc-nm.org*

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Announcements

1. March's ASLC speaker is ASLC Member, Steve Barkes. The topic will be Messier Marathon. The presentation includes planning, preparation, and strategy to complete this very fun challenge.

2 The agreement to use the facilities at Good Sam for our meeting prohibits members from bringing in ANY food or beverages, except water in a container with a screw lid. Take note: no more Starbucks or Saturn Cookies!

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Meeting Minutes

by John McCullough

Minutes, January 2017 ASLC Meeting

Show & Tell:

John Kutney demonstrated a "noise" trap or "lawn mine" he uses to protect his telescope ant other equipment against tampering while in the field. To purchase one or to see other versions, he recommends searching lawn mines on the internet.

Steve Barkes talked about having a Messier Marathon at Leasburg Dam State Park (LDSP) on 25 March. The Society may host another pot luck as a starter but more details will be in the newsletter, The High Desert Observer (HDO). Sid Webb has information regarding camping at LDSP and will give it to Steve to include in the article. Sid also stated he would like more members to be checked out on the 16" Meade in the LDSP Observatory as David Doctor, the current primary operator, is encountering more conflicts with his schedule.

Charles Turner had several large format images he is donating to the Society for a raffle.

Call to Order:

Howard Brewington, President, Astronomical Society of Las Cruces (ASLC, the Society), called the February 2017 business meeting to order at 7:14 pm, 24 February 2017, Creative Arts Room, Good Samaritan Society Las Cruces Village, 3011 Buena Vida Circle, Las Cruces, New Mexico.

President's Comments:

Howard Brewington, President, welcomed the group to tonight's meeting. He reported that apparel with the Society logo is available and that he would like a volunteer to handle that responsibility during his tenure as President. There were no visitors or guests present at this month's meeting and Howard asked all members present to sign in on the rosters at the rear of the room. Howard thanked Charles Turner for the February edition of the HDO and the people that contributed excellent images for the issue. The minutes of the January 2017 meeting were published in the February 2017 HDO. If there were no corrections, Howard asked that the minutes be accepted as submitted by acclamation; they were.

Treasurer's Report:

Trish Conley, Treasurer, reported the budget for this year is very similar to last year's with two (2) exceptions: increased liability insurance premium and a payment of approximately $500 to IPower for three (3) years web domain hosting. There were other considerations that could affect the budget. There may be ways to economize on web hosting costs. A membership dues increase may be required in the future. Fred Pilcher stated he understood the stresses on the Society's finances and supported a dues increase if necessary, but would like to have a more detailed accounting of the Society's expenses. Trish indicated she would have more detail at next month's meeting.

Outreach:

Chuck Sterling, Outreach Coordinator, reported there will be an open house at the Tombaugh Observatory on 03 March. Steve Shaffer reported no clouds at the last open house. There will be a Moon Gaze at International Delights Café (IDC) on 04 March. The monthly event at Leasburg Dam State Park (LDSP) will be 18 March. There will a star party at Bright Beginnings Pre-School on Friday, 10 March. Contact Chuck for details. + Texas Star Party 2017;

Volunteer Positions:

There are several opportunities to serve the Society in volunteer positions, such as apparel coordinator. Contact Howard Brewington if you are interested.

Cosmic Campground:

Steve Barkes had located a scientist at New Mexico State University (NMSU) involved in climate research that can utilize the data collected at the Cosmic Campground and who would be interested in sponsoring the data station there.

Speakers:

Steve Barkes will make the presentation in March. A speaker is needed for the April meeting.

Presentation:

This month's presentation was by Society member Gary Starkweather on photo mosaics. Gary, currently a resident of the New Mexico Astronomy Village north of Deming, moved from Florida to pursue astronomy. He began his presentation with a video of what it's like to do astronomy on the road. While engaged in this pursuit, he became interested in photo mosaics that present a large field of view with large amounts of detail. Gary went on to describe the imaging equipment he used to collect mosaic data of Orion, how he captured the data and processed the images. He also described some of his issues with data management, image alignment, layering, and finishing adjustments. He also covered some of his trials dealing with data density and large format printing. He then presented his end result: a large format (approx. 4' x 8') print of Orion from Betelgeuse to Rigel.

The February meeting of the Astronomical Society of Las Cruces concluded at 8:42 pm. A period of social interaction commenced shortly after at Pecan Grill.

-Respectfully submitted by John McCullough, ASLC Secretary

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Back at the Telescope
by Bert Stevens

Staying Warm at the Eyepiece

AHere in the desert southwest we have benign winters. Our typical nighttime lows are in the twenties, with an absolute lowest temperature ever recorded in Las Cruces of -10 degrees Fahrenheit on January 11, 1962. This allows us to observe in winter without going to extremes.

Observers in the Midwest have to deal with much colder average temperatures. In addition, Midwestern winters are usually cloudy. It is not too surprising to have two months of cloudy nights in a row. When the sky does clear, it is usually the result of a frigid Canadian high-pressure dome.

Warm southerly winds bring Gulf of Mexico moisture northward on the backside of a low-pressure center. The frigid cold high-pressure pulls down cold air out of Arctic. Where the two air masses meet, a cold front lifts the moisture higher, cooling it, allowing it to condense out and fall as snow. The snowstorm sweeps across the region followed by very cold temperatures.

When the high pressure clears the skies, observers must take advantage of the infrequent clear weather to record the sky. This frequently means fighting both the cold and the newly deposited deep snow to make observations. This can be a daunting combination. The Racine Astronomical Society's Modine-Benstead Observatory is on a small hill with a teardrop-shaped driveway. During the winter, the driveway was not cleared of snow and accessing their sixteen-inch Cassegrain was difficult.

It would take an hour to reach the observatory driving down Interstate highways, arterial and local roads that had been cleared of snow. The cold-weather gear was too bulky to have on in the car, so driving to the observatory was done in more civilian clothes. Reaching the observatory, the car is parked up against the snow-banks on the side of the road to reduce the risk of being hit from behind, making access to the passenger side of the car impossible.

Figure 1: *This sixteen-inch Cassegrain telescope was made by members of the Racine Astronomical Society. It has an exchangeable front-end that also provides a Newtonian diagonal and focuser. This excellent instrument gives great views of the sky.*

With the air outside the vehicle around -10 degrees Fahrenheit, it was time to get dressed. The cold weather gear started with an undershirt to help wick-away moisture from the body, with a flannel shirt over it. Even this would normally be far too warm, but as the car cooled-off, it was comfortable.

Feet are very important to protect since they would be touching the cold observatory floor. Dressing the feet for cold-weather observing started with cotton socks, again to wick-away moisture from the feet. Next comes thick wool socks to keep the heat in. The final touch is heavy boots with felt liners. The three-quarter-inch felt liners provided insulation while the boot itself kept moisture from the snow away from the felt liners.

Figure 2: *Goose-down pants, often used by hunters in cold weather, provide excellent insulation during cold-weather observing. These pants are supported by suspenders and are worn over regular slacks that provide an extra layer of insulation.*

To protect the legs from the cold, a regular pair of slacks was covered by goose down-filled pants that kept the legs warm. Goose-down clothing has the goose-down stuffed between an inner and outer layer of nylon. The goose-down keeps the two layers of nylon apart and creates thousands of tiny air pockets that keep the cold from penetrating through to the legs.

A heavy parka, again with plenty of goose-down covered most of the torso. The parka was very bulky and hard to get on while sitting in the car. Nonetheless, this provided protection to keep the arms and the body's core warm. The final touch was goose-down mittens that had one compartment for the thumb and a larger one for the rest of the fingers. These did a good job protecting the hands, but did not allow for making adjustments and operating the equipment. A slit opening just above the palm allowed the fingers direct access the equipment to make adjustments and perform whatever task are required.

In the coldest weather, a scarf was wrapped around the lower part of the face to reduce heat-loss through the skin. The parka's hood was pulled up and secured to protect the head and ears. This left only the eyes exposed to the cold, a necessity in the days of manually guiding long exposures.

Now dressed for the weather, there was the long trek up to the observatory. The driveway was too steep to walk up through the snow, so clutching the equipment bag, the path to the observatory was at

Figure 3: *A heavy goose-down parka is essential for very cold weather observing. The large pockets can hold gloves, cameras and other accessories. The zipper is covered by a flap that is held down with snaps, providing an extra seal against the cold air. The hood is also insulated and protects the neck and keeps body heat in.*

a diagonal to the slope of the hill from where the property line met the road. The deep snow made the walk difficult.

If the snow was very deep, a snow shovel would also be part of the gear, and the entrance to the observatory would have to be shoveled out, since the entry door opened outward. Finally inside, the normal procedure for opening the dome and operating the telescope could commence. The nights were routine from that point on. The cold made it cumbersome to perform even the simplest functions. Nonetheless, the astrophotography commenced. As with most clear nights, the later it got, the colder it got.

The beginning of astronomical twilight brought an end to the work. The whole process was reversed, ending up back at the car and taking off the heavy gear. One advantage that the very cold weather had was that the reciprocity failure of film was reduced, making the film more sensitive.

Figure 4: *The backs of these gloves are goose-down insulation. The palm-side has a slit to allow the finger and thumb to handle equipment directly without removing the glove. Since the equipment is at outside temperatures, contact must be limited to keep the fingers from being frozen.*

One major advantage that the observatory had was heated rest rooms. This was necessary as the observatory was open to the public in nicer weather, but the pipes could not be allowed to freeze and split open. In addition to the continuously operating space heaters in each rest room, the pipes were wrapped with electrical heating tape that provided heat directly to the pipes in the outer wall.

Rest room breaks allowed the gloves and scarf to come off for a brief rest before returning to the cold of the dome room. It also allowed balky equipment to be warmed up if it became too cold and failed to function. This happened only rarely.

Today, the telescope and imaging equipment can be controlled from a warm room or even from thousands of miles away. Astrophotography has become a much more comfortable proposition with

remote operation and autoguiding eliminates the need to have an eye at the guiding eyepiece. This allows the observer to focus more on the tasks of observing and less on the process of getting to the telescope.

Figure 5: *The Modine-Benstead Observatory about ten miles west of Racine, Wisconsin, has a main building with a general room, heated workroom and heated restrooms on the first floor. The sixteen-inch telescope and an observing deck make up the second floor of the building. A roll-off roof building on the left and a storage building on the right complete the observatory campus. This view up the hill from the road shows the teardrop shaped access road.*

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Photo of the Month

OBJECT: **NGC 2359** Thor's Helmut is an emission nebula rich in Oxygen located in Canis Major also known as NGC 2359. It is also catalogued as Sharpless 2-298 and Gum 4. The OIII somewhat overwhelms the Ha but one can see the faint Ha clouds in the background. The massive central star, an extremely hot star thought to be in a brief pre-supernova stage of evolution, is the Wolf-Rayet star WR7 (HD 56925). It is shedding massive amounts of gas as it nears the end of its life. NGC 2361 is a bright knot of nebulosity on the edge of the central ring of NGC 2359.

RC10 / FLI ML16200 / LRGB 7x5min / Ha 6x5min 4x10min / OIII & SII 5x10min / CCDstack /PS/ Las Cruces 1/29/17

By John Kutney

#14

Night Sky

Radiant gem
brilliant glow
aura of warmth
circle of life

Transparent ice
visions passing thru
static for existence
circle of death

Submitted by John Kutney

Editor's Note: *If you have not visited the Tombaugh Observatory for one of the Open House sessions, you really should. It is a very unique and interesting telescope. They don't make them like this anymore!*

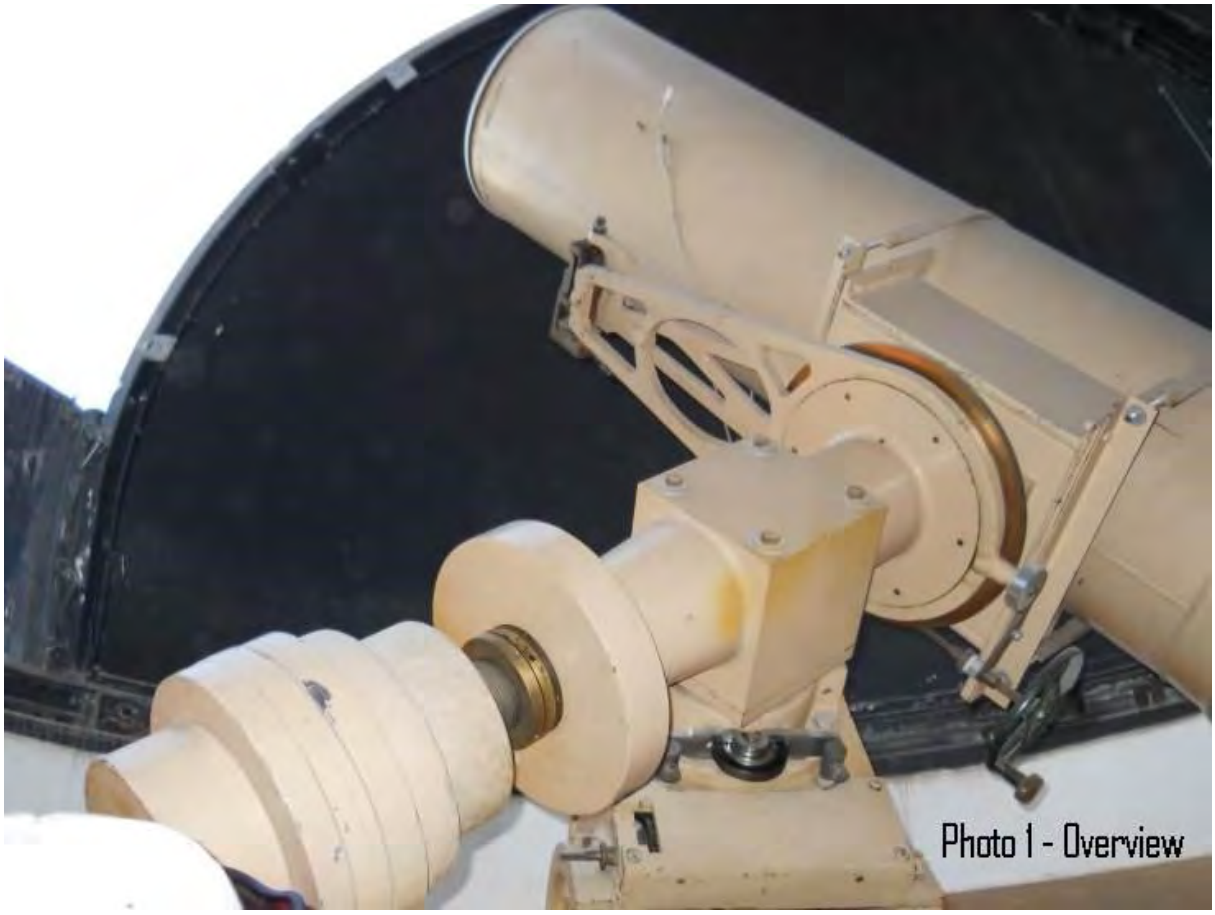
Tombaugh Observatory Use

Version 09/11/2011

By David Anderson and Steve Shaffer from class by Dave Dockery

The Tombaugh Observatory available to Astronomy Society of Las Cruces (ASLC) houses a 12.5 inch, F = 200 inches (5080mm), f/16 classical Cassegrainian telescope. The telescope was constructed in the 70's by Clyde Tombaugh and early members of ASLC. The housing was made from an Honest John missile body hack sawed to length.

Mirrors were ground and polished in the optics shop at White Sands Missile Range. The mount is a gravity driven model manufactured by Grubb's of Dublin in 1895.



As shown here, every part of this telescope and mount is made from heavy, unyielding metal. Colliding with the equipment will hurt you, not it. **Watch your head**.

Eyepieces and diagonal do not have a retention groove and can fall out if not restrained well. The eyepiece set screw is nylon or plastic. It will not cause damage so tighten it firmly on eyepieces and diagonal.

Eyepieces are not threaded for filters. The diagonal is threaded but that may not be an acceptable option. If you need to use filters to enhance planet details, you will need to bring your own threaded eyepiece and filters.

The light switch is to the left as you enter the east door. Begin by recording your visit in the log book. Use a ladder to get up to the panel at the bottom of the dome shutter. The shutter should have been left facing north. Remove the screws and panel, placing the panel on the roof directly in front of the opening. Rotate the dome to the direction of the sky to be viewed. The rotation control is mounted on the east wall just to the right of the doorway. Open the dome shutter by plugging in the control cord dangling down from the motor at the top of the dome and turning the switch to open. When the shutter comes within a foot of vertical, turn the switch to off. Turn the switch to open and then to off until vertical is reached. Raise the bottom of the shutter to no more than straight over head. Going too far past that point will run it out of engagement with the motor drive. If this happens see appendix A. for instructions on reengaging it.

Remove the blanket which serves as a dust cover. Climb up the ladder and remove the large cap on the upper end of the telescope tube. Prepare the Telrad finder by sliding open the battery door, raising the battery holder, and placing the loose AA cell in the holder. Verify the polarity of the AA cell is correct before putting it into the holder. Replace the holder and door panel. Mount the Telrad finder on top of the telescope tube from the ladder. Two thumb screws hold it in.

Photo 2 - Motor crank

Wind up the gravity motor by turning the crank. A weight inside the column is attached by cable to a capstan. As you crank, the capstan turns, raising the weight. When you finish and engage the motor, the weight moves downward due to gravity, turning the capstan's shaft. The capstan's shaft connects to a fly-ball governor which adjusts and regulates its speed. From there the shaft is coupled through several bevel gears to the worm shaft. The worm turns the worm wheel sector which moves the telescope in right ascension.

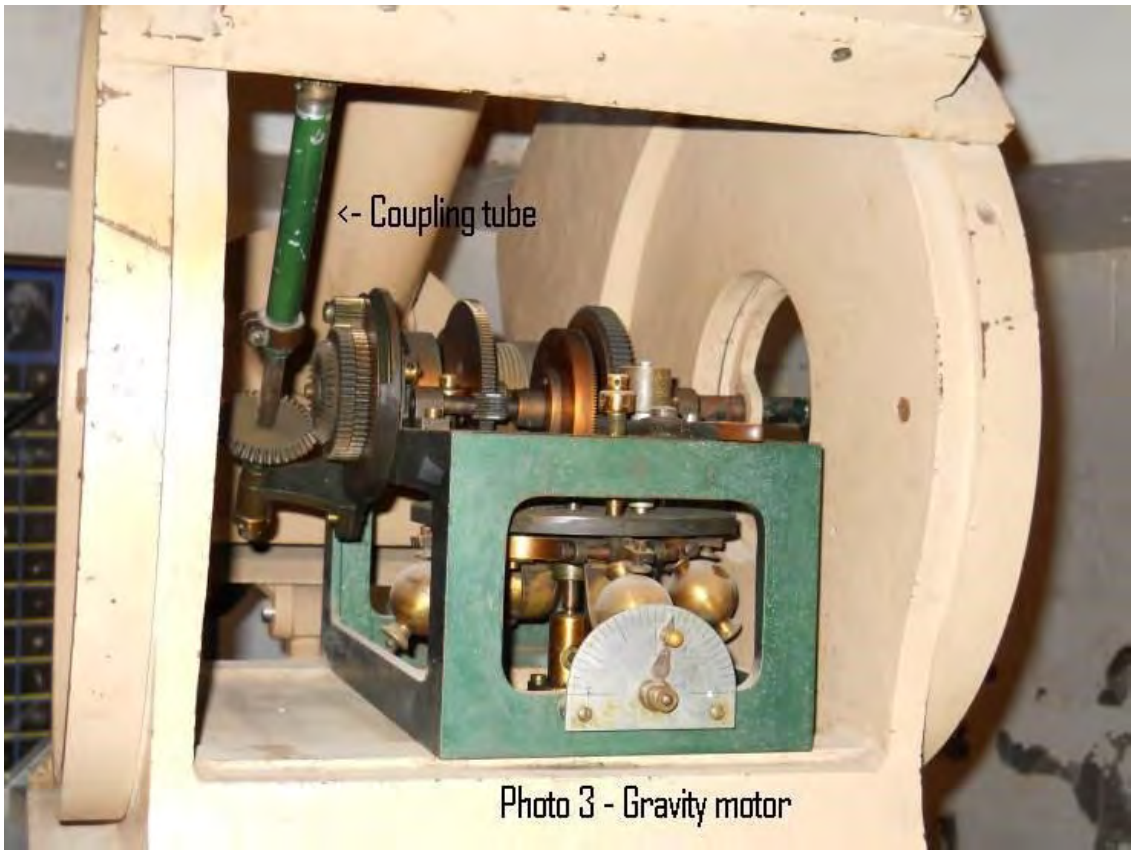
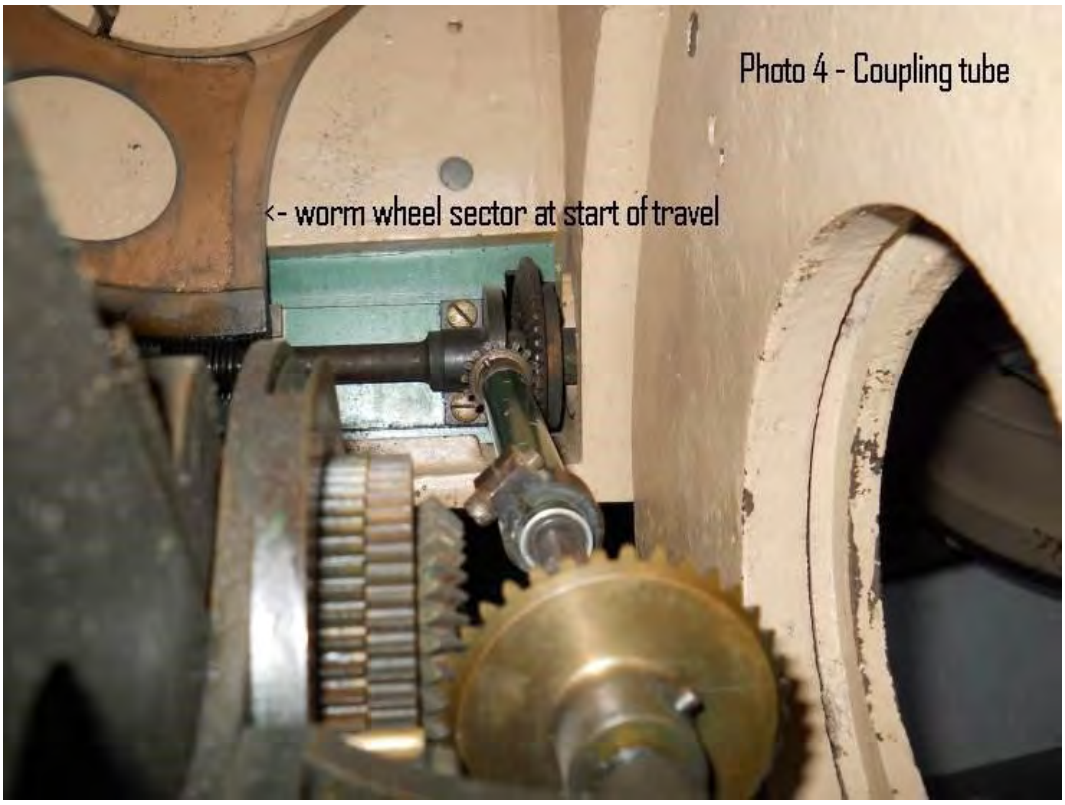


Photo 3 - Gravity motor

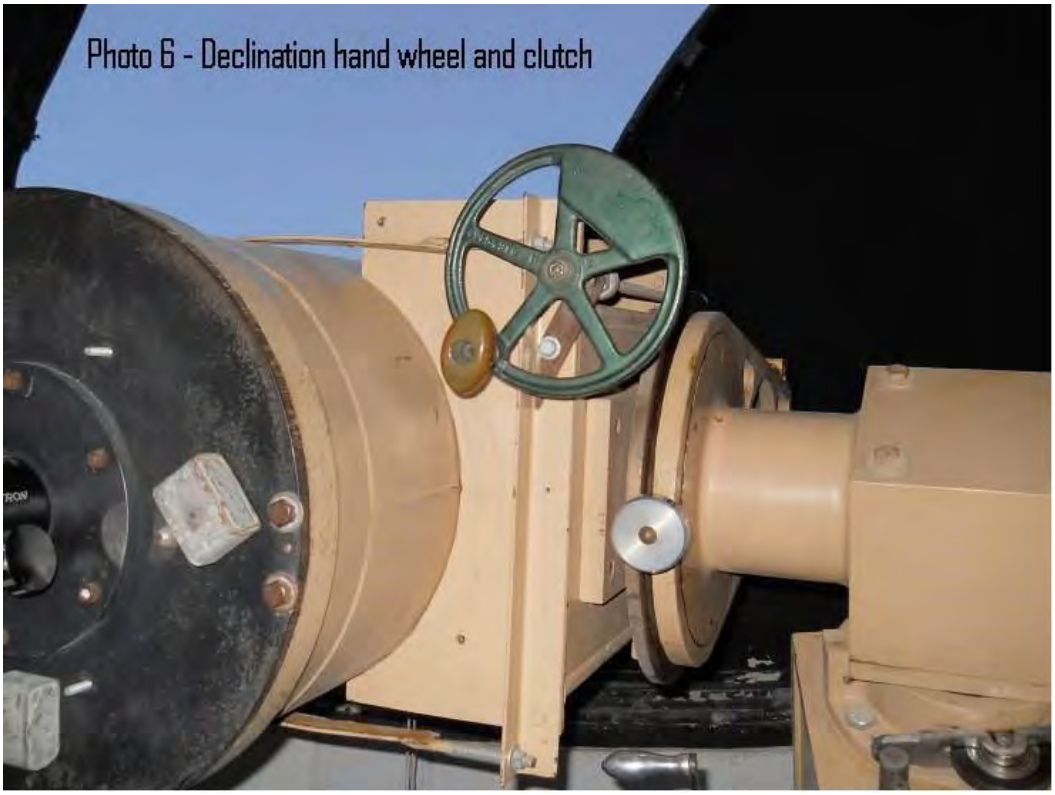
Sliding the green coupling tube upward engages its bevel gear with the mating gear and couples the gravity motor to the telescope. Look at the worm wheel sector. If it is not at the beginning of its travel, it should be rewound. See the description for this below. After the worm wheel sector is set to the beginning of its travel, slide the green coupling tube upward and tighten its clamp.



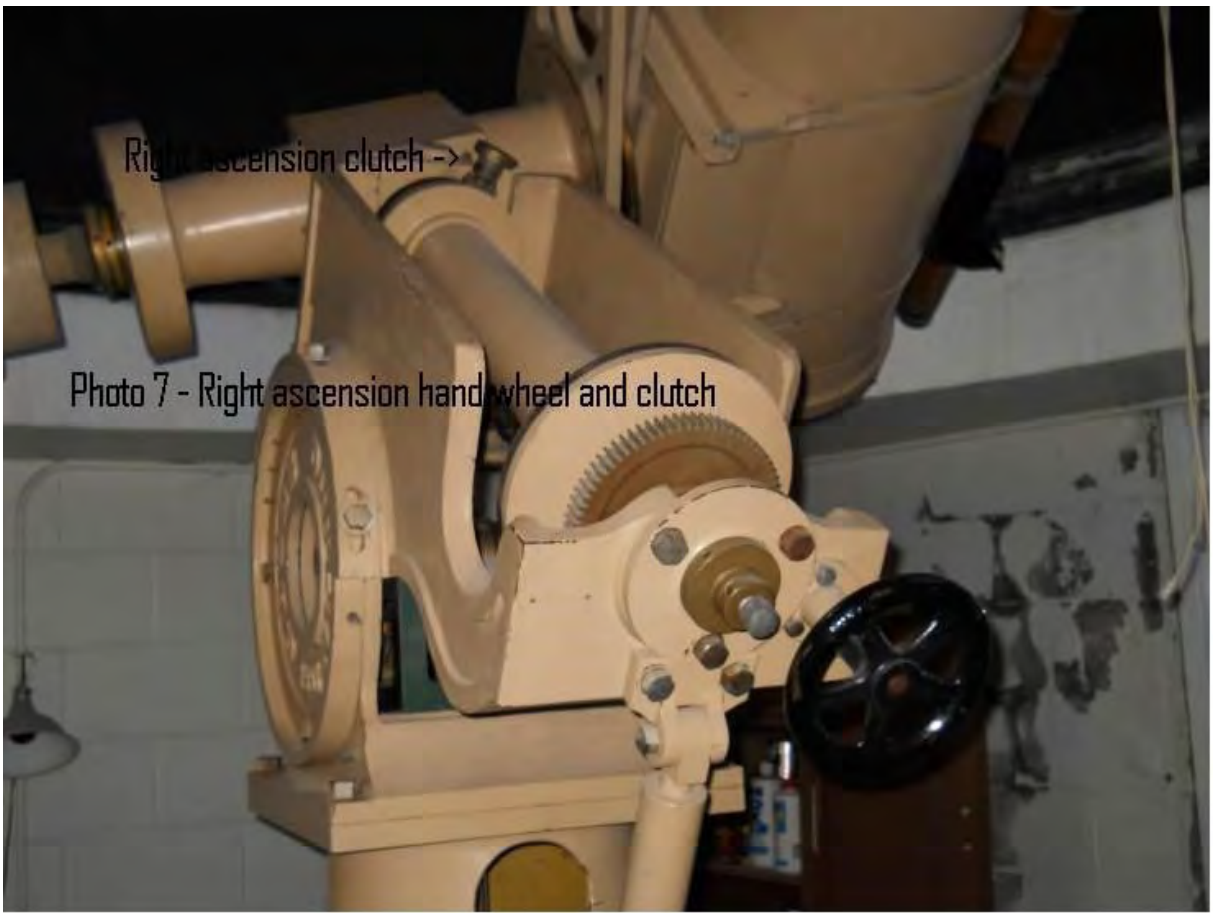
The photo shows the green coupling tube from inside the frame. The bevel gear pair at the bottom connects the gravity motor shaft from the fly-ball governor to the green coupling tube. The green coupling tube has another bevel gear at the top which engages with one above it on the worm shaft. Slide the tube upward until the bevel gears engage and tighten the clamp to keep it in place. The gravity motor is then coupled to the worm wheel sector which moves the telescope in right ascension.

Move the lever on the top of the green housing to the left to start the gravity motor. The telescope should now be moving in right ascension compensating for the earth's rotation. The pointer above the scale marked F / S (fast / slow) controls tracking speed by adjusting the fly-ball governor. It needs to be adjusted for the type of target being tracked such as star, planet, or moon. It will require trial and error to find the right speed.

Loosen the nylon set screw in the focus tube, and remove the focus tube dust cover. Insert an eyepiece in the focus tube, securing it tightly with the nylon set screw. Move the telescope to the desired target.



The declination hand wheel and clutch are shown above. The clutch locks declination movement to the hand wheel. The hand wheel allows fine movement, but may not be as convenient as loosening the clutch and pushing the optical tube where you want it. Retighten the clutch when done.



The right ascension hand wheel and clutch are on the back side of the mount. The clutch is at the top and may be difficult to reach. The right ascension hand wheel moves the telescope faster than the declination hand wheel. It is harder to set to a precise position. Again, it can be disengaged and pushed. Retighten the clutch when done.

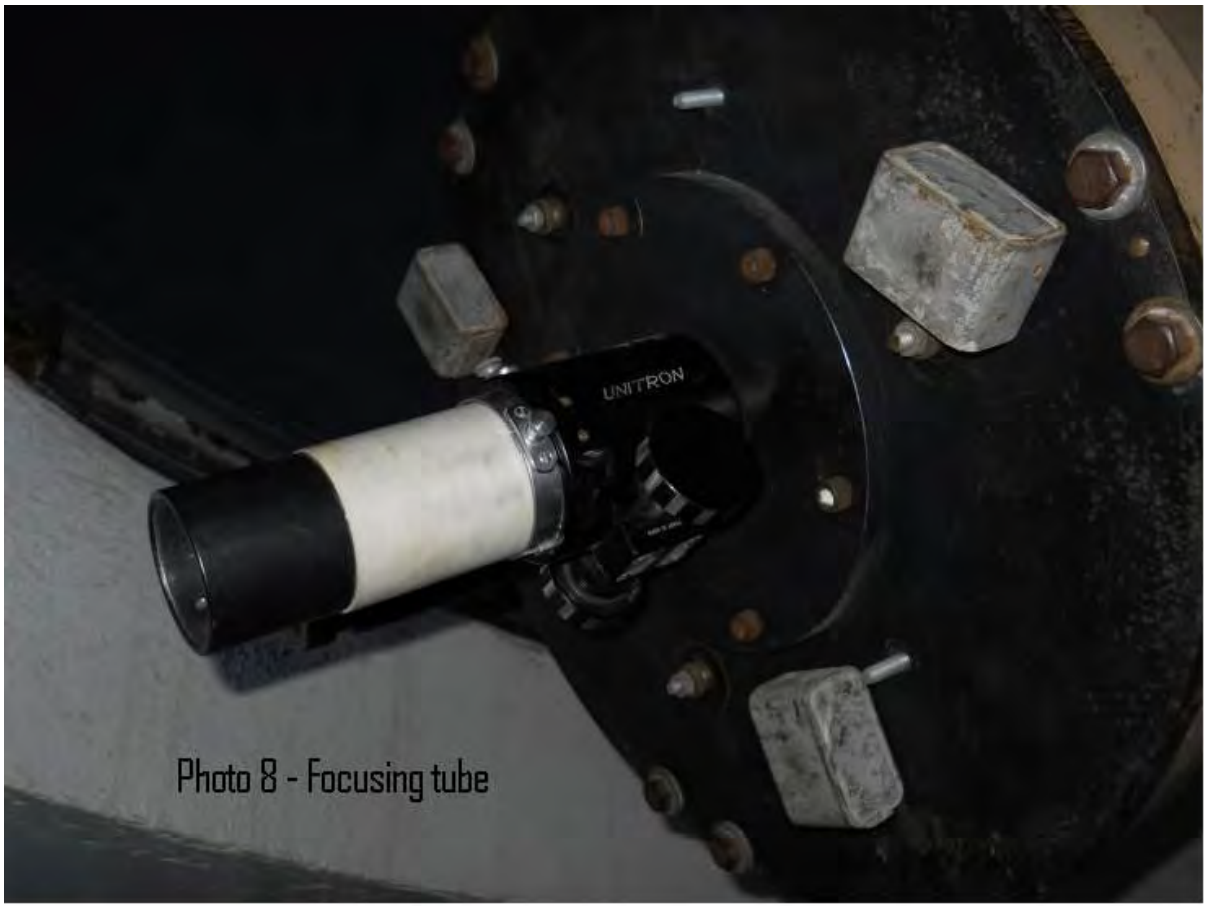
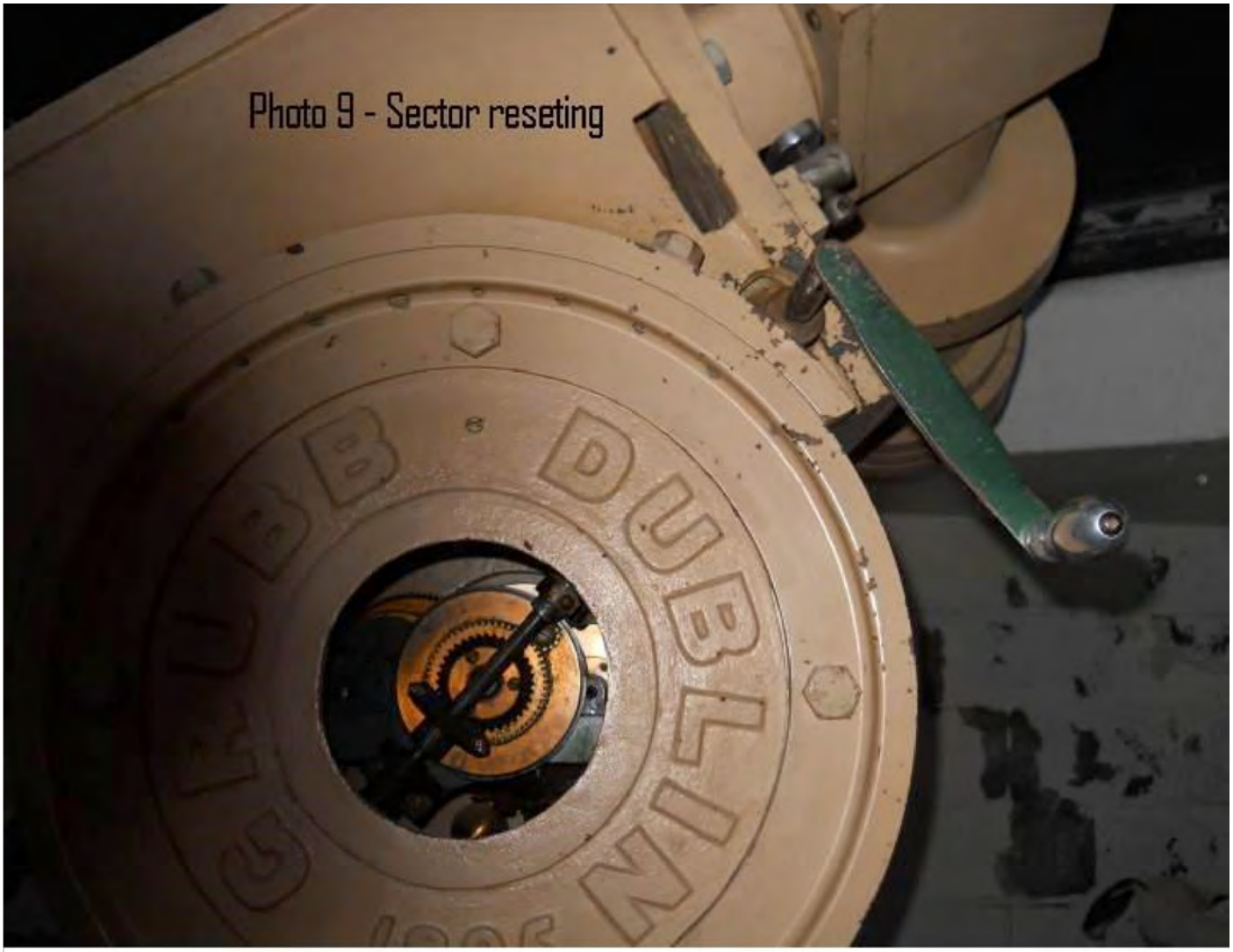


Photo 8 - Focusing tube

Focus by loosening the metal set screw at the bottom of the focus tube and sliding the white tube in and out for a coarse focus. Tighten the metal set screw when near focus is found and use the focus knob to get a precise focus. Tracking should last for an hour or more but will probably require some moving to keep the telescope on target during this time. Tracking will stop when the weight reaches the floor or when the worm wheel sector reaches the end of its travel. Turn the crank as shown earlier to raise the weight.



If the worm wheel sector has reached its end of travel, disengage the motor by loosening the clamp on the green coupling tube. Then remove the crank from its square pin, placing it on the square pin on the opposite side as shown above. Turn the crank clockwise while facing it. This will turn the worm and move the worm wheel sector back to its starting point.

Turning the crank moves the right ascension worm wheel sector back to its starting point. The telescope will have to be moved back on target after moving the worm wheel sector. Reengage the motor by raising the green coupling tube until the bevel gears engage and tighten its clamp. The only thing to remember in moving the telescope is to keep the optical tube pointing above horizontal. Moving downward past horizontal may let internal mirrors move out of place.

When you are finished, loosen the green coupling tube's clamp to uncouple the gravity motor and allow it to spin down. The run / stop lever must remain to the left in the run position. The weight should move down to the floor inside the mount. Remove the Telrad finder from the top of the telescope tube. Slide the battery compartment door open. Pull up the battery holder, remove the cells, and place them in the plastic bag. Replace the battery holder and slide the cover back in the groove. Store the Telrad finder in the eyepiece box in its cutout. The cells in the plastic bag can be placed on the foam without keeping the box from closing. Remove any eyepiece used from the eyepiece box and replace it there. Replace all dust caps. Don't forget the large cap at the top of the telescope tube. Drape the blanket over the telescope body and mount, covering the openings. Wrap it so it will stay in place. Secure it with the bungee cord. Rotate the dome so the opening is to the north. Retrieve the door from the roof, replacing it and securing it with its screws. Close the shutter by plugging the control cord into the wall socket and turning the switch to close. There is no automatic stop so turn the switch to off a foot or so before the shutter is closed. Move the switch from off to close to off a time or two to finish closing. Check to see that all materials are put away. Verify you have the door key. Close the doors and check that they are locked.

Appendix A: reengage shutter with motor drive

The shutter door's drive does not have an automatic stop at either end of its travel. When the door is at either end of its travel, gravity assists in its movement and the motor coasts with no load. Turning the motor off does not stop movement right away because of the coasting. At either end of the shutter travel turn the motor off before the shutter reaches the desired place and wait for the coasting to finish. Then turn the switch from off to on to off until the shutter has moved to its position.

If the shutter opens too far at the top of its travel (a little past vertical) it will coast past the end of its drive mechanism and disengage. If this happens, the shutter must be reengaged to its drive. First rotate the dome until the shutter is at one of the four corners of the building. Climb the ladder and get on the roof next to the shutter. There will be room to stand if you've rotated the shutter to a corner. While someone below turns the drive motor to close, lift the shutter until it reengages. The shutter will probably stick at the bottom of its travel when disengaged. Jerk it upward to free it.

Appendix B: Viewing ladder.

The first try was to position the ladder so that the handrail was between the viewer and the eyepiece. But that required the viewer to walk up the ladder and turn 180 degrees to look in the eyepiece. By rotating the ladder 180 degrees the viewer could walk up the ladder, view, and then turn 180 degrees to go back down. The handrail was now on the side opposite of the eyepiece.

Appendix C: list of equipment

None of the eyepieces have a manufacturer, part number or mm on them. The Sticker refers to a self adhesive sticker that has writing on it. The 31.XXX is hand engraved and the "T" should be upside down and may be some sort of alignment mark?

15mm felt tip pen, 22mm felt tip pen 1 1/4"

Eyepieces:
26mm MPL 5 elements Sticker

1 1/4" to 2" adapter
2" diagonal

Telrad finder
2" eyepieces:
32mm MPL 5 element Sticker 45mm Erfle 5
element Sticker

52mm MPL 5 element 31.775 T (upside down) Sticker and engraved
62mm rke? 3 element 31.519 T (upside down) Sticker and engraved
75mm MPL 5 element 31.775 T (upside down) Sticker and engraved

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