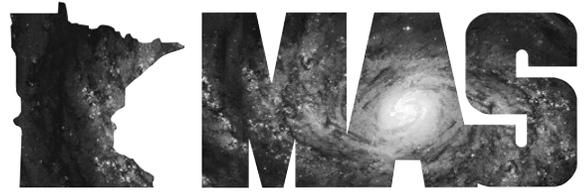


Gemini

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The Transit of Venus in Tucson

by Dave Falkner

Sometimes goals need to be modified. For the Transit of Venus, my original goal was to travel with two or three companions to Alaska, taking the scenic Alcan Highway. Admittedly, it was an ambitious trip. Fairbanks is about 6,100 miles round trip from the Twin Cities, and to do it all in ten days would be grueling. Then there's the weather. Historically, Alaska tends to have a fair amount of cloudiness in June. I guess I shouldn't have been surprised that there was only one reluctant taker for this — not enough to make the trip financially viable, let alone to take turns driving.

I didn't see the 2004 transit, so this was my last chance to see this rare astronomical event. I decided that if I couldn't do the Alaska trip, then I would go someplace where there is a high probability of clear skies. There were several places to choose from: The Sahara Desert, the Australian Outback, the Middle East, most mountains above 12,000 feet — and the southwestern U.S. It seemed to me that hotel/airline package deals to the southwestern U.S. in June, when temperatures routinely top 100 degrees, were probably going to be pretty reasonable. Since I wasn't planning on taking any astronomical equipment (I would take a camera), I needed to find someplace that was hosting a Transit of Venus event so there would be equipment available to view the Sun. The Sun-Earth Day website has such a map, so checked it out. The Mt. Lemmon Sky Center was hosting a private event. (I liked the idea of a smaller group.) This is a mountaintop astronomical site northeast of Tucson run by the University of Arizona. They were hosting a Transit of Venus event complete with a classroom segment, a meal and nighttime viewing — all for \$100. Space was limited. This sounded perfect, so I signed up

I knew that Kitt Peak National Observatory was also in Arizona; a quick Google search determined that it was located just southwest of Tucson, about the same distance as Mt. Lemmon. As long as I would be in the area, I felt I owed it to myself to spend an extra day and visit Kitt Peak as well. I thought it would be great to sign up for the Night Observation Program (NOP), but when I went to sign up I saw that the calendar indicated June 6 as reserved for the Transit of Venus. Clearly there was an error. What an embarrassment for the National Observatory! I called the scheduling number and advised them of their error, but of course the scheduler had to check with her supervisor. It took about two weeks before the correction appeared. I signed up for the June 6 NOP.

Stories Wanted: *Gemini* is written entirely by our members, for our members! *Gemini* needs your stories... how you first became interested in astronomy, how your interest has evolved over the years, equipment you use, star parties and events you've attended here and elsewhere, how you've encouraged others — especially young people — to get involved in this fascinating hobby. Submit your stories to: brownreveugene66@gmail.com

E-mail Update: If your e-mail address has recently changed, chances are your address used for MAS email distribution lists is not current. Please inform Bob Brose of your new e-mail address at bob@qbjnet.com



Photograph of the Transit of Venus taken through H-Alpha filter.

I made reservations at a hotel halfway between the two observatories, reserved a car and made airline reservations. I would arrive in Tucson on June 4, visit Mt. Lemmon and watch the Transit of Venus on June 5, visit Kitt Peak on June 6, and return to the Twin Cities on June 7.

When I arrived on June 4, I was checked into my hotel by 1:30 p.m. With an afternoon to kill, I looked for something to do. The AAA tour book listed the Pima Air and Space Museum, located not too far from the hotel. I jumped in my rental car and headed out. Some first impressions struck me. First of all was the heat. It was over 100 degrees, and even though it is a “dry heat” it was hot. Thank goodness for air conditioning. Second was how desolate Tucson appeared. It was flat and sandy, with a smattering of cacti and a few desert plants. I realize that this is high desert, but I was surprised at how little effort was made in trying to tame it. With only eighteen inches of rain a year, clearly water was a precious commodity, and no one was going to waste it trying to grow a lawn. Even residential areas were landscaped with sand, gravel and desert plants. The last thing that struck me was how expansive Tucson is. The distances on the map didn’t seem too far, but the streets were much farther apart than at home. The mountains in the background seemed fairly close but were deceptively far away. Tucson covered a large area of land.



The Transit of Venus in progress.

I made it to the Pima Air and Space Museum. The desert air makes it a perfect spot to store planes — and they have over 300 of them. There is at least one of every military and specialty plane you can think of from more than 100 years of aviation. Some notable ones are the SR-71 Blackbird, F-14 Tomcat, F-4 Phantom, B-29 Superfortress, B-52 Stratofortress, the Aero Spacelines 377-SG Super Guppy (I swear I don’t know how that one flew) and many, many more. The museum has five large hangars which are air conditioned as well as a Space Museum building. A large number of the aircraft were parked outside. I had no problem spending four hours touring this history of aviation.

The next day was June 5 and the Transit of Venus. I would be going to the Mt. Lemmon Sky Center. Despite the stifling heat in Tucson, I dressed for cooler weather. The summit was over 9,000 feet, and I was staying for the evening program as well. I’m sure it would be nice during the day, but after sunset it cooled off quite a bit — into the 40s. I wore my special “Transit of Venus” Onan Observatory t-shirt with jeans and took a sweatshirt and jacket with me. It was about an hour-and-a-half drive from my hotel northeast into the mountains of the Santa Catalina Nature Area. This took me from the hot and desolate desert into more of a Canadian evergreen environment. When I arrived at Mt. Lemmon, the temperature was in the high 70s and was very delightful.

We were told to arrive by 1:00 p.m. so the group would be ready for the transit, which started at about 3:08 p.m. I was the first to arrive. There were a couple of shuttle buses waiting for us. Our host was Adam Block, who I later learned is a noted astro-imager who frequently has his images published in Astronomy magazine. His first comment was, “I love your t-shirt. Where did you get it?” That comment would be repeated by most of the 25 visitors that day. The t-shirt was a big hit.

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When everyone had arrived, the shuttle buses took us to a classroom building on the site. Tables had been set up in a horseshoe shape to seat all of us. There was a wonderful lunch buffet, and while we ate, Adam and the co-host, Alan, reviewed the history of the Transit of Venus, especially the role of Jeremiah Horrocks. We also observed the feed from the SDO. Special filters allowed Venus to be visible in the corona before it started across the solar disk.



The author at the Kitt Peak National Observatory.

Around 2:30 p.m. we all boarded the bus for the short ride to an observatory at the summit. Although the observatory housed a 32" Richey- Chrétien telescope, it was covered for this event. Attached to the same mount were two small solar telescopes. One had a DSLR camera attached and was set to take a picture every three minutes. The second telescope was equipped with a broadband solar filter and a video cam cabled through a laptop to a 52" HD TV. Outside the observatory a 60mm Coronado telescope was set up for visual observing, as well as a Lund telescope with a video cam linked to the University of Arizona website transmitting a live feed.

As 3:00 p.m. arrived we all gathered around the large TV monitor to try to discern the first contact of Venus. Many had phones with apps for recording the contact times. At 3:08 we were straining to see the indentation of the solar disk that marked first contact. We thought we saw it, then, yes, definitely the indentation was smooth and growing. We continued to watch the black spot move onto the solar disk until second contact at about 3:27. The black-spot effect was very evident, but determining exactly when second contact occurred was more art than science. Then the disk was completely on the solar disk.



The author with the 32" Richey- Chrétien telescope.

Since the Sun would set about mid-transit, the most exciting part was done, and we settled down to watching the disk slowly cross the face of the Sun. We tried to get pictures of the transit on the large TV monitor, using welder's glass or capturing the image

through the Coronado telescope eyepiece. I got a nice picture through the Coronado which shows some solar prominences.

At 5:30 our group retreated back to the classroom building for a delicious Italian buffet supper with lasagna, Caesar salad, garlic bread and other sides. They fed us well. During the meal we learned that there were folks in our group from all across the country. Besides Arizona and Minnesota, we had people from Illinois, Ohio, New Jersey, Florida, California and even Ontario, Canada. Everyone was very nice and excited about having this unique opportunity to see the transit.

After supper we returned to the summit to watch the sunset and take more pictures. As we transitioned to twilight, Adam talked about some of the interesting atmospheric changes, including the onset of the Earth's shadow preceded by a pinkish band in the sky commonly referred to as the Belt of Venus. (Adam was clearly annoyed by that reference.) As the first stars began to peak out, binoculars were given to each of us, and we observed several binocular objects while the sky darkened. Then we moved into the observatory, where the 32" telescope had been uncovered. We got some spectacular views of the Coma Star Cluster, the Whirlpool Galaxy (M51), the Needle Galaxy (NGC 4565), the yellow/blue binary star Albireo in Cygnus, the Ring Nebula (M57), the planet Saturn and globular cluster M5.



Kitt Peak from the Mayall Observatory.

Around 9:30 the waning gibbous Moon rose. Adam ended the observing session and we returned to the classroom. Some beautiful prints of his astro-images were for sale. Then we returned to our cars and made the long trek down the mountain to Tucson. I arrived back at my hotel around midnight.

The next morning I was out of bed by 7:30, got dressed and enjoyed the complementary continental breakfast provided by the hotel. I was on the road by 8:15, since I needed to be at Kitt Peak by 10:00 for the first telescope tour. The early morning in Tucson wasn't bad — warm but not hot. In fact, in the shade it was rather pleasant until around 10:00. Then it got brutally hot, even in the shade.

When I drove to Mt. Lemmon, I had to pass through most of Tucson to reach the mountain road. The route to Kitt Peak was quite different. I left the west side of Tucson and was out in the desert. I passed giant sequoias, many of which were propped up with 2x4 planks or had their massive arms supported by 2x4s. The border patrol was out in force as well. Tucson is fairly close to Mexico, so I'm sure there are a fair number of illegal aliens flowing across the border. After about an hour I reached to road up to Kitt Peak. I didn't know much about Kitt Peak National Observatory (KPNO). It is operated as part of the National Optical Astronomy Observatory (NOAO). I knew about the McMath-Pierce solar telescope. I thought there might be a half-dozen or so telescopes on the mountain. I was surprised to see a radio telescope on my way up (one of two I later

learned), and by the time I reached the visitor parking area it was clear that there are far more than a half-dozen telescopes on Kitt Peak.

KPNO is home to the largest collection of optical telescopes in the world. At the time of my visit there were 24 operational telescopes, ranging from 0.4-meters (the visitors' 16" telescope) to the massive 4-meter (158") Mayall telescope. Most of the telescopes are owned and operated by university consortiums, such as the SARA Observatory (Southeast Association for Research in Astronomy), which includes Florida Institute of Technology, East Tennessee State University, Florida International University, Valdosta State University, Clemson University, Ball State University, Agnes Scott College, the University of Alabama, Valparaiso University and Butler University; and the WIYN Observatory (University of Wisconsin, Indiana University, Yale University and the NOAO). Use of those observatories is pretty much restricted to their respective universities.

Other telescopes are operated by KPNO and NOAO, like the Mayall telescope, and time on them is available to anyone with a research project reviewed and approved by the NOAO. In fact, the availability of telescope time for smaller universities and even individuals was the reason KPNO was established in the first place.



A close-up of the Mayall Observatory.

The early 1950s was a crucial time for knowledge about the universe; it was also the beginning of the space race. Many reputable astronomers were eager to acquire time on large telescopes with top-notch equipment. Most colleges and universities either couldn't afford such instruments or were located in parts of the country where they couldn't be used to their full potential. The two finest telescopes in the world are the 200" Hale telescope at Mt. Palomar and the 100" Hooker telescope at Mt. Wilson. They are owned by Caltech and the University of California, respectively, and only faculty from those universities can have time on them.

In 1954 a group of astronomers petitioned the National Science Foundation to fund a national observatory which would be open to any astronomer. They asked that it be equipped with 36" and 80" telescopes and the world's largest solar telescope. The NSF agreed to fund the project, but the astronomers would have to find the location. After an exhaustive search and testing the observing conditions at a number of sites, the mountain known as Kitt Peak was chosen. It received its name from George Ruskrige, the Pima County Surveyor, who named it after his sister, Phillipa Kitt, as an enticement for her to move to Arizona. The astronomers then went to the Department of the Interior and requested that the land be sold

to the NSF to build the observatory. As it turned out, the land wasn't the Department of the Interior's to sell. It belonged to the Tohono O'odham tribe as part of their reservation.



The Mt. Lemmon Sky Center.

Kitt Peak was known as Ioligam to the Tohono O'odham people and was the second most sacred spot in their culture. Not surprisingly, when the astronomers petitioned the elders to sell 200 acres at the summit, the elders refused. Aden Meinel, who headed up the astronomer group, refused to take No for an answer. He felt that the elders couldn't appreciate what the astronomers were doing without looking through a large telescope. So he invited the elders to come to the University of Arizona and look through their 36" telescope. The elders must have been impressed, because they agreed to sell the land with a few stipulations: Only astronomical research could be conducted on the mountain; tribal members must have first consideration for jobs; utilities must be purchased from the tribe; and half the items in the gift shop had to be tribal crafts. The deal was struck and on May 5, 1958, the NSF secured a perpetual lease from the Tohono O'odham tribe.

I arrived at the Kitt Peak visitors' center right at 10:00 a.m. People had gathered for the first tour, the McMath-Pierce solar telescope. The guide gave us the rules for Kitt Peak (including that cell phones had to be turned off completely so as not to interfere with the radio telescopes) and told us the history of Kitt Peak. Then we walked to a large structure oriented north-south and at about a 32-degree angle (the latitude of Tucson), making it a huge equatorial mount. The flat-mirror heliostats at the top reflect sunlight down the 500-foot shaft, of which 300 feet are underground and 200 feet above ground. The part above ground has cooling pipes in the interior wall so the temperature can be kept constant for the entire length of the shaft to reduce distortion from air currents. The light path then reflects off the 1.6-meter main mirror to the offset secondary mirror, which directs the light into the observing room. This configuration makes the McMath-Pierce the largest unobstructed-path telescope in the world.

We were able to enter the observation room because the Transit of Venus was the previous day and the lab had not been reconfigured for the next research project. The sunlight can be displayed on a table for study in the broad spectrum, or additional mirrors can be used to direct the light to other instruments, including a 13.5-meter spectrograph located below the observation room. While the McMath-Pierce telescope has been the largest solar telescope in the world for 50 years, construction has already begun on a 4-meter solar telescope in Hawaii. It was a thrill to see this unusual telescope.



The Pima Air and Space Museum.

The next tour took us to the 2.1-meter telescope operated by Kitt Peak National Observatory. This was one of the first telescopes envisioned by Aden Meinel and the first astronomers and was completed in early 1960s. The 84" mirror is polished to within 0.000004" and is an f/2.3 Schmitt-Cassegrain outfitted with a spectrograph. Among its accomplishments is the discovery of the first gravitational lens and the first pulsating white dwarf.

The final tour took us to the showplace telescope on Kitt Peak, the 4-meter Mayall telescope. The observatory is located near the highest point of Kitt Peak, with the telescope mounted 158 feet above the ground. The architects believed that mounting the telescope at this height would move it above the air stream that sometimes flows over the mountain. However, the results are questionable, at best.

At the time of its completion in 1973, this 158" Schmitt-Cassegrain telescope was the second-largest in the world after the 200" Hale telescope at Mt. Palomar. The telescope is fitted with the MOSAIC imager, which was developed at Kitt Peak and was instrumental in determining the distance scale and the large-scale structure of the universe. At prime focus this instrument is f/2.7, making it an excellent telescope for conducting sky surveys. This telescope discovered more than half of the known Kuiper Belt objects. The observatory has a very nice observation deck of about 270 degrees, with windows providing a spectacular view of the Kitt Peak facility as well as the surrounding area.

The Mayall telescope tour ended at 4:00 p.m., and the evening program didn't begin until 6:00. Since the observatory was closed, there wasn't much to do except take a nap in my car. At six o'clock I returned to the visitors' center, where the evening program provided a box lunch. Since I hadn't eaten all afternoon, I was famished and welcomed the sandwich, chips, cookies and a bottle of water. There were about 30 people who showed up for the evening program. I listened to the introductory lecture for the fourth time (they started each tour with it), and then we traveled as a group to the ridge facing west to observe the sunset. The tour guide talked a little about the Sun and the effects on the atmosphere at sunset.

Shortly after sunset he directed our attention to the east, where he pointed out the Belt of Venus, that pinkish area of the sky marking the transition between daytime sky and the shadow of night.

The group returned to the visitors' center, where they again handed out binoculars to everyone. As the stars and other objects began to appear, they would direct our attention and have us look through the binoculars. The ISS made a pass, which was fun to watch. We could also see Omega Centauri. This naked-eye object is a spectacular globular cluster even with binoculars. When twilight was nearly done, they had us trade our binoculars for some disposable red lights and divided us into three groups. We then went by bus to one of the visitors' center observatories. Ours housed a Meade 16" LX-200 telescope on a mount guided by a laptop. The leader had to mess with it for about 30 minutes because the mount apparently lost the link to the computer. He finally got it going and we looked at a number of summer objects, which seem even more spectacular in the dry skies of Arizona.



The Aero Spacelines 377-SG Super Guppy.

The program completed around 10:00 p.m., and we were taken back to the visitors' center. The buses they used had slits for headlights, so they didn't light up the area much. The administrators of the center are very conscious of the astronomers who are doing research. As a result, they did not want us to turn our headlights on. To guide us down the mountain, the bus was placed at the head of the line and the cars lined up behind it with just parking lights on. The mountain was amazingly dark as this caravan wound its way down the mountain, each car following the taillights of the car in front of it. About halfway down, the bus went into a turnout; that was our signal that we could turn on our headlights and continue on our own.

I got back to the main road and turned toward Tucson. On the way I came to the border-patrol checkpoint but had no problem getting through. I returned to the hotel around midnight. The next day I boarded my flight to Minneapolis. My immersion into the world of astronomy over the last two days was a real treat. I'm so glad I made the trip and would do it again in a heartbeat. 🦋

Reminiscences of an Astrola Man

by John E. Hill

I joined MAS after the Transit of Venus in 2012, but I have had an interest in astronomy dating back to when the Russians put Sputnik into orbit in 1957. My interest was facilitated as a matter of geography. I was born at the Naval hospital in Long Beach, California, during the last months of World War II, and my family continued to live in that area as I grew up.

Before Sputnik, I spent my youth peering through a series of increasingly powerful microscopes for kids. After Sputnik, I began watching the skies like many other kids drawn to science and technology. This meant that my very patient mother gave up her time to chauffeur me long distances to attend the latest planetarium shows at the Griffith Park Observatory and to places like Mount Palomar Observatory. Along with that, I got my first telescope, a 3" reflector from Edmond Scientific that was available as a kit.



The author's Astrola telescope on its pedestal mount.

What I remember most about that scope is that the optical tube reminded me of a tube from inside a roll of toilet paper but perhaps a bit heavier. Many other things about that scope also reminded me of the bathroom. I needed something better.



The proud owner of the Astrola telescope.

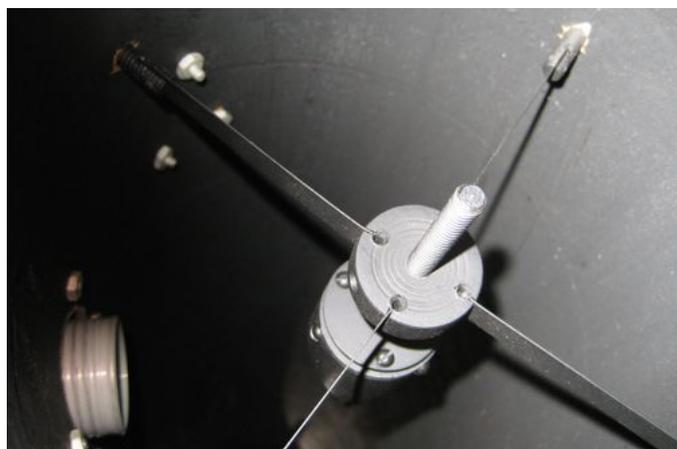
For reasons that I still wonder about, two of the early builders of amateur telescopes were located close by in Long Beach. One of them was Coast Instrument Co., located on Long Beach Blvd., which built Treckerscopes and the coin-operated telescopes used at many tourist attractions around the country. The other telescope-builder was Thomas Cave of Cave Optical, which operated out of a small shop on Anaheim Street. Cave used the name Astrola for its Newtonian reflectors, ranging in size from 6" up to about 16"—all

on very sturdy pedestal mounts.

I made pilgrimages to both builders until in early 1960 I decided on a 6" student-model Astrola. I was impressed with Thomas Cave's local reputation as a planetary observer; besides, my father worked out a better deal with him than with the people over at Coast.

Even though my student-model Astrola was the most basic model offered by Cave, I have never thought about parting with it even though it has not been used in decades. Inscriptions on the back of the 6" f/8 mirror indicate that it was made by Murrell Snell but refigured by Thomas Cave in March 1960. It has a Parks tube with a simple 1.25" helical focuser that seems indestructible. The Bushnell finder is definitely the only weak component.

The three eyepieces that I got along with my Astrola were a 28mm war-surplus Keller along with a 6mm and 12.5mm Huygens from Goto, Japan. The Keller is still great because it provides a nice field of view, but the two Huygens have very narrow FOVs, even though the images are clear and bright. They are great for precise star-alignment when I drop them into my refractor for star-aligning my PushTo computer.



The secondary mirror in its spider.

When it was new, I mostly used the Astrola for observing the Moon and the planets; although the skies were clear near the ocean where we lived, light pollution was already a significant problem in the Los Angeles area. Additionally, I did not have the observing skills to find deep-sky objects on my own and did not even know of a club back then where I could get help.



The logo of the Astrola telescope, made by Cave Optical.

After I went off to college in 1963 to become a microbiologist, the Astrola did not get much use. I occasionally set it up for neighborhood kids and visiting guests so that they could see the

moons of Jupiter and the rings of Saturn. In the mid 1980s I stopped using the Astrola altogether in favor of a pair of 11x80 Meade binoculars that I have used for observing every bright comet since Comet Halley—about a half-dozen comets.

Coming full circle, my new telescope is an American-made Stellarvue 110ED refractor with a connection to Cave. Vic Maris, the owner of Stellarvue, got his start in telescope-building with the help of Thomas Cave back in the 1960s. After retiring from a 30-year career with the California State Park Service, he returned to telescope-building in 1997 by founding Stellarvue in Auburn, California. As for myself, I have spent the last half-century peering through microscopes and am now looking forward to spending a lot more time with telescopes instead. I might even unpack my

beloved Astrola and point it skyward after a little refurbishing.

Astrola reflectors have not been built since 1980 but are still in use and affectionately coveted as if they were a classic car. I understand that interest in Astrola reflectors declined as Schmidt-Cassegrain telescopes became more popular from a pair of upstart Southern California companies named Celestron, in Torrance, and Meade, in Irvine. I grew up in Torrance and lived within walking distance of Meade during the 1990s. I'll bet that some of the old-timers at these companies were also influenced by Thomas Cave.

For more information on Thomas Cave and Astrola telescopes go to: <http://www.frobenius.com/cave.htm> 🐦

One ATMer's Top Ten List

by Paul A. Nelson

Although I'm a newcomer to MAS, I've been chasing photons for more than 25 years. Since I'm right in the middle of building telescope #6 (my third truss-tube Dob), it seemed only natural that this article would address a few of the things that I've learned over 25 years of building telescopes.

Disclaimer: I'm not an expert. I do this for the fun of it. I don't do optics, metal work, or anything other than basic electrical stuff. All my scopes are Newtonians. What follows is my philosophy in building scopes. Your mileage may vary.

So here goes my Top 10 List (of things I learned the hard way):

1. You won't save a lot of money.

I began my first project (a 12½" f/4.8 Dob) back in the '80s when I had three young boys, little time and less money. I thought building a scope would save a lot of money. It saved some, but this was the era when bigger Dobs were just coming around. There were no Obsessions, Starmasters or Tectrons. Building was the only option. Since that time there are excellent commercial scopes and many dealers selling components. After adding up the cost of good components as well as the capital expenditures for tools (unless you already have a fully equipped shop), the cost is only a bit less than an Obsession or Starmaster. Add in your time and the cost comes close to leveling out. Personal satisfaction is, however, priceless.

2. It is a lot of work.

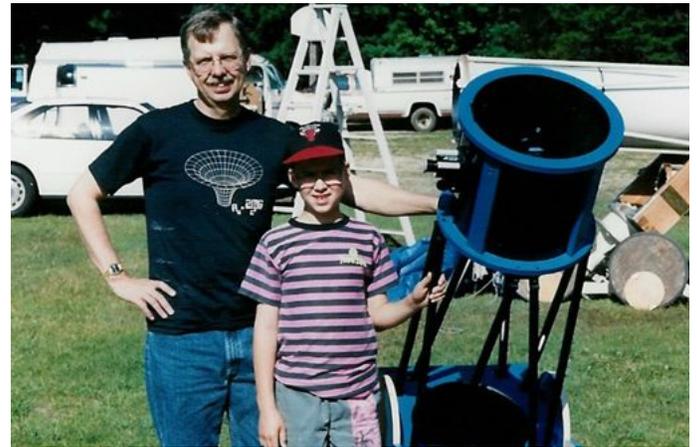
Take it from me. Building a scope may seem to be a straightforward project (and in many ways it is), but the detail, the precision and the inevitable makeovers take time, effort and patience. The biggest decision in my current project was whether I wanted to commit myself to the work and time that this would take.

3. Give yourself enough time.

This is a corollary to #2. Having a deadline to work against is sometimes helpful, but it can also be a source of stress if you've underestimated the work involved. Doing the final tweaking of a new scope the night before leaving for that weeklong star party you signed up for several months ago is a real challenge.

4. KISS (Keep it simple, stupid.)

I add this one because I have found that my fancy or complex ideas are difficult to fabricate. They often don't add to the operation of the scope or its aesthetic value. I personally value simplicity, functionality and reliability.



The author and his son Patrick with the first scope, built in 1989. Patrick got him into the hobby of astronomy when he said that he wanted to learn about the stars. He is now an aerospace engineer with Boeing in the designing and building of satellites.

5. Avoid analysis paralysis.

There are dozens of decisions to make in planning and building a telescope, and most of them are important. You will have numerous options that affect decisions down the road. Diagonal size, focuser, intercept distance, clamp designs, cell design, bearing-ring construction, focal ratio, eyepieces, coma correctors and many other choices have their advantages and disadvantages. With the Internet and the numerous discussion groups, there can be a seemingly endless dialogue on a particular issue—cell design and mirror support being one of them. At some point you have to decide. Make the decision before you go crazy.



The author built wheels on his first scope for easy portability.



Paul and Patrick with the 18" f/4.5 truss-tube Dob built in 1993.

Woodsmith, Fine Woodworking or some of the specialty publications would be productive and enjoyable.



The 18" f/4.5 Dob ready to go to work at New Mexico Skies.

6. Let the professionals do the hard stuff.

Perhaps this is antithetical to some ATMs. I'll never be able to make a spider, diagonal holder or focuser to satisfy myself. On my first Dob I built the mirror cell completely from scratch. On my second one, I cut the steel, drilled and tapped all the holes, and did all of the final assembly. I had a machine shop cut the stainless steel triangles and weld them according to my instructions. On my current project I had the cell built by a professional. You decide.

7. Be square. Be accurate.

I consider myself an intermediate woodworker. I've got a fairly complete shop with all the major power tools and good hand tools. Among the most valuable, however, are setup and measuring tools. You can get through most any woodworking project with material that is close to square or close to the right dimension. However, when you get to the end of the project, all those little errors add up and you have difficulties. I'm not qualified to teach a woodworking class but would suggest that spending some time with Shop Notes,

8. The perfect is the enemy of good.

This may appear to be the opposite of #7. It is not. Perfection is not attainable. Don't let your desire to have the best working and looking telescope on the observing field prevent you from finishing the scope or enjoying it. After years of use with my second Dob (an 18" f/4.5), I discovered I had made an error in the placement of one of the bearing rings. It was not visually noticeable and did not affect the scope's use at all (no DSCs were ever used). It only bothered me after I discovered it.

9. Your scope will never be done.

By this I mean you'll be making some changes or additions
Continued on page 10

MAS Patron Members

MAS offers a patron membership to those members who wish to contribute a little extra to help support MAS activities. Patron memberships are established by constitution at 2-1/2 times the regular membership rate — currently \$70 annually for a patron membership. The \$42 additional contribution is tax-deductible. It is used to fund equipment acquisitions, facility improvements, further outreach activities and more. We would like to thank the following patron members as of February 17. 🐿

Tom Alm	Paul Davis	Victor Heiner	Sridhar Mahendrakar	Mary Beth Smith
Scott Anderson	Shawn Davis	Ric Heins	Duane Martin	Geoffrey Stone
William Arden	Courtney Dietzmann	Lauren Hoen	Michael Maydock	David Swymeler
Jack Atkins	John Donohue	Dan Holmdahl	Ron McLaughlin	Todd Thyberg
Steve Baranski	Russell Durkee	George Hulme	Javier Medrano	David Toole
Greg Baril	Jim Elmquist	Dick Jacobson	Beverly Miller	David Tosteson
Bradley Beisel	Steve Emert	Gale Jallen	Bob Minor	Dale Trapp
Ken Bolvin	Dennis Faith	Mark Job	Claudia Nelson	Valts Treibergs
Collin Bonde	David Falkner	Chelen Johnson	Alan Noot	David Truchot
Rev. Eugene Brown	Al Ferber	Julie Johnson	Douglas Oines	Carl Tubbs
Jonathan Burkhardt	Joe Fisher	Jerry Jones	Daniel Price	Steve Ulrich
Jeff Burrows	Lisa Forrence	Daniel Kaminski	Brian Rembish	Bob Vangen
William Bynum	Andrew Fraser	Ron Kasel	Kirby Richter	David Venne
Ken Carlson	Cindy Funk	Mark Klunder	Stephen Riendl	Paul Walker
Scot Carpenter	Paul Gade	Jim Knudsen	Jack Sandberg	Fred Wall
Kurt Casby	William Glass	William Kocken	Roy Sarver	Greg Welch
Joseph Chiodin	Steve Grabarkiewicz	David Kocken	James Schenz	Mark Wicklund
Deane Clark	Lawrence Gray	Parke Kunkle	Loren Schoenzeit	Brian Wray
Paul Coffey	Dale Hagert	James LaPitz	David Schultz	Neal Zimmerman
Michael Conley	Greg Haubrich	Michael Lawrence	Robert Seabold	
Mark Connolly	Thomas Hawkinson	Louis Leichter	Dan Siers, Sr.	
Mike Daniels	Michael Haydock	Clayton Lindsey	David Siskind	
Alex Danzberger	Jonathan Hayman	Brad Linzie	Drew Smith	

January

Budget: We need to figure out more line items, especially with all the construction. We will meet on January 26 to complete the budget. There will be a mid-year budget meeting to go over expenses. Hold off on expenses until the third quarter. **Cherry Grove Observatory Update:** We need to work on the light fence, keeping in mind the budget. Maybe we do some sections this year, some next year. We still need to finish the shed, the electricity and the scope, so there will have to be a budget set up. It should be ready by the time of the Messier Marathon in March. **Sylvia Casby Observatory and Classroom:** Merle provided the budgets for Onan and Casby. The Onan family contributed again this year. We may get an iPad for the telescope rather than a computer. We need to furnish the classroom (chairs, curtains, DVD player, etc.). **Color Brochure Printing:** Mark will get the cards printed with an image on the front; the schedule is on the back. We need to give credit to the image-taker. We will print 100 each. **Ads for Reflector:** Merle will get them ready; he just has to change the date. **MESTA conference:** Lots of people came by, but there was not much interest in using the facilities. It will be in Plymouth this year. Dave did not feel that it helped the organization out at all, so we will not set up a booth. **Explore Minnesota:** Dave will send our schedule to the magazine for some publicity. **Web addresses:** All Web addresses will go to the Web team, since the ones listed are outdated. **Takahashi Mewlon 300 Telescope Donation:** A telescope has been donated to go in the new Sylvia Casby Observatory at Baylor Park. **Star Party Schedule for 2013:** The schedule is set up and is online. **Nomination of Jerry Jones as Observing Chair:** For the Go/NoGo call, there has been a modification of the MAS main page and star party pages. There won't be a phone message posted. **National Astronomical Convention:** Greg will get more information to see if this is something we want to take on.

February

Budget update: MAS will move to using QuickBooks; software has been ordered. It will make separating items easier. Mark will help Chris set it up when it arrives. **Naming of Baylor Park Site:** The name of the Baylor Park site is the Eagle Lake Observatory featuring Onan Observatory, Sylvia A. Casby Observatory and The Hot Spot Classroom. All signage will include the names of the three buildings; each building will also have its own identifying sign. **Sharing via a cloud service:** Clayton will look into setting up a gmail shared account for the board to utilize so access to documents is easier. **Astronomy magazine renewal:** Greg will take on sending in Astronomy magazine renewals if we want him to, until we get the membership database going at least. He will post a message on the list serve and the forums. He will do renewals twice a year, spring and fall. **Cherry Grove Observatory Update:** Nothing is happening. We are waiting for the thaw. We will need to get an electrician. **Sylvia A. Casby Observatory and Classroom:** Once the buildings are done, we will need to look at a way to capture live video instantly. For special events, it would be a nice thing to have. The bottom ring on the Sylvia A. Casby Observatory is done, and they are starting to put the dome together. It won't be done before the first star parties, but it is progressing. Merle wants it all done by Astronomy Day, April 20. The cement work may not be done, but the buildings

will be ready. The scopes will be installed and usable. The insides may not be completely finished, but they will be usable. The outer shell of the classroom is done. Work parties are listed on the forums as in progress. We need to make sure insurance is notified of an increase in coverage for the buildings. Mark Job will contact Russ Durkee about the agent. **Recognition pins:** Clayton is working on leading ideas to generate interest at the observatories. For example, there could be an observing list per place to earn the pin. Another pin could be an award for contributions to the club. A minimum order would last us for many years. Greg and Clayton will work on a list of items to observe. **Installation of Lunt Solar Scope at J.J. Casby Observatory:** It is installed and ready to go. Clayton will get a picture of the scope. **Reflector Ads:** Ads are in for the spring edition. We get billed after they run, around \$125 for both ads. **Gemini articles:** The board will consider having an article about what is out at the observatories, encouraging members to explore the scopes. **Onan Budget:** Merle presented the Onan budget. The phone total is over \$1,600; it should be split with the MAS and Onan fund 50/50. The budget will be revised. **Windy City novelties and Half Price Books:** These should not come out of the Onan budget since the donations for them go to the general fund. They will be moved. The items within the Onan Observatory are covered by the Onan fund. **Property Tax Exemption:** Property taxes for Cherry Grove are \$82. The hard deadline was February 1 to apply for tax-exempt status for 2014. We missed that deadline. We will apply for 2015. They may be higher for 2014. **Non-Profit Board Responsibilities:** The board will have to provide a 1099 for those contracted to build at Onan. **Lunar Image on MAS Home Page:** The image is fixed, according to Mark. **Telescope Donations:** Clayton sent a spreadsheet of telescopes. As far as the set of books, we will keep some in the library and use others for door prizes. The recommendation regarding the last scope is to donate it to the Scouts (Ric Heins). Clayton made a motion to follow the recommendations on the spreadsheet: have a process of how we deal with donated scopes. First offer it to the observatories, then offer it to MAS members on the forums, then go to Astromart and sell it. Seconded by Mark. All approved. **Forum Revamping:** Merle sent an e-mail about modifications to the forums that he would like to have considered. Have some events open to the public and some private (like outreach). We need to have a clear way for people to request an outreach event. The Web team needs to evaluate what can be seen by unregistered users and what can be seen by registered users. Dave will send a message to Russ about the Web team making changes to the forums. **AstroShort articles for Website:** A request has been made to the Web team to include a link to outside places on the Website. The Web team will look at the site and decide. **FedEx Printing of Gemini:** The suggestion was made to move from print to electronic. We need to find out how many to print, price breaks, etc. Possibly consider allowing members to opt out of the print version for a price break on membership. Should we research a "print on demand" option? Greg will check with Steve to see if there already is a checkbox for receiving Gemini. We are looking at reducing the cost to the club by printing fewer newsletters. Find the break-even point: the cost if you send it out to all versus sending it out to some. How many copies do we print in excess of the membership? Mark will take this on. **Moving some books from Eisenhower to Hot Spot:** Merle will consider it. 📌

Directions to the Star Party Locations

For maps and further details about the sites, please go to our website at www.mnastro.org/facilities.

Baylor Regional Park and Onan Observatory

To reach Baylor Regional Park, head west on Minnesota Highway 5, through Chanhassen and Waconia, to the town of Norwood-Young America. Turn right onto Carver County Road 33 and continue approximately two miles north. Baylor Regional Park is on the right side of the road, marked with a prominent sign. When entering the park, stay to the right and follow the road approx 1/4 mile.

When visiting the Baylor Regional Park, MAS members are requested NOT TO PARK OR DRIVE on the grass. There is a drive up to the observatory which can be used for loading or unloading or handicapped parking only.

For an alternate route from the southern suburbs, take U.S. Highway 212 west to Norwood-Young America. Turn right at the second traffic light onto Carver County Road 33. Continue two miles north to the park entrance.

Cherry Grove

Cherry Grove is located south of the Twin Cities, in Goodhue County, about 20 miles south of Cannon Falls. To reach Cherry Grove, head south on Highway 52. On 52 about six miles south of Cannon Falls, and just past the Edgewood Inn, is a large green highway sign for Goodhue County Rd. 1 "WEST". Turn right, and follow County 1 straight south for about sixteen miles until you arrive at a "T" intersection with County A. The observatory is immediately at your right, nestled in the shoulder of the "T". Parking is permitted on the site, or along the road, preferably County A.

Metcalf

Head east from St. Paul along Hwy. 94. Exit at Manning Avenue (exit #253) Turn south (right turn) and then almost immediately turn left onto the frontage road (Hudson Road S). Continue east on the frontage road for about 1.5 miles. Turn right onto Indian Trail, checking the odometer as you turn. Follow Indian Trail south for just about 1.1 miles, where you'll see an unmarked chain-link gate on the right, opening onto a dirt driveway with slight up-slope. This is the entrance to Metcalf.

Belwin / Joseph J Casby Observatory

Head east from St. Paul along Hwy. 94. Exit at Manning Avenue (exit #253). Turn south (right turn) and then almost immediately turn left onto the frontage road (Hudson Road S). Continue east on the frontage road about 3.4 miles until Stagecoach Trail South, then turn right onto Stagecoach Trail and go east about 2 miles until reaching Belwin Conservancy on your left at 1553 Stagecoach Trail South. From the Belwin driveway entrance, travel about 500 feet and turn left at the gate. Travel about 1/4 mile through the woods until you emerge at the parking area near the classroom building and the Joseph Casby Observatory.

Long Lake Conservation Center

From Western Twin cities

Take I-94 west to Rogers/MN 101. Go north/right on MN 101 through Elk River, where MN 101 becomes USA 169. Continue north on US 169 approximately 90 miles to Aitkin. At stoplight in Aitkin, turn east/right onto US 169/MN 210 and go out of town eight miles. Then turn east/right, following MN 210 toward Duluth. Proceed seven miles. A large green highway sign marks the turn off 210 to Long Lake Conservation Center. Turn north/left on County Rd. 5. After three miles, turn east/right on gravel County Rd. 88. It is approximately one mile to the LLCC gate. Follow signs to parking and unloading areas.

From Eastern Twin cities

Go north on I-35 to Finlayson/Exit 195. Turn west/left and go one mile to County Rd. 61 and MN 18. At stop sign turn right/north and go two miles. Follow MN 18 west/left and continue 19 miles to MN 65. Turn north/right on MN 65 and proceed 30 miles to McGregor. Intersect with MN 210 and follow 210 west/left (through McGregor) for seven miles. A large green highway sign marks the turn off MN 210 to Long Lake Conservation Center. Turn north/right on County Rd. 5. After three miles, turn east/right on gravel County Rd. 88. It is approximately one mile to the LLCC gate. Follow signs to parking and unloading areas.

Continued from page 8

sooner or later. Plan for that now. Even if you star-hop exclusively, make the center pivot bolt one that is already designed for the addition of the DSC azimuth arm. If the addition of a ServoCat is even remotely possible, you may want to have the rocker sides high enough so the unit can fit in your rocker box. It also means that the ground board should be cut as perfectly round as possible. Think ahead.



The author's essential setup tools for building an accurate scope.

10. It is your baby.

When the scope is finally done and you are under the dark skies, there will be a special feeling, knowing that you had a big hand in bringing those ancient photons into your eye. It is truly a personal scope made to your specifications and design, well worth the time, cost and energy. Priceless!

This article was not designed to give you any detailed, technical advice. I would, however, highly recommend that if you wish to build a Dobsonian you buy or borrow a copy of Dave Kriege and Richard Berry's classic book, *The Dobsonian Telescope*, published by Willmann-Bell. While it is now a bit dated, it provides an excellent guide for such a project. There are others, but I've found the discussions on cloudy nights to be helpful. 📖

Minnesota Astronomical Society 2012 Star Party Schedule

Friday Date	Sunset:	Twilight at:	Completely dark from:	Completely dark to:	Moon % Illuminated	Onan Public Night (Sat.)	Cherry Grove	LLCC Weekend	Notes
Apr 05	19:46	21:32	21:32	04:38	18%	Apr 06	X	*	
Apr 12	19:55	21:44	22:34	04:39	8%		X	X	
Apr 19	20:04	21:57	03:23	04:23	67%	Apr 20			Astronomy Day
May 03	20:22	22:26	22:26	03:10	31%	May 04	X	*	
May 10	20:31	22:41	22:41	03:34	1%		X	X	Virgo Venture at CG
May 17	20:40	22:57	01:51	03:19	51%	May 18			
May 31	20:54	23:26	23:26	01:42	45%	Jun 01			
Jun 07	21:00	23:38	23:38	02:43	0%		X	X	
Jun 14	21:04	23:46	00:21	02:38	35%	Jun 15			
Jun 28	21:06	23:48	23:48	00:13	71%	Jun 29			
Jul 05	21:05	23:41	23:41	02:52	4%		X	X	July 4-6 at LLCC - 3 nights
Jul 12	21:01	23:30	23:30	03:04	22%	Jul 12-14	X	X	Camping with the Stars, at Onan, July 12-14.
Jul 26	20:48	23:03	never	never	75%	Jun 27			
Aug 02	20:39	22:47	22:47	03:05	12%		X	X	
Aug 09	20:29	22:31	22:31	04:03	11%	Aug 10	X		
Aug 23	20:06	21:58	never	never	87%	Aug 24			
Sep 06	19:40	21:25	21:25	04:55	3%	Sep 07	X	X	Northern Nights Starfest #5: Sep 4-8
Sep 13	19:26	21:09	01:07	05:06	67%	Sep 14			
Sep 27	18:59	20:39	20:39	00:38	40%	Sep 28	X	*	
Oct 04	18:45	20:25	20:25	05:36	0%		X	X	Fall Mini-Messier Marathon at CG and LLCC
Oct 11	18:32	20:11	00:08	05:45	53%	Oct 10			Fall Astronomy Day
Oct 25	18:08	19:48	19:48	23:24	57%	Oct 26			
Nov 01	17:57	19:38	19:38	06:12	2%		X	X	
Nov 08	16:48	18:30	22:10	05:21	39%	Nov 09			
Nov 29	16:29	18:16	18:16	04:37	27%	Nov 30			Special Event - Comet ISON
Dec 06	16:26	18:14	21:08	05:52	24%	Dec 07			Special Event - Comet ISON
Dec 20	16:28	18:18	18:18	20:00	87%	Dec 21			Special Event - Comet ISON

LLCC nights indicated with an “*” instead of an “X”. We will be sharing the facility with other groups. Not all of the lights will be extinguished.

This schedule is subject to change. Please check the MAS online calendar at www.mnastro.org for a complete schedule of all MAS events. Cherry Grove Star Parties are held on Friday nights, with Saturday reserved as the backup night if Friday is cloudy. LLCC Star parties are held on both Friday and Saturday night. Onan Public nights are held on Saturday nights only.

The **Casby Observatory at Belwin** is available to MAS members who have completed the Belwin Orientation and training to use at any time. We will not have scheduled star parties at Casby. To reserve the observatory for yourself, please post your request on the Casby Observatory Keyholders discussion forum.

The **Metcalf Observing Site** is available to MAS members at any time. We do not have organized, scheduled star parties at Metcalf. Feel free to head out there whenever you wish.

The **Onan Observatory** holds regularly scheduled Pubic nights. You are welcome and encouraged to bring your own observing equipment to these events. All other nights the observatory is available for trained members use. To reserve the observatory, go to the Onan reservation calendar at <http://www.mnastro.org/onankey/reservations/reserve.php> Before heading out, Please check the Onan reservation calendar to verify if there is a outreach event scheduled.

In 2013 daylight saving time begins March 10 and ends on Nov 3.



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How to pay your dues

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To Renew Your *Sky and Telescope* Subscription

New subscriptions to *Sky and Telescope* at the MAS member discount must be sent to the MAS for group membership subscription processing. Send new subscriptions with your MAS membership to the attention of the Membership Coordinator at the MAS at the Post Office box address shown on the back cover of the *Gemini* newsletter.

You may mail your subsequent subscription renewal with payment directly to *S&T* or renew via phone with Sky Publishing at 1-800-253-0245. This method is especially beneficial to those who wait until your subscription is about to expire before renewing *S&T*. If you wish, you may still submit your *S&T* subscription renewal to the MAS when you renew your membership in the MAS and we will enter your renewal on your behalf just as we always have done.

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