SkyWAAtch

North America Nebula

Many of the summer sky's best treats can be found in the constellation Cygnus. These two nebulae – the North America and the Pelican – cover a 3-degree swath of sky (six times the width of the moon) and show up well with Hydrogen Alpha filtering. Mauri Rosenthal shot this with a Borg 55FL astrograph at 200mm focal length with a ZWO ASI1600MC camera using an IDAS LPS-V4 filter which passes both H-alpha an O-3 wavelengths and little else, making it an excellent nebula filter for dark or light polluted skies. The total exposure time from Mauri's yard in Yonkers was 92 minutes captured in 4 second exposures using SharpCap Pro and the final stack was processed with PixInsight.

In This Issue . . .

Events for August

Upcoming Lectures

Pace University, Pleasantville, NY

There will be no WAA lecture for the month of August. Lectures resume on September 14th with Members Presentations Night. It's a WAA tradition to start the fall meeting series with Members' Night. WAA'ers present talks on their astronomy travels, equipment, imaging techniques and observing experiences. It's our most popular meeting and a great way to start off the academic year.

Starway to Heaven

Saturday August 4th, Dusk.
Ward Pound Ridge Reservation, Cross River, NY

This is our scheduled Starway to Heaven observing date for August, weather permitting. Free and open to the public. The rain/cloud date is August 11th. **Important Note**: By attending our star parties you are subject to our rules and expectations as described here. Directions and Map.

New Members. . .

Arlene Persampieri - Mamaroneck
John Lasche - Hastings-on-Hudson

Renewing Members. . .

Lydia Maria Petrosino - Bronxville
Anthony Bonaviso - New Rochelle
Robbin Conner - Millwood
Satya Nitta - Cross River
Glen & Patricia Lalli - White Plains
Barry Feinberg - Croton on Hudson
Robert Brownell - Peekskill
Eric and Katherine Baumgartner - Redding
Ihor Szkolar - White Plains
Lori Wood - Yonkers
Leandro Bento - Mohegan Lake
David Parmet - Pound Ridge
Doug Baum - Pound Ridge

Call: 1-877-456-5778 (toll free) for announcements, weather cancellations, or questions. Also, don't forget to visit the WAA website.

RAC SUMMER STAR PARTY
August 10th through August 19th

The Rockland Astronomy Club is sponsoring its summer star party August 10th through August 19th. RAC holds the longest and most exciting star party, geared to both the serious observer, imager, and the whole family. The location in the Berkshires is known for its pristine dark skies, and gorgeous arching Milky Way. Don't miss the Opening Festival and StarBQ with live music. For details go to:

http://www.rocklandastronomy.com/ssp.html.

The Solar Viewing Party at NEAF this year inspired Mauri Rosenthal to try his hand at H-alpha Solar Imaging, so he acquired a Daystar Quark H-alpha etalon along with an Energy Rejection Filter which could be used with his 3.5" Questar telescope. Daystar had explained that performance could be improved with a telecentric Barlow such as a Televue Powermate, which keeps light rays parallel rather than diverging at the eyepiece, as occurs with a standard Barlow. "I remembered seeing a 2X Powermate advertised in the SkyWAAtch classifieds and went diving into recent issues to track down the seller. It's a relatively large and heavy component but I've been really pleased with the way it performs with several of my scopes, and I was able to get this image in my first real attempt. Thank you SkyWAAtch!" Mauri shot this with a ZWO ASI120MC planetary camera at a high frame rate and processed it with AutoStakkert and PixInsight.

ALMANAC
For August 2018 by Bob Kelly


Aug 4 Aug 11 Aug 18 Aug26

I hope you are enjoying the planet parade of summer 2018! Mars finally joins the lineup at a decent time of night, but Mercury scoots back in front of the Sun, leaving Venus, Jupiter and Saturn to welcome Mars.

Mars is closest for this two-year cycle as we start August, four days after opposition. What color is the 'red' planet? Did you see Mars at earlier oppositions? With dust storms sweeping the planet, how red is Mars compared to previous years? Will any change be noticeable when and if the dust settles out? No telescope is needed for this interesting observation. Even as we pull away from our neighbor, through the 21st Mars is closer than it will be at our next close approach in 2020 and we are still closer than it was at the 2016 apparition into the first half of September. To see details on Mars, we have to look through lots of our atmosphere. Mars is about as low in the sky as it gets – maxing out at 23 degrees above our southern horizon. And, that peak altitude happens near the midnight hour daylight time.

Three bright planets provide introductory courses to our celestial evening meal. Jupiter is dropping down into the southwestern sky, setting well before midnight. Catch it early for the best views. Jupiter still looks larger than any of the other planets, so there is lots to look at. There's a bonus of occasionally seeing two of its moons' shadows on the cloud tops of Jupiter - up to 11 times this month for an hour or so at a time, thanks to Jupiter being cattycorner to the Earth and Sun this month. By the way, how's that Great Red Spot doing? Is the Northern Equatorial Belt more irregular than the Southern one?

Saturn is next in line, between Jupiter and Mars. The ringed wonder is highest just after sunset. It's smaller than the other three brighter planets, but the rings are approaching their maximum tilt as seen from Earth this year. Bright moon Titan is visible in most telescopes, even with the rings so bright. Dimmer Iapetus will pass south of Saturn on the 8th and brighten as it moves to Saturn's west by the 29th.

Venus is likely to be the 'first star' people see tonight. It's at maximum elongation on the 17th, but it's getting low on the ecliptic and is just 10 to 15 degrees above the horizon at sunset. Catch it in a bright sky to see Venus' phase shrinking past half-lit during August.

Mercury disappears into the Sun's glare, but can be spied passing across the C3 view of the SOHO spacecraft from the 5th through the 13th. By the last week of the month, Mercury is highest in the dawn sky and an easier target than July's evening apparition. Just above, the twins of Gemini lie on their sides, as if they've just awaken from their night's sleep.

What about that flickering comet PANSTARS C/2017 S3? It's flared twice, low in the northern morning sky. It's likely to brighten to naked eye brightness, but the dawn's glare will make it harder to find. Look soon! It passes closest to the sun on the 16th. If it survives its 15 million-mile close pass by the Sun, it could be very bright in the C3 field from the 24th through mid-September. Watch it now as zips out of the inner solar system. With an orbital eccentricity of 1.00, it's not likely to return.

The summer's favorite meteor shower, the Perseids, is best on the mornings of the 11th and 12th. You can see increased numbers of meteors at least a week before and after. Fifty Perseids an hour can fall in the morning hours as the radiant is highest in the sky and our side of the earth is plowing through the stream of meteors. Evening hours should still be a good time to see a few dozen bright meteors. The radiant is up all night, and the meteors are streaming from above our path around the sun, not directly into our path, so some pieces of comet Swift-Tuttle are sprinkled into the evening sky. Many of the Perseids are bright, so this is a more urban-friendlier shower. Aim your eyes in the direction of the largest expanse of dark sky. To see the most meteors possible, keep your eyes out of direct light.

Again, this month has a new Moon, lining up with the Sun near lunar perigee increases high tides by a foot or several feet, depending on shoreline topography. This effect also decreases the height of low tide.

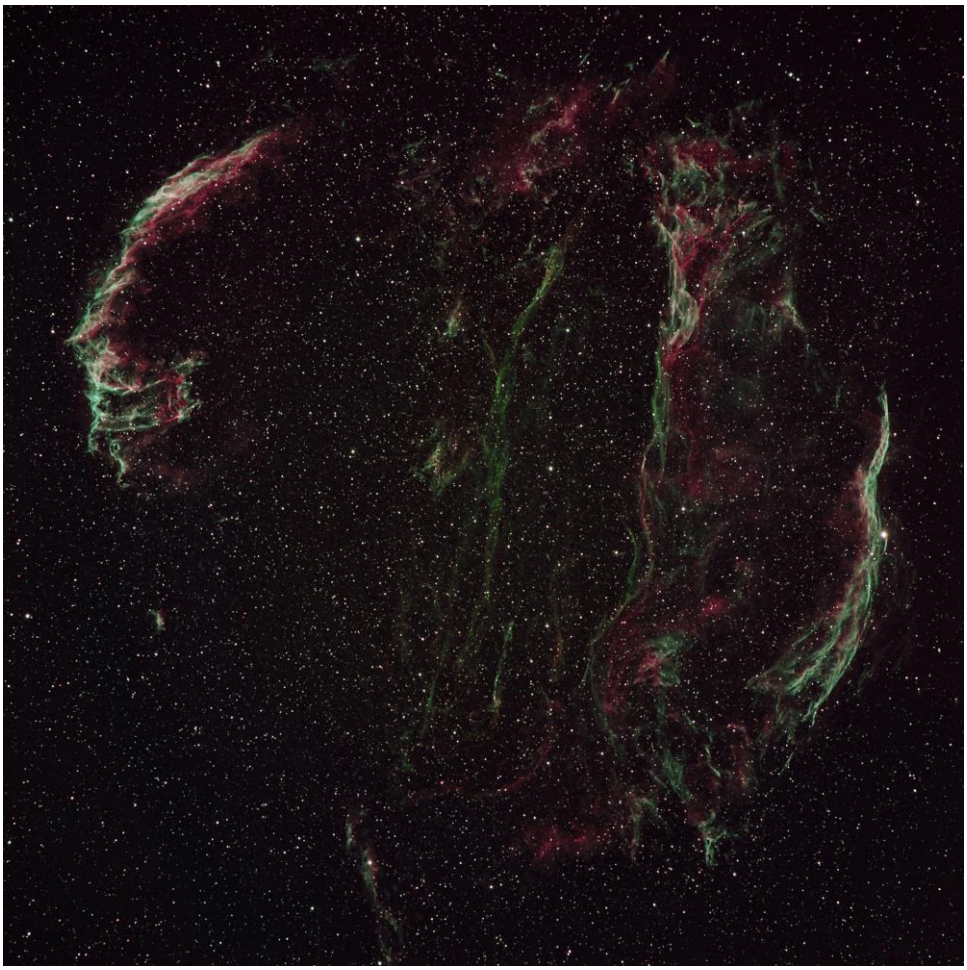
The moon makes some wide parings with the bright planets. Luna steers wide of Venus, after last month's close encounter. The banana moon lines up with Venus on the 13th and sails high over it on the 14th. Jupiter is seen in the lunar neighborhood on the 17th and 18th. Saturn is nearby the moon on the 20th and 21st. Mars dazzles near the moon on the 22nd and 23rd.

August is a great month for sighting the galactic center in Sagittarius, highest in the south about 10pm daylight time. It's low in our skies - not as good a view as the folks down under have (see https://milky-way.kiwi/). Look for star clusters and dust clouds, see the Milky Way as steam from a teapot, find a nearby teaspoon. It's a wonderful place to tell stories about distant objects in the solar system (like Pluto and New Horizons and Ultima Thule).

Fans of our multi-national outpost in low Earth orbit can view the International Space Station making evening overflights until the 10th.

* *

Veil Nebula



Scott Nammacher took this picture in 2016 but didn't process it for printing until recently. It is the full Veil Nebula, about 8,000 light-years away in the constellation of Cygnus. Scott captured this image at his Observatory in upstate New York with a 12.5 PlaneWave Scope, an Apogee U16 camera and narrow band filters plus some natural RGB frames.

Scott will be exhibiting his impressive photos at the Harrison Library through August 17th. For details see the following press release

"Treasures of the Night Skies"

Northern Lights and Astrophotos of Scott Nammacher will be on Exhibition at the Harrison Public Library's Halperin building

July 29th to August 17th, 2018

Deep Space and Northern Lights photographer Scott Nammacher, a Westchester based amateur astrophotographer, will be exhibiting his photos in the Eric R. Smith Community Room at the Harrison Public Library. The exhibition opens July 28th and extends to August 17th. It is called "Treasures of the Night Skies."

Mr. Nammacher's photographs are taken from his up-state observatory (Starmere) and two remotely operated observatories (one in Australia and the other in New Mexico). He has been photographing nebulas, galaxies, along with cloud and gas regions, and more local solar system targets since the early 2000s. He became more seriously involved after he designed and built his own fully automated observatory near Catskill, NY in late 2008. He has shown earlier works at locations in the Hudson Valley area, including the Hudson Opera House in Hudson, NY and libraries around Westchester. He has also given talks and presentations around the region on astrophotography.

He recently photographed a spectacular show of the aurora borealis (northern lights) from Churchill, Manitoba, just south of the Arctic Circle. The best of these will be shown at this show as well.

His prints are created using a unique process that involves printing on a coated piece of thin aluminum, which enhances the color and vibrancy of the photos. His website is starmere.smugmug.com.

He will also give a talk on his photographs on August 4th, at 10:30 am. Weather permitting, he will set up a solar telescope for attendees to get amazing views of the sun.

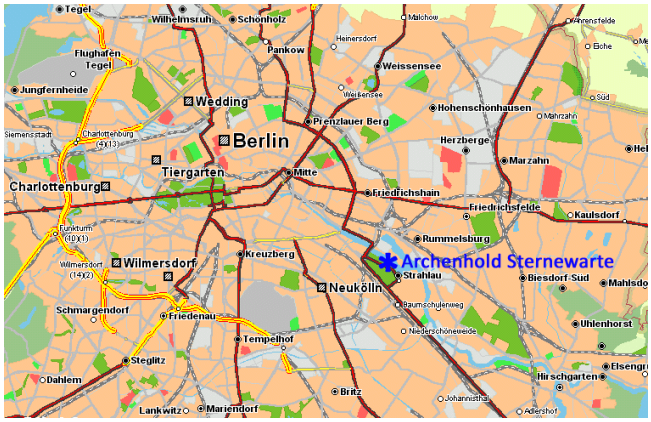
Harrison Library information:	2 Bruce Avenue, Harrison, NY Phone: (914) 835-0324 Website: www.harrisonpl.org
Artist Information:	Website: starmere.smugmug.com Email: snammacher@msn.com

HERE is a sample of some of Scott's photographs. More can be seen on his website:

We Visit the World's Longest Refractor

Larry Faltz

Within a span of two weeks Elyse and I found ourselves at the longest and the widest refractor telescopes in the world. The widest is the famous 40" Alvan Clark refractor at Yerkes Observatory in Williams Bay, WI. I learned earlier this year that the University of Chicago, owner of the observatory, was going to close it at the end of September, so we planned a trip to Chicago in late June to see it. The longest is the 69-foot long Großer Refraktor (Great Refractor) at the Archenhold Sternewärte (Observatory) in Berlin. It was unknown to me until J. Kelly Beatty of Sky & Telescope told me about it just before we left for a long-planned visit to the German capital in mid-June. This article will describe the Archenhold instrument, and next month I'll tell you about Yerkes.



We were in Berlin from June 12th to the 19th. On our second day, we took the efficient Berlin subway to Treptower Park, on the left bank of the Spree River that courses through the middle of the city. A walk of about a mile along the river brought us to the Restaurant Zinner, where we stopped for a beer. Just inland from the beer garden stands an impressive building out of which is sticking what appears to be a giant cannon. This is the Great Refractor, also known appropriately as the Himmelskanone (Celestial Cannon). It was a peculiar sight.

Berlin was an important although somewhat provincial municipality even in the days of greatness of the Kingdom of Prussia under the cultured, flute-playing Frederick the Great (reigned 1740-1786), but it became a truly international city when it was made the capital of Otto von Bismarck's unified Germany in 1871. A few years later, eager to compete with their European neighbors for recognition as an industrial and scientific power, German businessmen wanted to hold a World's Fair. World's Fairs were big in the 19th century as the Industrial Revolution came to maturity. Two were held in Paris in the years after Prussia humiliated the French in the Franco-Prussian War of 1870. The first *Exposition Universelle* in Paris was mounted only 8 years after the war and the second, in 1889, featured that marvel of French design and engineering, the Eiffel Tower. It must have been galling to the Germans that their traditional enemy could rise so quickly from the ashes, and in such style. So a competing World's Fair ought to reestablish Germany's reputation as the leader of the industrial world.

Unfortunately, the German government was not willing to front the money for a grand international exhibition. In fact, Kaiser Wilhelm II was completely opposed to the concept, writing to his chancellor

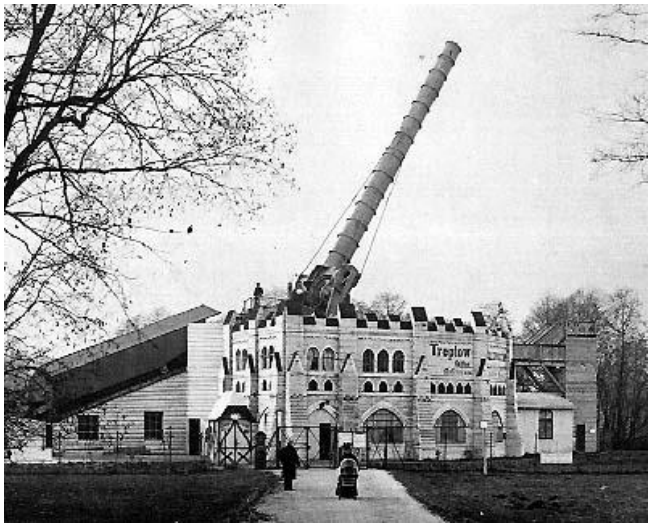
> [People say] Paris's fame keeps Berliners from sleeping, Berlin is a major city, and as such it must have an exhibition. This is completely false. Paris is simply what Berlin will hopefully never become: the biggest whorehouse in the world.

Nevertheless, the Association of Berlin Merchants and Industrialists was able to plan a fairly sizeable, if not internationally recognized, industrial fair, the Berlin Industrial Exposition, to be held in 1896, the 25th anniversary of German unification. It was sited at Treptower Park.

Friedrich Simon Archenhold at the eyepiece of the Great Refractor, taken about 1931 (Bundesarchiv)

In 1889, a young astronomer, Friedrich Simon Archenhold (1861-1939), was hired by the Berlin

Observatory, a venerable institution founded in 1700 and associated with many illustrious astronomers, among them Encke, Bode, Galle and von Struve. Shortly after he began work at the observatory, Archenhold claimed to have discovered a nebula in Perseus near the star ξ (Xi) Persei. The California Nebula, NGC 1499, is located very close to the star. It had been catalogued by E.E. Barnard in 1884. Archenhold's claim of a separate nebula in the same region was not generally accepted by other astronomers. Archenhold decided that a large telescope should be constructed for the purpose of observing and photographing nebulas. He arranged for this instrument to be temporarily housed in a wooden building at the Industrial Exposition, where it was used for public viewing. The revenue from admission charges would pay for the relocation of the instrument to a permanent site. However, when the exhibition ended funds were insufficient, so the altruistic Archenhold incorporated the Treptow Observatory as a public facility, the first in Germany. In 1909 a permanent building was constructed and remains to this day, having survived World War II with only moderate damage from a bomb hit that missed the telescope. This is rather amazing considering that the Treptow area was a major battle ground during the final days of the war and most of the city of Berlin was reduced to rubble.



The original wooden building of the Treptow Observatory

Archenhold developed the observatory as a major site for public outreach in the sciences, not limited to astronomy. Among the personalities who lectured at the observatory were geologist Alfred Wegener, polar explorers Roald Amundsen and Fridtjof Nansen and rocketry pioneer Hermann Oberth. In 1915, Albert Einstein gave the first public lecture on the theory of General Relativity at the observatory, an event memorialized by a large bronze plaque on the door to the lecture room.

Archenhold retired from the directorship of the observatory in 1931 and his son Gunter took over. However, because the family was Jewish, in 1936 the Nazis replaced him. Gunter and his brother fled to England via Switzerland, but the elderly Archenhold stayed in Germany, dying in 1939. His wife and daughter perished in the Theresienstadt concentration camp.

When the city was divided after WWII, Treptow was in East Berlin. In 1946 the observatory was renamed in honor of Archenhold and integrated into the school system. Although the Great Refractor was decommissioned, smaller telescopes were erected on the roof and in separate domes on the property. The refractor was restored in the 1980's and is available for public outreach.

Archenhold Observatory today (LF)

Writing in the observatory's journal, *Das Weltall* (The Universe) in 1908, Archenhold described the observatory as

> a house from which a new light shall continuously shine out and ever new findings shall always find their way to each individual among the people.

Besides hosting the Great Refractor and other observing instruments, Archenhold is a complete astronomy museum, with many displays dedicated to history, astrophysics, instrumentation and observation. There are a large number of objects on display in the spacious two-story building. A small planetarium offers sky shows. There is a lecture hall/theater, a library and classrooms. The local amateur astronomy organization appears to be fairly active with the observatory's

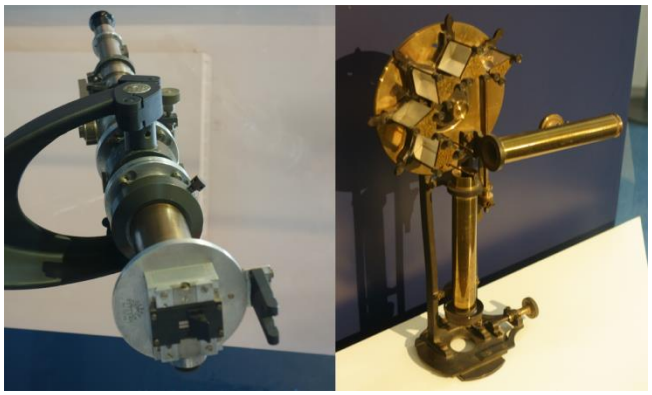
support. Educational activities for young students were evidenced by a collection of portraits of Einstein in a display case at the entrance to the property.

Albert Einstein portraits by students (LF)

The observatory is only open in the afternoon, Wednesday to Sunday, except for viewing nights. Apart from a dour and apparently non-English-speaking lady behind a window at the entrance (free), no one else seemed to be around the day we were there, so we guided ourselves through the facility. Only a few of the many exhibits have English descriptions but that didn't prevent us from getting the gist of much of the information or simply appreciating the many instruments and artefacts on display.

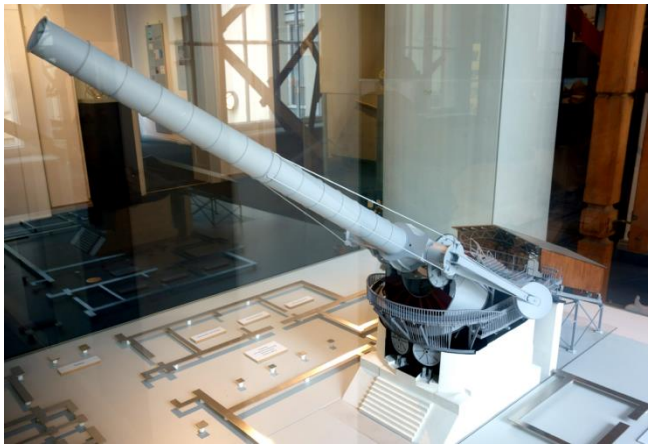
Entrance gallery (LF)

An impressive review of archeoastronomy sites includes a model of Stonehenge and a wall-sized model of the Jantar Mantar Observatory in Jaipur (1734). An exhibit on the solar system features a large Canyon Diablo meteorite from Barringer Crater in Arizona. Displays about the history of astronomy exhibit a number of historical works, including original editions of Apian's *Cosmographia* (1540) and Sacrobosco's *Libellus de Sphaera* (1545). There are astrolabes, armillary spheres, large meridian telescopes, sextants, pocket sundials and many historic measuring instruments as well as some modern ones. In one gallery, a working coincidence detector and a spark chamber were measuring the flux of cosmic rays by detecting muons.



Two spectroscopes on display at Archenhold. The instrument on the right was made by Browning in London in 1870. It uses 6-prisms. (LF)

We took a stairwell up to the second floor to look at the telescope. Unfortunately there was no access to the mount, so we could only look through windows. The Great Refractor telescope is unique not just for its tremendous length. It's equatorially mounted on a fork, with the eyepiece sited at the rotational axis of the fork. This keeps the eyepiece at a nearly constant level for the observer, who is positioned inside the fork, regardless of the tube's elevation. That obviates the need for either a ladder or a moveable floor like those in the domes of the Yerkes or Naval Observatories. To counterbalance the weight of the tube, huge counterweights extend rearward from either side of the telescope like handlebars on a bicycle. The fork and counterweights are mounted on the polar axis. A shed-like roof covers the mount. It slides to the rear on tracks before the telescope is moved from its home position.

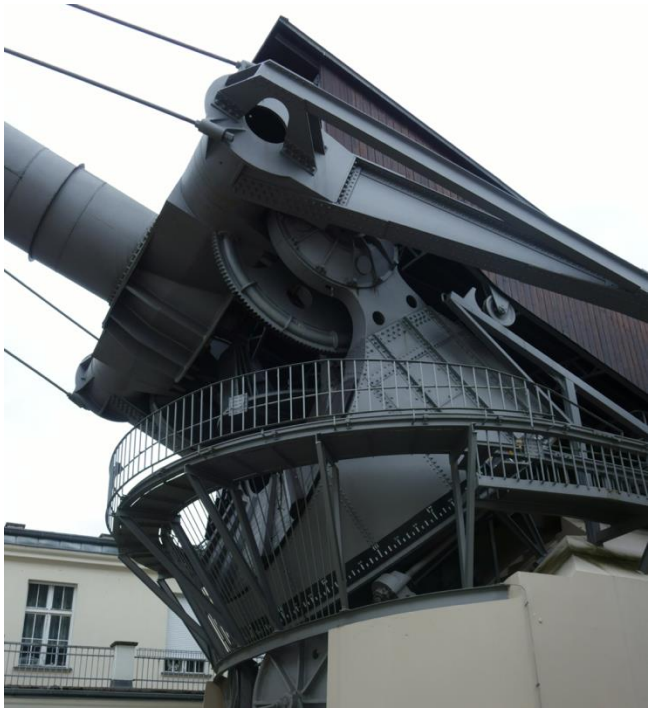


1:30 model of the Great Refractor. The model's telescope tube is about 28 inches in length. (LF)

A fully functional model of the telescope is on display in one of the galleries. It was made with the support of the Archenhold family and debuted on the 100th anniversary of the observatory in 1998. Constructing it was no mean feat: whatever engineering and construction drawings there were for the Great Refractor were lost during the war. The modelers had to measure the instrument down to its smallest details without taking it apart, and it was apparently a challenge to find appropriate materials for the model. One of the modelers apparently fell ill but continued to work on the project. The Archenhold web site, which is mostly in German, generously reports

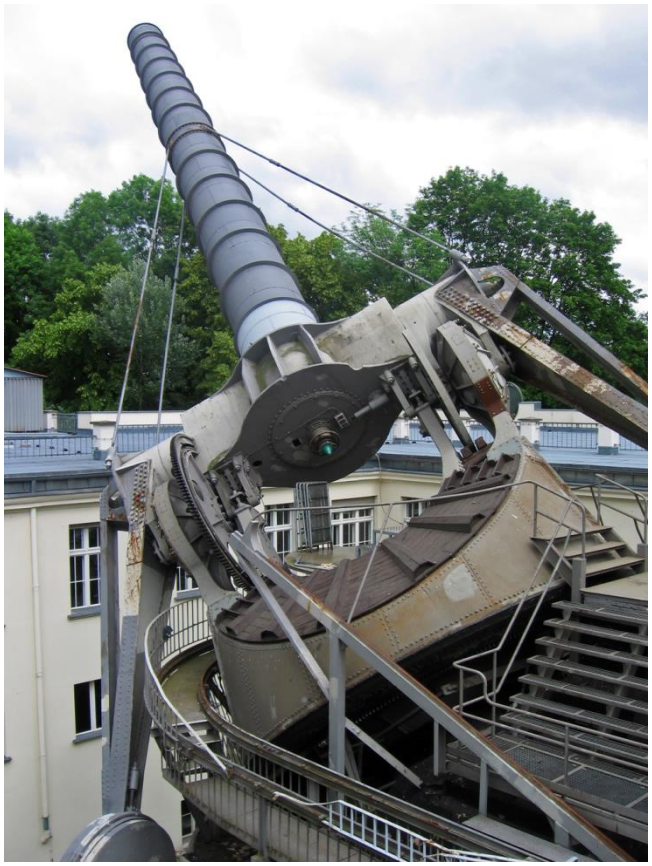
> In die Bauphase fiel zudem eine schwere Erkrankung eines der Modellbauer, dem an dieser Stelle für sein engagiertes Weiterbauen herzlichst mit besten Genesungswünschen gedankt sein soll.
>
> (During construction, the modeler became seriously ill. He should be sincerely thanked for his dedication and continued building, with best wishes for recovery.)

A YouTube video[1] shows the actual telescope in motion. The telescope and mount together weigh 130 metric tons.



Detail of the mount, showing the fork and the setting circle scale around the polar axis (LF)

The Great Refractor has an objective diameter of 68 cm (26.77 inches) and a focal length of 21 meters (69 feet), giving f/30.9. I could not find any information about eyepieces, but assuming for arguments' sake that I could put my favorite eyepiece on it, a 24 mm Televue Panoptic (68º), the instrument would give a somewhat ridiculous 875X magnification with an actual field of view of just 4.6 minutes of arc. I imagine the actual eyepieces are custom-made and have focal lengths of perhaps 100 mm or more. It must be a great scope for splitting double stars and for planetary observation. The objective was made by C. A. Steinheil & Söhne, a Munich firm that made large and small telescopes in the mold of Alvin Clark. Ernst Tempel used a 4-inch Steinheil refractor to discover the Merope Nebula surrounding the Pleiades (see my article in the January 2018 SkyWAAtch).



Another view of the mount and telescope, apparently taken before the most recent repainting (H. Raab)

In the current era of telescope design, the short-focal length refractor is commonplace. Advances in optical design, glass chemistry, figuring and coating techniques permit refractors to have speeds as low as f/5 with minimal chromatic aberration. Chromatic

[1] https://www.youtube.com/watch?v=HB77A89QEwo

aberration is the bane of refractors, and the longer the focal length, the lower the aberration. Early refractors all had long focal lengths, taken to the extreme in Johannes Hevelius' 150-foot long open-tube refractor, which made for a good engraving but was apparently useless as an observing instrument (see the article on Hevelius (and Hevelius beer) in the May 2015 Sky-WAAtch).

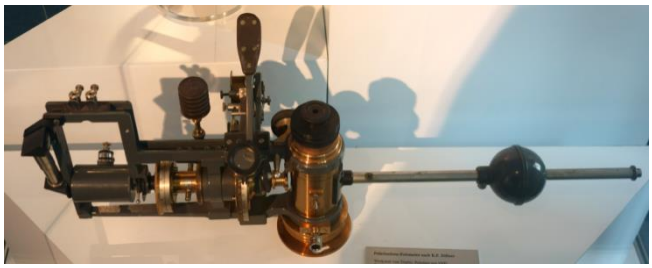
The first "great refractor" is considered to be the 24 cm (9.4 inch) telescope at the Dorpat Observatory in Estonia (now Tartu Observatory). It was made by Joseph von Fraunhofer, inventor of the spectroscope and the diffraction grating.

Telescope	Year	Aperture cm	f/
Dorpat	1826	24	17.0
Harvard	1847	38	18.2
Lowell	1894	61	16.0
US Naval Observatory	1873	66	15.0
Archenhold	1896	68	30.9
Allegheny	1914	76	18.6
Nice	1891	83	19.5
Lick	1888	91	19.3
Yerkes	1897	102	19.0

Some of the most famous and largest refractors. Note that they all have very slow focal ratios.

Large refractors became an endangered species once the silver-coated glass mirror reflecting telescope was invented by Léon Foucault in 1857. His ground-breaking 80 cm telescope saw first light at the Marseilles Observatory in 1864. Mirrors are easier to make than lenses. Only one surface needs to be ground, the curvature is a simple parabola and there's only 1 optical element rather than two (the crown and flint glass lenses in an achromatic objective). Easier to grind, polish and maintain and far more reflective than earlier speculum-metal mirrors, coated glass mirrors inevitably meant the reflecting telescope would eclipse the refractor as a research tool. Reflectors can be made with larger apertures because the mirror can be supported from behind, not just along its edge. Gravity will deform the figure of an edge-supported lens larger than 40 inches, since glass is an amorphous rather than a crystalline solid. Reflectors can have much faster focal ratios than refractors without suffering from chromatic aberration. Large, fast reflectors were better tools for astronomical research as the focus shifted from understanding stellar evolution to determining galactic structure, which demanded the acquisition of fainter objects. Reflector mounts are also more stable since the long-tube refractor has a large moment of inertia even when counterbalanced.

The mount and one counterweight (LF)



A polarizing photometer from 1900

Since 2016, the Archenhold Observatory has been a component of the Stiftung Planetarium Berlin (Berlin Planetarium Foundation), made up of 3 units: Archenhold Observatory in Trepow; the Wilhelm-Foerster- Sternewärte in the southern Berlin district of Schöneberg, consisting of a large 20-meter planetarium dome (1963) and several telescopes on a small hill made from WWII rubble; and the Zeiss-Großplanetarium in Prenzlauer Berg, just northeast of central Berlin, featuring an architecturally dramatic 30-meter dome that opened in 1987 with state-of-the-art Zeiss equipment. (Zeiss invented the modern planetarium in 1924). We didn't get the opportunity to visit the other two planetariums, what with all the museums and historic monuments on our Berlin itinerary and the general wandering that is so much fun when you visit a new place. We also spent a day in the magnificent Sanssouci Park in Potsdam, featuring three of Frederick the Great's palaces, but we were due back in Berlin for a concert that evening and so couldn't take the time to see Potsdam's Einstein Tower, a structure built in the early 1920's for a solar telescope dedicated to testing Einstein's General Theory of Relativity by measuring the red shift of spectral lines in the sun's massive gravity. Perhaps we can get there on another trip. Berlin is a very civilized place: no one jaywalks and the subways work on the honor system. If you haven't been there, make plans to do so. There's a lot to do, astronomical and otherwise. ■

Portable Sundials

Larry Faltz

The most primitive time measuring devices are shadow clocks, or sundials as we like to call them. Garden variety sundials are just that: frequent adornments to gardens or public spaces. Many lost their functionality, but preserved their decorative value, once more reliable and accurate machines for telling time were invented. Portable mechanical clocks, which were invented in the 15th century, have been refined and miniaturized, and almost none of us are without an accurate timepiece on our person. Some people have given up mechanical wristwatches altogether, referring to their cellphones when needing the time.

Roman portable sundial. Museum of the History of Science, Oxford, UK. Bronze. Diameter 2½".

Sundials have been found in Egyptian and Babylonian sites dating from at least 1500 BC. But a traveler needing to tell the time couldn't rely on fixed sundials. He might not encounter another one for many days. Portable sundials were probably invented shortly after the fixed dial, and Greek and Roman examples survive. One of the problems using them is how to align the gnomon so that it faces directly north-south, a requirement for a functional sundial. Sundials need to know when the sun is directly overhead as a reference point for noon. Then its displacement from the meridian can indicate the time. Some sundials even correct for the Equation of Time, the difference between apparent and mean solar times.

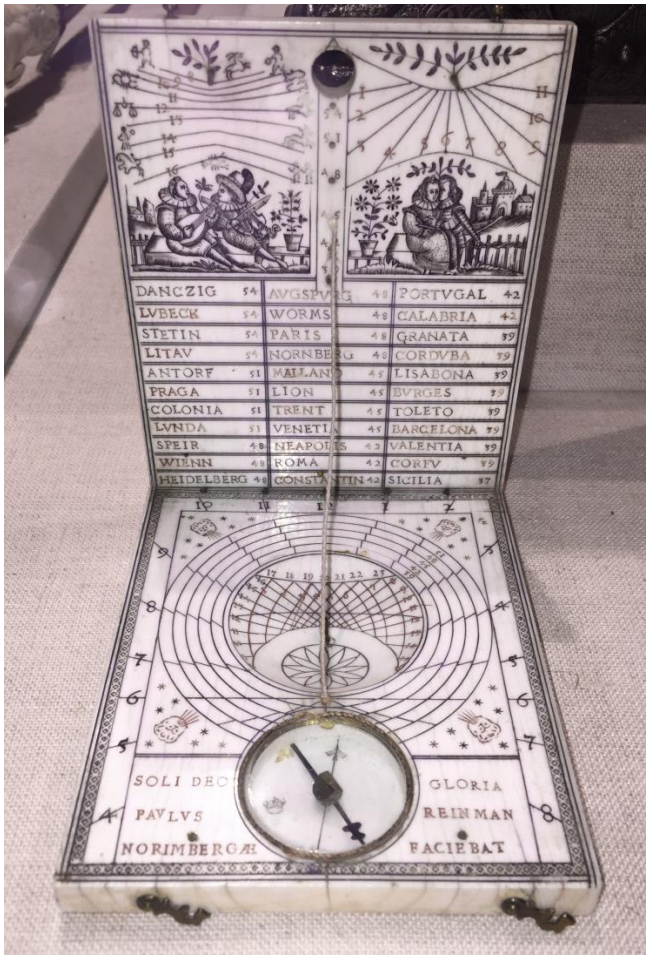
Pocket Compass/Sundial by Michael Butterfield (1635-1724), Paris c. 1710. Silver. 2.6" x 3" x ⅓" (gnomon height 1.1"). Wallace Collection, London

Like fixed sundials, portable sundials became decorative objects in the hands of skilled artisans. An example of this is a small pocket sundial I saw in December at the Wallace Collection, a wonderful museum in the elegant Marleybone section of central London. In addition to its paintings, porcelains, furniture and armor, the Wallace Collection is particularly rich in unusual personal objects. We found an elegant silver pocket sundial from the early 18th century, made by an English silversmith working in Louis XIV's Paris. The Wallace Collection commentary says:

> A cultured eighteenth-century gentleman would be knowledgeable about the arts and sciences. Many would be enthusiastic scientific observers and carry scientific instruments, such as this combined compass and sundial, in their capacious pockets.

The Museum of the History of Science in Oxford, UK, has hundreds of pocket sundials in its collection. Many of them are made of ivory and date from the mid-16th to the early 17th century. Quite a few incorporate compasses, like the silver version at the Wallace, so the user can align the device to the meridian and get a more accurate reading.

The Metropolitan Museum of Art also has a few of these elegant objects. We saw a particularly sophisticated piece on a visit several months ago. It's a folding model with the gnomon made of a piece of string, a listing of latitudes for major cities and countries in Europe, complex rulings for more accurate measurement and some artwork for ornamentation and style.



Portable folding sundial by Paulus Reinman (German, active 1575–1609). Ivory, 4½" × 3½".

These pocket sundials at least avoid the problem of a mechanical watch running down. A clever Dutch watchmaker, Jan Jansen Bockeltz, split the difference and made a combination brass and silver watch with a small sundial and compass in its cover. This elegant device was made around 1605 and was among the many treasures donated to the Met by J. Pierpont Morgan in 1917. It has engravings on the dial of figures representing the Four Seasons. In addition to the time, it shows the phases and age of the moon and the day of the month. If the watch runs down, at least on a sunny day the sundial can be used to set it, although hardly with the accuracy that we can obtain by setting our watches to the time given by the National Institute of Standards and Technology (https://time.gov/).

Clock-watch with sundial, Jan Jansen Bockeltz, 3½" x 2½" x 2½" (closed)

It's almost sad that now we have no need for these devices. Our smart phones can tell us exactly where we are, what time it is and even what's in the sky. While that's fantastic, it takes almost no intellectual effort to get the information. The user of a sundial at least has to know something about the daily and yearly motions of the sun and maybe some basic trigonometric concepts, but I wonder if that simple awareness is being lost among the general population as technology seemingly becomes a substitute for knowledge. ■

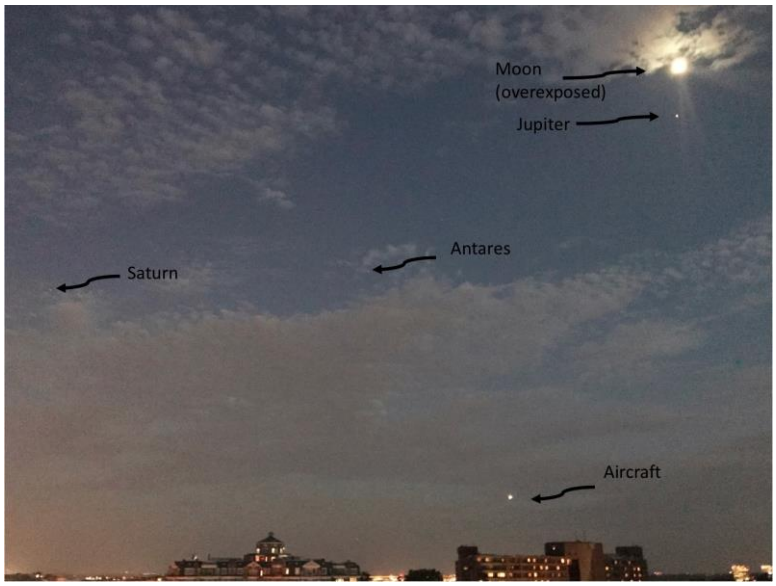
Astrophotos

M20

Courtesy of Gary Miller is this image of M20, the Triffid nebula in Saggitarius. Gary captured the image at Ward Pound Ridge (47 30-second images at ISO 1600 with a Canon T7i). He used an ES127 Triplet refractor and stacked the images in DeepSkyStacker--darks and flats subtracted. Gary further processed the photo in Photoshop.

M17

Courtesy of Gary Miller is this image of M17, the Swan nebula in Saggitarius. Gary captured the image at Ward Pound ridge (47 30-second images at ISO 1600 with a Canon T7i). He used an ES127 Triplet refractor with a 0.7 focal reducer/field flattener. He then stacked the images in DeepSkyStacker--darks and flats subtracted. Gary further processed the photo in Photoshop.



Capitol Cityscape

Bob Kelly provided this iPhone photo, which he took on Friday, July 20th; it's a Washington DC Cityscape. The photo features the Moon, Jupiter and Saturn and some stars. Notes Bob: Mars wasn't up yet, and Venus was out of this photo and hiding behind some clouds (iPhone photo with NightCap app pushing the ISO to 1250 with 1/4 second exposure at f/1.8 3.99mm focal length. Taken about 50 minutes after sunset).

Member & Club Equipment for Sale

August 2018

Item	Description	Asking price	Name/Email
Celestron 8" SCT on Advanced VX mount	Purchased in 2016. Equatorial mount, potable power supply, polar scope, AC adaptor, manual, new condition.	$1450	Santian Vataj spvataj@hotmail.com
Celestron CPC800 8" SCT (alt-az mount)	Newly donated to WAA. Like new condition, perfect optics. Starizona Hyperstar-ready secondary (allows interchangeable conversion to 8" f/2 astrograph if you bought a Hyperstar and wedge). ADM top rail, Starizona counterweight bottom rail. Telrad finder. Many counterweights. ADM 100 mm diameter rings with ADM saddles for piggyback mounting. SCT-to-T adapter for prime focus imaging with Canon EOS adapter. 2" CPC steel tripod. AC power supply. No eyepieces or diagonal.	$1300	WAA ads@westchesterastronomers.org
ADM VCW Counterweight system	Clamping plate for a V series dovetail. 5" long ½" thick threaded rod for counterweights. Original ADM 3.5 lb counterweight plus a second weight. New condition. Lists at $55. Link.	$35	WAA ads@westchesterastronomers.org
Celestron Ultima-LX 5 mm eyepiece Celestron Ultima-LX 8 mm eyepiece	70° FOV, fits 2" and 1¼". 16mm eye relief. 28 mm clear aperture eye lens. 8 elements. Rubber coated bodies. Ergonometric contours. Extendable twist-up eyeguards. Takes 1¼" filters. These are large, impressive eyepieces, no longer in production! New condition.	$40 each	WAA ads@westchesterastronomers.org
Meade 395 90 mm achromatic refractor	Long-tube refractor, f/11 (focal length 1000 mm). Straight-through finder. Rings but no dovetail. 1.25" rack-and-pinion focuser. No eyepiece. Excellent condition. A "planet killer." Donated to WAA.	$125	WAA ads@westchesterastronomers.org
William Optics E-BINO-P Binoviewer	1¼" nosepiece. Comes with a pair of 20 mm 66° eyepieces, 1.6x Barlow. Compression ring eyepiece holders, BaK4 prism. New condition in original packaging. Lists @ $268.	$150	Larry Faltz lfaltzmd@gmail.com

Want to list something for sale in the next issue of the WAA newsletter? Send the description and asking price to ads@westchesterastronomers.org. Member submissions only. Please only submit serous and useful astronomy equipment. WAA reserves the right not to list items we think are not of value to members.

Buying and selling items is at your own risk. WAA is not responsible for the satisfaction of the buyer or seller. Commercial listings are not accepted. Items must be the property of the member. WAA takes no responsibility for the condition or value of the item or accuracy of any description. We expect, but cannot guarantee, that descriptions are accurate. Items are subject to prior sale. WAA is not a party to any sale unless the equipment belongs to WAA (and will be so identified). Sales of WAA equipment are final. *Caveat emptor*!