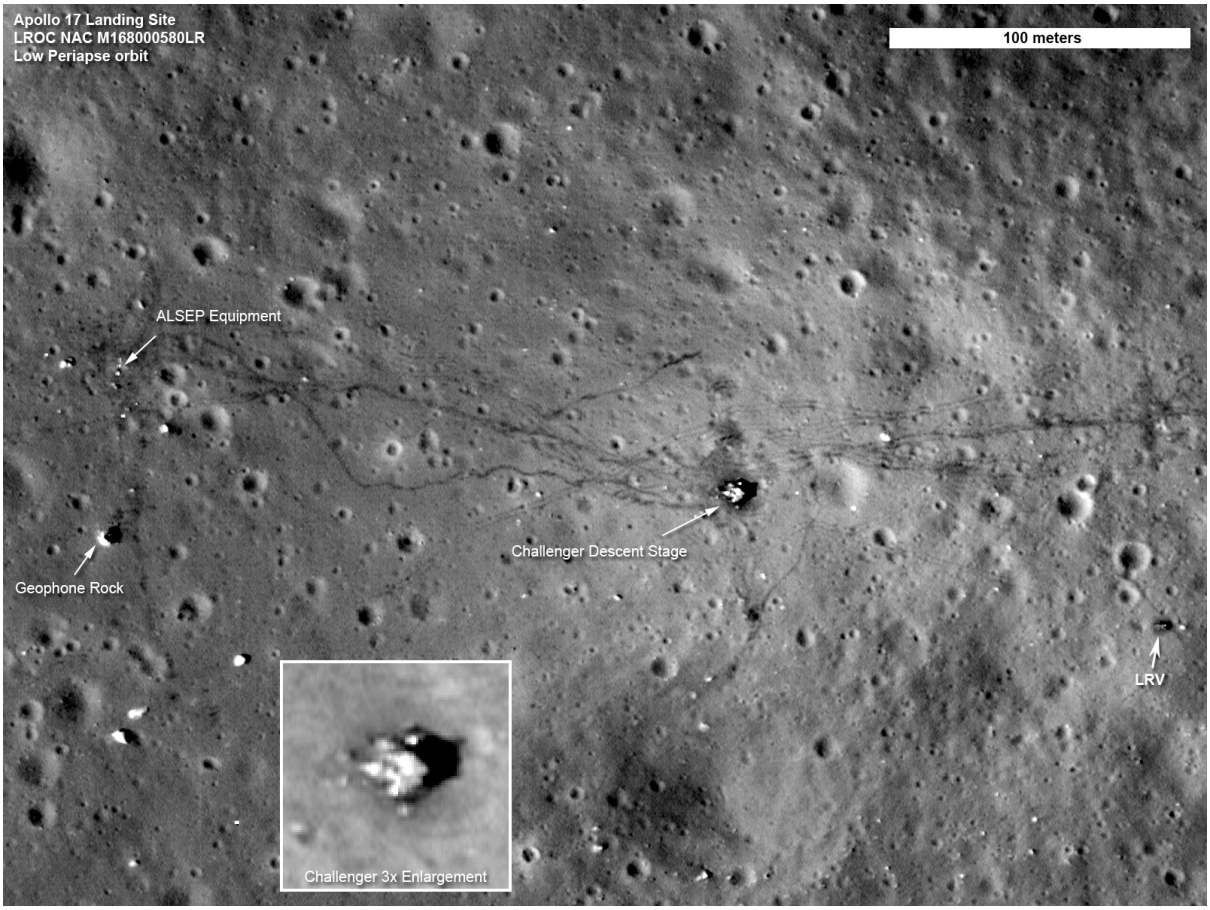
SkyWAAtch



They Were There, Really

This view of the Apollo 17 landing site in the Taurus-Littrow valley was captured last month by the Lunar Reconnaissance Orbiter (LRO), the sharpest ever recorded from space. The high resolution image data was taken during a period when LRO's orbit was modified to create a close approach of about 22 kilometers as it passed over some of the Apollo landing sites. That altitude corresponds to only about twice the height of a commercial airline flight over planet Earth. Labeled in this image are Apollo 17 lunar lander Challenger's descent stage (inset) and the lunar rover (LRV) at its final parking spot.

Credit: *NASA / GSFC / Arizona State University. Lunar Reconnaissance Orbiter.*

Events for October 2011

WAA Lectures

"A Night on Astrophotography"
Friday October 14th, 7:30pm
Miller Lecture Hall, Pace University
Pleasantville, NY

On October 14th, Dr. Reuben Kier will be the presenter. Dr. Kier has contributed photos to, and written for, *Sky and Telescope*. He is the author of *The 100 Best Astrophotography Targets* and lectures frequently on astrophotography. Free and open to the public. Directions and Map.

Upcoming Lectures
Miller Lecture Hall, Pace University
Pleasantville, NY

On November 4th, our presenter will be X-ray astronomer Dr. Jason Koglin from Columbia's Nevis labs in Irvington. His talk will be entitled: "The World's First Telescopes to Focus Hard X-rays in Space -- Built in Westchester." Free and open to the public.

Starway to Heaven

Saturday October 1st, 8:00pm
Meadow Picnic Area, Ward Pound Ridge Reservation, Cross River

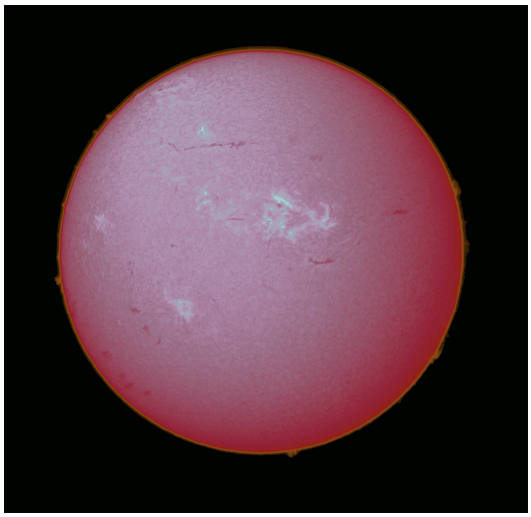
This is our scheduled Starway to Heaven observing date for October, weather permitting. Free and open to the public. The scheduled rain/cloud date is October 22nd. Participants and guests should read our General Observing Guidelines and Directions.

Renewing Members. . .

Charlie Gibson - Scarsdale
Erik and Eva Andersen - Croton-on-Hudson
John James - Sunnyside

Jupiter

Bob Kelly took this prime focus photo (1/100 second exposure) through his 8-inch dobsonian with a Canon XS. Notes Bob: "There was more detail than the camera shows, with enhanced color around the red spot and a small dark streak in the mid latitudes."



A Stellar Close-Up

Larry Faltz captured this image of the Sun on September 18th using the afocal method with a Canon point-and-shoot A1100iS camera (12 megapixels) and Lunt 60mm double-stacked H-alpha telescope. This is a single exposure (about 1/160 second) minimally processed in Photoshop. This first attempt at solar imaging by Larry shows granules in the photosphere as well as coronal loops.

Westchester Amateur Astronomers, Inc., a 501(c)(3) organization, is open to people of all ages with the desire to learn more about astronomy. The Mailing address is: P.O. Box 44, Valhalla, New York 10595. Phone: 1-877-456-5778. Observing at Ward Pound Ridge Reservation, Routes 35 and 121 South, Cross River. Annual membership is $25 per family, and includes discounts on *Sky & Telescope* and *Astronomy* magazine subscriptions. Officers: President: Doug Baum; Senior Vice President: Larry Faltz; Vice President Public Relations: David Parmet; Vice President Educational Programs: Pat Mahon; Treasurer: Rob Baker; Secretary/Vice President Membership: Paul Alimena; Vice President Field Events: Bob Kelly; Newsletter: Tom Boustead.

Articles and Photos

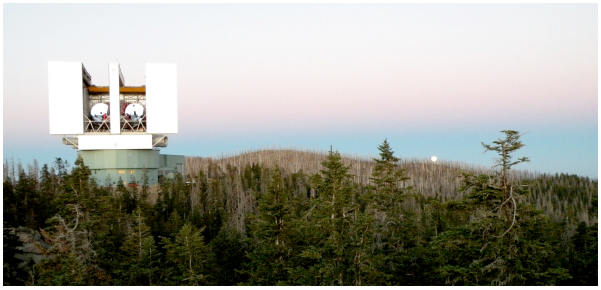
An Astronomy Vacation in Arizona: Part 5: The Smithsonian Trip Day 3
by Larry Faltz

The last day of our Smithsonian Journeys "Astronomy in Arizona" trip was a trek to the Large Binocular Telescope, the largest telescope in the world at the current time. It is situated at the Mt. Graham International Observatory, a branch of the University of Arizona's Steward Observatory. Although it's only 68 miles northeast of Tucson, "you can't get there from here" so you have to make a long loop around the back of Mt. Graham to reach the observatory. Our troop of two dozen astronomy enthusiasts boarded 4 comfortable vans and drove east on I-10 for two hours, with a rest stop in Willcox at one of those gargantuan T/A truck stops, then north to the tiny hamlet of Swift Trail Junction (at 3,230 ft. elevation). Then we slowly ascended Mt. Graham for over 30 miles on an incredibly twisty national forest road. The road was paved only for the first 20 miles or so, and the going was even slower once we hit the rocky and rutted dirt section that looped around the south side of the peak as it ascended to the observatory at 10,567-ft. The total trip time was over 4 hours.

The Large Binocular Telescope from ground level

We passed through a gate and up a few more tight switchbacks. Before us on the summit was the enormous telescope building, 131 feet tall, looking nothing like a telescope. Like the MMT on Mt. Hopkins, the scope is on an alt-az mount and the cubic building co-rotates with the scope on a separate pier with its own bearings.

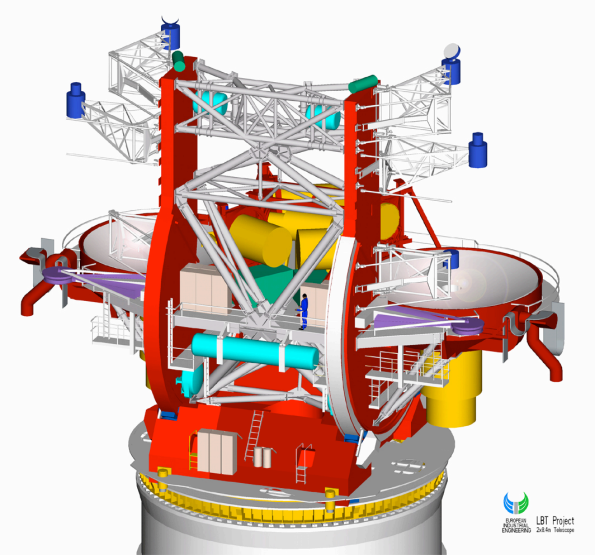
Besides the scope, the building houses control facilities, workshops, a re-aluminizing facility and quarters for the observing staff who spend one week on the mountain and then get two weeks off. Some of the maintenance workers actually drive up and down the mountain every day from their homes in Swift Trail Junction or Safford, 7 miles further north. Although buried power lines run to the facility, all of the water is trucked up and all the waste trucked down, a requirement imposed by Congress when the observatory was finally approved over objections of environmentalists and the San Carlos Apache tribe, who claimed that a subspecies of the American Red Squirrel would risk extinction if the project disrupted their ecosystem. Given the vast amount of pristine land on the otherwise forest-covered mountain, a veritable "island in the sky" of many hundreds of thousands of acres, I suspect the squirrels have little problem simply ignoring the observatory. Bear, deer, elk and other fauna apparently abound on the mountain, although we didn't get to see any.



The LBT ready for action at dusk. (Photo John Hill/LBT)

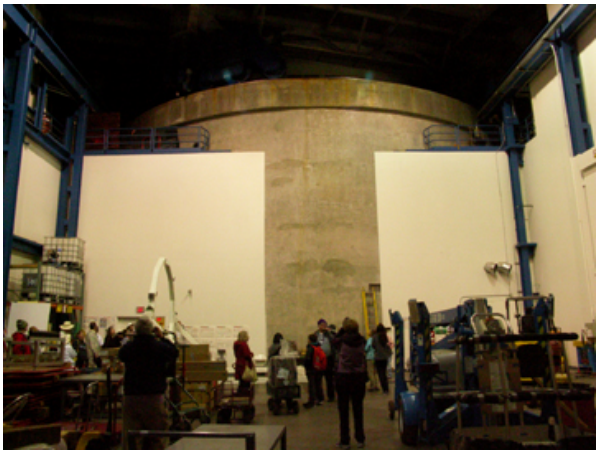
After an introduction to the facility by staff members, we were taken inside the telescope. When the elevator doors opened, we were met with an astonishing sight. The enormous telescope defied our expectations. It's 82 feet high. The two 8.4 meter (27.5 foot) f/1.142 mirrors, whose centers are 47 feet apart, hang off each side of a large central structure. Over each mirror, swing

arms carry a large camera at the primary focus, a secondary mirror with actuators for adaptive optics and a tertiary mirror for beam synthesis by an interferometer housed between the two mirrors, which can give the telescope the equivalent of 11.8 meters aperture and the resolving power of a 22.8 meter [74.8 foot] scope. The scope works at f/15. The altitude bearings are precision-machined C-rings with a radius of 10 meters (32.8 feet). They ride on a thin layer of oil. The entire structure weighs 580 metric tons, yet the balance is so good it takes only four 3-horsepower motors to operate it. Pointing accuracy is less than 0.3 arc seconds and tracking accuracy is a tenth of that. Dynamic balance is maintained by flowing ethylene glycol through the aluminum struts that stabilize the mount.



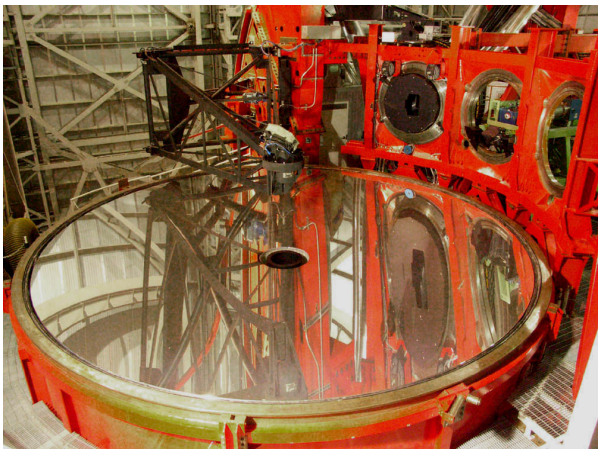
Design rendering by the manufacturer (image from LBT). Note the human figure for size.

The telescope was designed and built in Italy (maybe the Italian sense of design is behind its rather exciting color). It is operated by a consortium of American, Italian and German universities and observatories who share strictly proportioned time on the instrument.



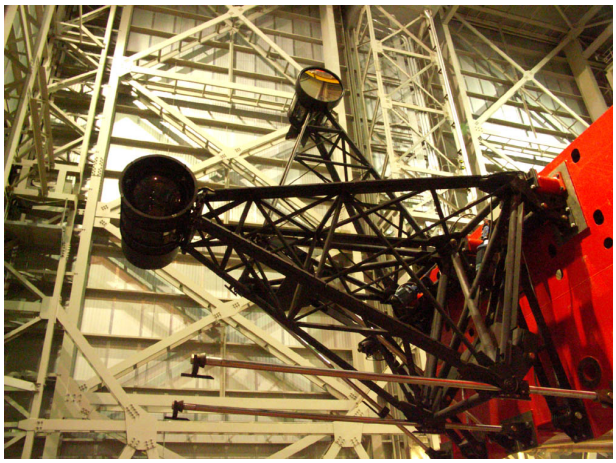
The massive pier of the LBT, 42 feet in diameter.

We first viewed the instrument from a walkway on the back side, where we could easily examine the optics because the scope was pointed to the zenith.



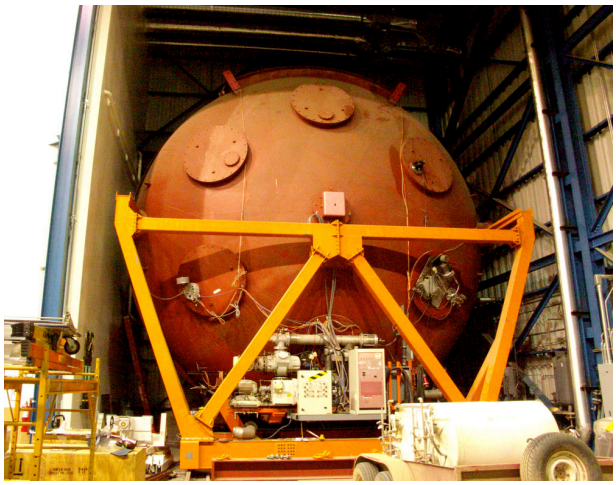
An 8.4 meter mirror with tertiary mirror in place

Seen from an angle, the mirrors were visibly dusty, the result of the inevitable deposition of particulates carried up the mountain by desert winds (the building can withstand winds of 140 miles an hour). But the very visible dust doesn't reduce light transmission much, and in any case each mirror is re-aluminized every other year.



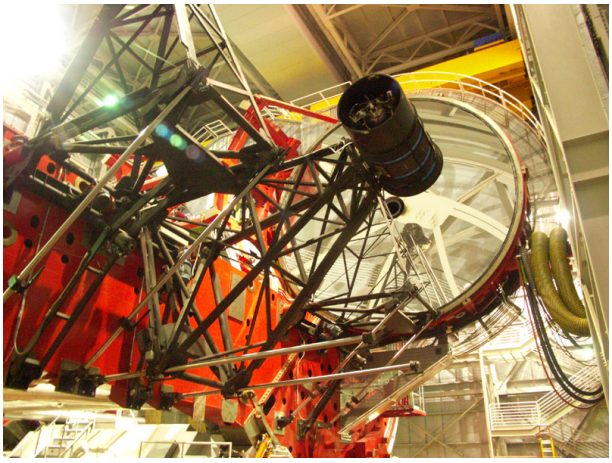
Prime focus camera (left) and secondary mirror (above) on their swing arms

Resurfacing is done without demounting the mirror using a device called a Bell Jar. This creates a seal over the scrubbed mirror, and after a vacuum is created, a small piece of aluminum is vaporized to create the 20 micron coating. Aluminizing takes place in the summer, when monsoon conditions in the southwest bring frequent afternoon thunderstorms and all of the large observatories suspend regular observing in favor of maintenance.

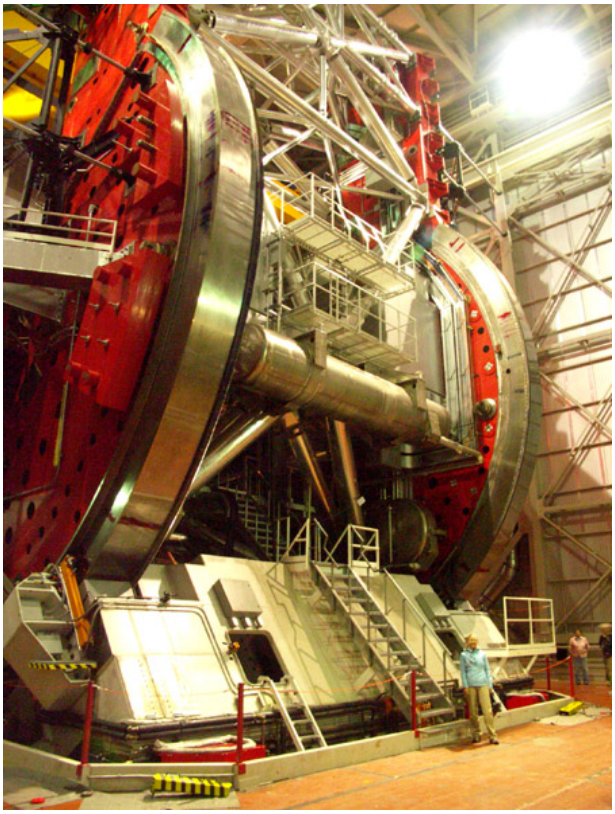


The Bell Jar resurfacing chamber

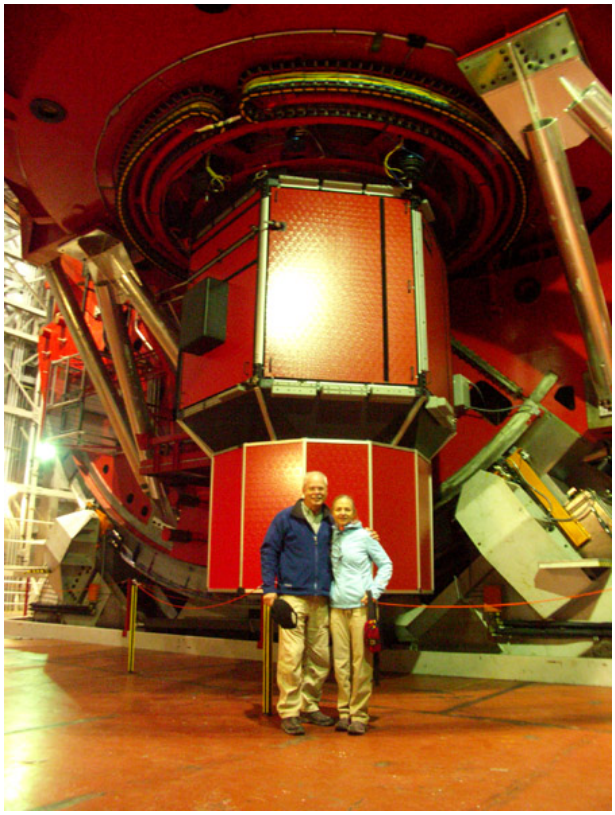
For about half an hour, one of the telescope operators explained the scope's design, construction and operation. We then went down to the floor of the observatory and walked in front of the enormous altitude bearings. From this vantage point, the mammoth scale of the telescope could easily be appreciated. After a few minutes, the technicians slewed the telescope from its vertical starting position to zero degrees elevation (horizontal) which took only sixty seconds. We were surprised and delighted to note that the massive scope moves silently, the only noise in the building (other than our conversations and gasps of amazement) being the sound of the cooling systems that maintain the environment at night-time temperature, so when the shutters are opened in the evening thermal equilibrium is quickly achieved.



One of the prime focus cameras, this one designed to be sensitive in the blue (and thus it has blue trim on it)



Elyse at the base of the LBT



In front of the MODS spectrograph (photo by David Aguilar)

Under the f/15 Gregorian focus of the "left" mirror we examined the massive MODS optical spectrograph, designed and operated by Ohio State University. This is one of a pair of multi-object spectrographs that will work in tandem to exploit the full 11.8-meter effective aperture of the combined mirrors. These complex instruments have large (3088x8288) CCD sensors fed by multiple internal filters and optics. Each weighs nearly 3 tons. They are attached to a massive field de-rotator (a necessary accessory on alt-az mounted scopes).

In the LBT control room

About 45 minutes later we were herded down to the LBT's spacious control room and spent some time talking with the technical staff and the astronomers (two graduate students) who were setting up for that night's observing. The observing programs are complex and everything is choreographed in advance. Sadly, from time to time weather or an emergency call to get the spectrum of a new supernova can bump a deserving graduate student and slow down his or her thesis work.

LBT in winter (photo Jorge Esguerra/LBT)

Operating from September to June, the observatory has to contend with snow (snowpack can be 8-12 feet) which makes travel to the scope treacherous, but the staff manages to keep the roads clear even in the most dreadful weather.

After a box lunch and more chatting with the staff, we started back down the mountain road to the base station in Swift Trail Junction. From there we headed back to Willcox and then to the town of Benson for the final trip activity, a barbecue dinner and observing at the San Pedro Valley Observatory just outside of Benson, Arizona.

The San Pedro Valley Observatory has been in operation for many years. Formerly known as the Astronomer's Inn and Skywatcher's Inn under previous owners, the facility sits in the Sonoran desert just southwest of the town of Benson. It's a funky bed-and-breakfast dedicated to astronomy, but with a nice collection of paleontology specimens and other items of scientific interest, set in a rambling one-story building. Individuals can rent time on the scopes for observing or imaging. The main telescope, in a spacious dome, is the 20-inch f/9.5 Vega-Bray Maksutov, reputedly the third-largest Mak in the world. A DOS-based computer controls the instrument on its massive equatorial mount. Down the hall, a roll-off roof observatory houses 8 scopes of varying sizes and types, including 2 12"

Meade LX-200s, an 8" f/4 Schmidt-Newtonian and a 14.5" solid-tube dob. Several of these are set up for imaging (including remote imaging via the Internet). Another roll-off roof observatory in a separate building houses two 11" Celestron SCTs, one with Hyperstar.

We shuttled between the Meade and the Mak, the latter driven by astrophotographer Dean Salman, who has had several deep-sky images printed in Sky and Telescope's *Gallery* section. Under dark skies (SQM 21.11, mag 6.18) we observed several dozen objects. M46 and its planetary nebula were a lovely start to an evening filled with faint fuzzies, globular clusters, galaxies and planetaries. Among the latter, the Ghost of Jupiter (NGC 3242) was spectacular, as was NGC 6210. We compared three globular clusters in Hercules, M13, M92 and NGC 6229, to get a good sense of the variations in their size and brightness. The waist of M82 was plainly visible in the 20". The dust lane in NGC 4565 was easily seen with averted vision. Among the other galaxies we took in were M51 (with its spiral arms faintly visible with direct vision), M106, M94, M64, M65, M66, M84 and NGC 4631 (the Whale, with the Pup, NGC 4627, easily seen with averted vision). Saturn, high in the sky throughout our trip, was still in demand by many of the group, and was a gorgeous object in the 20" (although not quite as fabulous as in the 24" refractor at Lowell…how could it be?). We were told that the Nogales fire, which was mentioned in my September article, caused a slight loss of transparency, but nevertheless the views all evening were outstanding.

As the evening wore on, three of the four vans departed, but a core group of half a dozen astronomy die-hards remained until about midnight, when we finally called it quits and drove back to Tucson, a trip of only 45 minutes.

The Smithsonian Journeys "Astronomy in Arizona" trip was formally over, but Sunday morning on our way out of Tucson back to Phoenix, we wanted one more dose of astro-stimulation, so we stopped at Starizona, one of the nation's leading astronomy shops. Owner Dean Koenig, who many of you may have met at past NEAFs, showed us his famous Hyperstar modification for Celestron SCTs, which converts the slow f/10 scope into a fast f/2 imager.

Starizona. Dean Koenig is on his cell phone.

This device, which substitutes for the SCT's secondary (and is removable) permits very short exposure times and provides a very wide field. Even though the store is located on a major road in north Tucson, Dean holds star parties Friday and Saturday nights in his front parking lot, a testament to the efficacy of Tucson's lighting ordinance and the light-gathering power of Hyperstar.

Inevitably, modern research telescopes have to be at dark, dry and high sites. No one is going to invest hundreds of millions of dollars to build a large instrument in, say, Ward Pound Reservation, where half of WAA's star parties are clouded out and where a 5th magnitude semi-transparent sky is considered by us to be a divine gift. So visiting these facilities takes some planning and patience. Although we enjoyed the camaraderie and hospitality of the Smithsonian trip, you don't have to wait for a tour operator to build a trip like this. You can assemble one yourself. All of the facilities are open to the public and offer a variety of educational experiences, some of which include dark-sky viewing through moderate-sized (8-20") scopes. Their informative web sites are packed with useful information for visitors, and each hold special events throughout the year. In addition, there are places like the San Pedro Valley Observatory and Spencer's Observatory that offer the combination of overnight B&B hospitality and reasonable-size rental telescopes for imaging or visual observing. If you base your trip in Tucson, you can include visits to the University of Arizona's Flandrau Planetarium and with a little chutzpah I suspect you can easily weasel your way into some UA Department of Astronomy academic seminars, many of which

are listed on their web site. By the way, they even serve refreshments at seminars of the Theoretical Astrophysics Program! Obviously, planning for viewing must include consideration of where the moon will be so it doesn't interfere with your deep sky observing, and you'll need proper dress, since it can get cold at night. Although the southwest can be interesting to visit over the hot summer, with afternoon thunderstorms followed by beautiful rainbows, the big scopes shut down for maintenance and may be less available for visiting. Be sure to take decent 10x50 binoculars and perhaps some way to stabilize them (see this hint).

It's much harder to create your own trip to non-US facilities, like Chile, Australia or the Canary Islands. Elyse and I are hoping to sign up for a Smithsonian trip to Chile that David Aguilar says he is planning in a year or two. Magellanic Clouds, here we come!

Read parts 1-4 of this series in the June, July, August and September *SkyWAAtch* newsletters. Photos by the author except where noted.

"To Clean or Not to Clean?" by Mike Cefola

Squirrel Apartment for rent-great views of the universe

I purchased a big Dob (18") in 2002 that I store in Vermont as part of "The Smokehouse Observatory." Sitting in a garage all year is no easy task through New England's sweltering summer heat to its winter subzero temperatures. My "Nightsky" Scope has had its trials including a wood squirrel who decided to make two homes for himself by building nests in the rocker box and on top of the light shroud. As if this wasn't enough, when he felt hunger pangs, he just gnawed at the wood base. Somehow I got through this initial freak-out to concede his right to stay protected from the elements. I did finally move the nest to dresser drawers stored in the garage which gave him a duplex. Somewhere along the years he moved out. Probably wanted something in a higher end neighborhood with more room like a Starmaster 20".

I've been very pleased with the views in this scope with its Pegasus Mirror and superb motion. As some WAA members can attest to, views of globulars and galaxies were a thrill to behold combined with nights of really good seeing. Through my scope, Doug's BIPH provided truly spectacular images.

The view through a frying pan

A while back I went to do some viewing and noticed objects looked really flat. I checked collimation which seemed okay and wrote it off to bad seeing. The next day I looked at the mirror and, to my horror, one of our frying pans had more reflectivity than it did. I suppose a gradual buildup of crud hardened on it but went unnoticed as I hadn't used the scope much recently. I had toyed with cleaning it but the thought was more terrifying than having my impacted tooth removed which had to be sawed in half before it could be pulled. At least I had gas to numb the fear in that case. I decided with the mirror's condition, I had nothing to lose but opted to wait for my WAA buddies who would be at the house for Stellafane to provide moral (and physical support) to clean it.

Cotton Cotton Everywhere

As it turned out Darryl and Mike V. did much more. "*They did everything.*" Darryl lifted the mirror out of the rocker box which sits in a cell beautifully crafted by the scope maker Jim Nadeau. The cell came out completely with mirror intact allowing Darryl to gingerly remove it. Of course I had none of the tools needed to do the job, so the three of us ran into town to buy gallons of distilled water, Dawn detergent, cotton balls, and a basin big enough to soak the mirror in the distilled/soap solution. A gentleman in the drugstore

sheepishly asked if he could have the last remaining bottle of distilled water as I was frenzily grabbing the other dozen or so.


Men at Work

Is there a doctor in the house?

After hours of soaking alternated by Darryl pouring water over it, the mirror looked better but still had a layer of crud. Bill Newell pulled out his iPhone and immediately found a site describing how to clean big mirrors in extreme cases by swabbing them with cotton balls. At this point Mike V. asked if I trusted him to give it a try with the cotton balls. In my despair of seeing this once beautiful mirror now looking like something a hotdog is grilled on, I said "Go for it".


Humm?


Getting better

I remembered this was the same Mike V, who with the hands of a surgeon, meticulously fit two circuit boards into a guitar I own so it would glow a deep sky blue in the dark.

Mike took a soaked cotton ball and literally let it touch the mirror by its own weight. He then moved it in a circular motion around the center collimation dot. To our amazement, the gunk pulled off revealing the original coating. Seeing the initial success, Mike proceeded to clean the entire 18" mirror while I passed fresh dampened cotton balls to him.


Don't worry, I've done this hundreds of times


Looking good

After Darryl placed the mirror back in the cell, we re-installed it in the scope. As a testament to Jim's cell design, the collimation didn't even need tweaking.

Pictures cannot "reflect" the final outcome of the cleaning. The proof was in the observing that night with breathtaking views of the Veil, Witch's Broom Nebula, edge-on galaxy NGC 891, etc.


Surveying the results

Sincere thanks to my mirror-cleaning crew for bringing my big Dob back to life as well as my enthusiasm for serious observing.

Almanac

For October 2011 by Bob Kelly

Oct 3 Oct 11 Oct 19 Oct 26

Planets hiding in the twilight are the side shows, standing aside for the arrival of the planet Jupiter in the prime time sky this month. But let's start with Mars. On the morning of the 1st, half-way up in the southeast before sunrise, Mars stands out like a red safety light at magnitude 1.3 but still only 5-½ arcseconds wide. Better yet, when viewing Mars with binoculars or a wide-view telescope on the 1st, you'll see the swarm of bees, M44, an open star cluster surrounding Mars, hidden from the eye by the glaring stoplight of Mars. Who will get a photo, or is this a sky sight that is best seen using the large dynamic range of the human eye with some optical aid?

Vastly brighter is Venus, but she is uncharacteristically coy, setting ½ hour after sunset on the 1st and 1 hour by the end of the month at magnitude minus 3.9 and 10 arcseconds wide. The disc is surprisingly small – only twice the size of Mars' disc in the sky. But as Venus did for Saturn in late September, in late October Venus stays low in the southwest evening twilight to point out Mercury two degrees below. They fly in formation for three weeks, but you'll need optical aid to see Mercury.

Saturn lovers will only get a fuzzy view of their favorite ringed planet, and only near the end of the month, low in the east southeast just before sunrise. Saturn will be magnitude 0.7 and 15 arcseconds wide. The rings are inviting a glance, now open to 14 degrees.

Jupiter is the main event for bright object fans as it exceeds 45 arcseconds wide and magnitude minus 2.9 through November. (Still, it only appears as large as the crater Copernicus on our Moon.) But Jupiter is ready for its close-up! Start with binoculars for the wide view of the four brightest moons – can you pick out the bands? A small telescope will show the bands, and you can track the width of the returning southern equatorial band compared to the northern band. Folks with larger telescopes have even more to see. What differences can you see in the four brightest moons? Some red streaks, called barges, have shown up in the Northern belt. They are more prominent now than the not-so-great red spot. Details may even be seen in the polar regions.

Jupiter's brilliance makes it hard to see details on the planet. It's a great time for color filters or even a pair of polarizing sunglasses. For the first part of the month, following Jupiter into the morning twilight will reduce its overwhelming glare and allow easier observation of its many features. When's the first evening when you can see Venus in the west and Jupiter in the east at the same time? Watch them as they get closer leading up to their closest approach in the evening on March 13th, 2012.

The Moon makes a scene with Jupiter on the 12th and 13th, bringing this month's feature planet to the attention of anyone not paying attention yet. Mars is off the left of the past-half-lit Moon on 21st. Watch out for coastal flooding as the new moon – the closest of the year – adds its weight to the Sun's in the tidal tug-of-war on the 26th.

Other solar system objects well placed for evening viewing include Uranus (magnitude 5.7 and 3.7 arcseconds wide), Neptune (7.9 and 2.3), Vesta at magnitude 7.2 and Ceres at 8.1. Check your local listings for location relative to brighter stars that will guide you to these extra credit possibilities. Comet C/2009 P1 Garradd is glowing softly at 7th magnitude, and may hang out at 6th magnitude through the beginning of the new year. Lots of observers are finding this comet to be a pleasing sight, well up in the west in the evening sky. Use finder charts for the first time you look around the area west of Hercules, since there aren't many bright stars nearby.

After the Moon moves out of the evening sky, the Milky Way is easier to see as it stretches high through the zenith. Here's my Trick or Treat Tour: start low in the southwest with Sagittarius. After exploring the clouds and clusters found toward the center of the galaxy, move up the Milky Way toward the giant swan (Cygnus) overhead. Make a stop on the right at the overlooked constellations Sagitta and Delphinus. The former is a small arrow and the latter a tiny group of five stars, larger than the Pleiades, but brighter. Next stop is the Swan itself with Albireo the two-color double star at its head. Then head east to the Great Square of Pegasus. Move from the northeast corner star out two more stars and to the left two stars to the M31, Great Andromeda Galaxy. Fainter M33 is off to the other side. Get back on the Milky Way track and move over to the sideways W of Cassiopeia. From the bottom of the left V of the W, head off to the Double Cluster. To me these are more like groups of stars than clusters, so don't look for two solid clusters. Then swing over to the east to lose our night vision on Jupiter before we pack up with the memories of celestial goodies dancing in our heads. And one thing you can count on – if you have a dark, clear night, in each of the houses we call on the mansions of the sky - there's always someone home!

See Bob Kelly at http://bkellysky.wordpress.com/