Fulfilling a Lifelong

AS A YOUNGSTER GROWING UP in Illinois, I developed an interest in amateur astronomy. In high school I made 6- and 10-inch Newtonian telescopes, including grinding the mirrors. Although I went on to study physics and astronomy in college and even did graduate work in astronomy at the University of Chicago, I ultimately took another career path and became a psychologist (or, as I like to put it, I switched from outer space to inner space). When I made that change, I promised myself that someday I'd build an observatory for the viewing enjoyment of myself and my community.

Observatory Design **and Construction**

The climate at my rural home near Monterey Bay in California is mild and frost-free, so I decided to build a roll-off-roof observatory rather than a domed structure. While I'm also blessed with relatively stable atmospheric conditions and a reasonably dark sky, some light pollution still spills over from nearby Santa Cruz and Silicon Valley. I felt that refracting telescopes, rather than large reflectors, would prove optimal for my conditions, and my observatory was designed for them.

Overall the observatory, which was built by David Frybarger, has the look of a conventional detached garage — except for the exterior beams along the patio and the roof that moves back and forth!

The structure sits on a sandstone knoll with an almost unobstructed 360° view of the sky. With the help of Ed Byers, who made the German equatorial mounts for my telescopes, I established a central north-south line for the observatory. Along this line two 4-foot cubical holes were jackhammered into the extremely hard sandstone and filled with concrete. These serve as bases for the concrete telescope piers, which were isolated from the building's concrete-slab floor to prevent vibrations being transferred from the floor to the telescopes.

All told, 42 cubic yards of concrete were poured for the observatory, piers, two walkways, and an adjacent patio on the north side of the building. There are embedded conduits for electrical lines and for cables used for computer

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Dream

Edward B. **Noffsinger**

This home observatory grew from a personal promise made long ago.

and video hookups. The roll-off roof slides northward over the patio, providing a shady place to relax on hot summer days when I use the telescopes for solar observing.

The observatory's outside dimensions are 16 by 20 feet, and the 9-foot-tall walls are conventional wood framing with 2x4 studs on 16-inch centers. The outside is covered with plywood siding, and the inside is finished with sheetrock. To ensure that the temperature inside the observatory remains in close equilibrium with the outside ambient temperature, no insulation was used in the walls. There are also 4-inch circular vents along the top and bottom of the exterior walls between each set of studs and at the top and bottom of all interior cabinets.

Seeds were sown for the author's observatory when he switched career paths from astronomy and physics to medicine in the early 1970s. The facility and its array of eight refractors (described in the accompanying text) were recently completed after more than two decades of planning and construction. Their design was driven, in part, by the mild climate and sky conditions at the author's Santa Cruz, California, home.

Roll-Off **Roof**

Two horizontal 4x8 beams topped with 1x4 lath extend northward from the upper north corners of the observatory along the east and west sides of the patio. Each beam is supported by three 4x6 redwood posts, and 2x8 redwood joists on 2-foot centers running between the beams keep them straight and parallel. A pair of 4x4 diagonal cross braces further stabilizes the beams at the end away from the observatory. The beams support barn-door tracks that are turned upside down for the roll-off roof.

The rolling roof consists of a rectangular, welded-steel frame with the same footprint as the observatory. There are a total of 24 barn-door "trucks" mounted along the east and west sides of the frame, and these roll on the inverted tracks. The frame carries 11 conventional roof trusses made from wood and covered with ½-inch exterior plywood sheathing. This is topped with lightweight metal roofing shingles that are designed to look like asphalt shingles.

The roof is powered by a gearmotor and chain drive that turns a steel shaft extending the width of the building at the top of the observatory's northern interior wall. The shaft has four garage-door cable drums mounted to it. Stainless-steel cable winds around the drums and attaches to each end of the roof through pulleys and guides. Magnetic switches limit the roof's motion.

The top half of the observatory's southern wall is a pair of bi-fold sections that swing outward to expose the southern sky to the telescopes. There are also large sliding windows on the building's north, east, and west walls.

MIKE NOFFSINGER

The author's daughter-in-law, Olga Ramirez Noffsinger, lends scale to the observatory and its battery of eight refractors, several of which are specially made for solar observing. The instruments are carried on a pair of German equatorial mounts built by Ed Byers.

Telescopes and Mounts

The observatory's primary instrument is a 12-inch f/12.2 refractor custom made by D&G Optical in Manheim, Pennsylvania. Barry Greiner thinks that the scope, which took more than a decade to complete, is the best large refractor his company has made. The achromatic objective is constructed with proprietary crown and flint glasses that are fully multicoated.

The 14-inch-diameter tube is oversized for better cooling and thermal properties. It was custom rolled and welded, and all the seams were ground and smoothed before the tube was powder-coated on the outside and its interior painted flat black. Extra baffles inside the tube minimize reflections, ensuring that views of the night sky through the instrument have a velvety black background. A 24-inch-long, 16-inch-diameter dew cap is fitted with a heater and an adapter that accepts various aperture stops and filters.

A cluster of four companion refractors and a finderscope are mounted along with the 12-inch. These include a pair of D&G Optical 5-inch f/30 achromats in oversized tubes that are intended primarily for solar observing. The other two scopes have 3-inch f/30 single-lens objectives and oversized tubes. Internal fans promote laminar airflow within the tubes to reduce air turbulence. They were custom made by the late Bob Mortimer for full-disk solar observing with hydrogen-alpha and calcium K-line filters. Hexagonal tube rings with collimation adjustments support the 12-inch refractor and auxiliary telescopes, enabling them to be accurately aligned to one another.

For solar observing, I typically configure the 12-inch scope with a Baader Planetarium 2-inch Herschel Safety Wedge Solar Prism for white-light observations. One of the 5-inch scopes is fitted with a Daystar 2-inch hydrogen-alpha filter that has a very narrow, 0.25-angstrom bandpass. The other 5-inch refractor is used for either calcium K-line or hydrogen-beta observing.

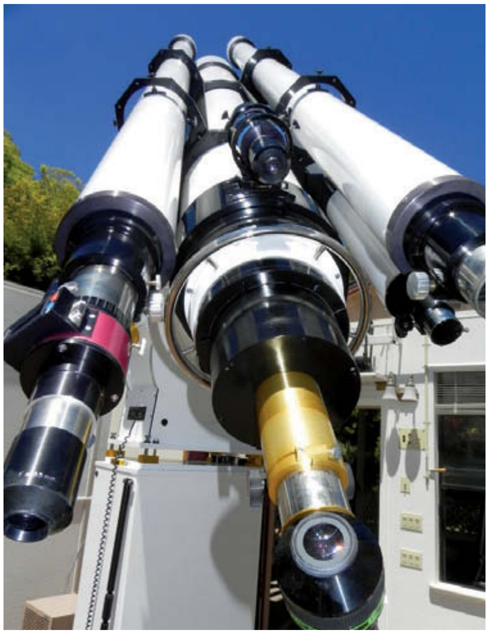
The scopes ride on a Byers Series III German equatorial mount attached to the larger of the observatory's two cement piers. The mount has 5-inch-diameter bearings at the top of the polar and declination axes. Both axes are driven by large worm gears, which are diamond lapped for maximum tracking accuracy. The gear on the polar axis is 18½ inches in diameter with 584 teeth, while the declination gear is 15 inches with 480 teeth. Both have worms that are spring loaded to eliminate backlash. The drives use DC servo motors, which have a greater speed range, more power, and are smoother than stepping motors. The electronics provide accurate solar, lunar, and sidereal tracking rates.

The mount has traditional setting circles as well as a digital readout for right ascension and declination. The highly accurate 18½-inch-diameter right ascension circle is unusual for having its own electronic sidereal drive system that keeps it synchronized with the sky. As such, I can initialize the setting circle at the beginning of an observing session and then point the scope to any object by dialing in the object's right ascension directly on the circle. I don't have to worry about making hour-angle calculations or having the setting circle lose its accuracy when I manually slew the telescope with its drive motors. The digital setting circles are initialized using any of six stars, three of which are always visible at any given time.

The smaller pier in the observatory is for an 8.2-inch f/8 semi-apochromatic refractor with an oil-spaced objective made by Fred Mrozik. It is mounted along with 5-inch and 4-inch Takahashi fluorite refractors on a Byers Series II½ mount. Rounding out my observing arsenal is a 16-inch f/5.5 Newtonian reflector on a Byers Series II mount with a custom pier on wheels. I prefer observing with the refractors because of their black sky background, but the reflector does have greater light-gathering power.

My home observatory is the culmination of a lifelong dream that began almost a half century ago. It is hard to describe the pure joy of observing with your own telescopes. I've held many stargazing parties here and look forward to many more. It's a thrill to see the looks on people's faces — children and adults alike — as they view through a large telescope for the first time. The observatory has become a major source of enjoyment for my family, friends, and community. I wish every success to others who have a similar dream of building a home observatory. I'm certain they will find it to be a fulfilling pursuit that provides great personal satisfaction. ✦

An enthusiastic amateur astronomer, ***Edward B. Noffsinger*** *spent 40-plus years as a psychologist, administrator, and consultant to national and international medical groups. He can be contacted through his website,* ***www.GroupVisits.com****.*



The business end of the 12-inch refractor includes a very large stainless-steel "yacht steering wheel" made by Ed Byers. It allows the observer a convenient handhold for swinging the big telescope and its auxiliary instruments around the sky.