Rambling Around U. S. Observatories

Astronomy

Prepared by James Stokley, from information gathered on personal travels.

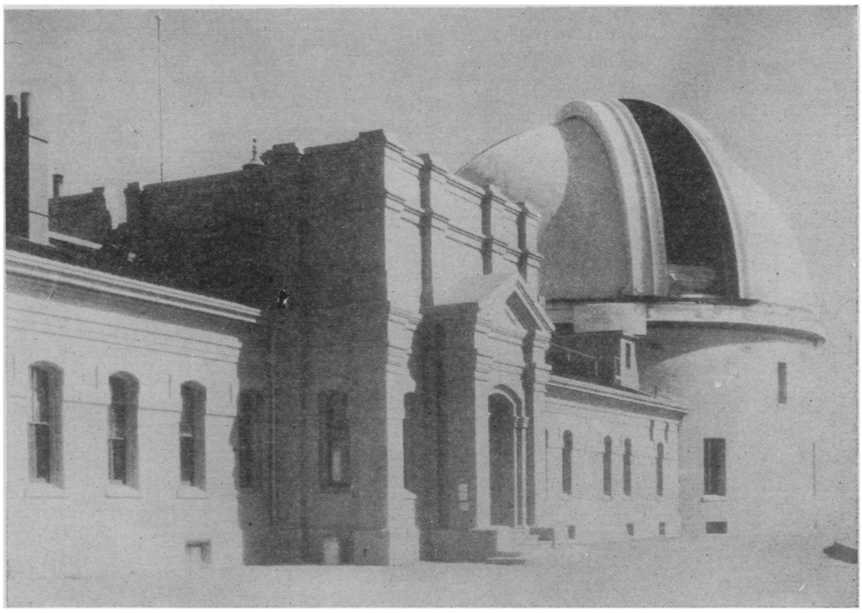
Astronomy in the United States is a relatively recent growth. A century ago there were no established observatories here, and so there are not the scenes and relics associated with earlier workers that can be found throughout Europe.

America is not entirely lacking in astronomical shrines, however, for in Colonial days there was one American astronomer of sufficient note that his fame extended even to Europe. This was David Rittenhouse, native of Philadelphia, whom the Royal Society of London honored by election to fellowship. He was a member, and in 1791 became president, of the American Philosophical Society. In the Society's quarters at Fifth and Chestnut Streets, *Philadelphia,* one of the buildings in the group including Independence Hall, home of the Liberty Bell, Rittenhouse's telescope, transit, and other instruments, are still preserved.

Another relic of Rittenhouse is to be found in the Provost's office of the University of Pennsylvania, at 34th St. and Woodland Ave. This is the orrery, or planetarium, to show the relative motions of the members of the solar system, constructed by Rittenhouse about 1770. At the time, this instrument attracted international attention. The machine has been repaired in recent years, and, once again, reveals the motions of the planets.

Turning to the modern observatories, the astronomical traveler of the United States might well start his tour near *Boston,* for the Harvard College Observatory, in *Cambridge,* is one of the most important centers of astronomy in the United States. Here one finds no great telescopes, though the 15-inch refractor in the dome on the roof of the main building was the largest in the world at the time of its erection some eighty years ago. Still in use, this venerable instrument nevertheless has a fascinating history, for with its aid the crepe ring of Saturn, as well as some of that planet's fainter satellites, was discovered; through it the Orion nebula was first studied in detail, and in the early fifties it was used for the first photograph ever made of a star.

A dozen or more other telescopes at the Harvard Observatory are in constant use recording the heavens night by night, which are supplemented by photographs taken at the Observatory's southern station in South Africa. It is the file of thousands of negatives, some of direct photographs of the heavens, others made with the spectroscope, that is the observatory's greatest treasure.



LICK OBSERVATORY, on Mount Hamilton, near San Jose, California.

Reached in a few hours' train ride from Boston, at *Springfield, Vermont,* are two things of astronomical interest. One is the turret telescope which its inventor, Hon. James Hartness, former governor of Vermont, has erected on the lawn of his home, and which connects by a tunnel with the house. On even a cold winter night, the observer can use this telescope in the comfort of a warm room.

The other interesting feature of Springfield is Stellafane, on one of the nearby hills. This is the astronomical club house where a group of employes of a large factory in the town gather with their home-made reflecting telescopes to watch the stars. It is the first of a number of groups of amateur telescope makers now springing up all over the country.

Philadelphia is of interest for the Rittenhouse relics, already mentioned. The Flower Observatory of the University of Pennsylvania, is located at *Highland Park,* Upper Darby, on the outskirts of the city, and is equipped with the 18-inch refracting telescope with which the late Prof. Eric Doolittle made his famous observations of double stars. Not far away, at *Swarthmore,* is the Sproul Observatory of Swarthmore College, from which many eclipse expeditions to all parts of the world have been made, and where the determination of star distances is a specialty.

At *Washington* is the U. S. Naval Observatory, chiefly important because it is the source of correct time for the entire nation. Star observations every clear night serve to check the standard clocks, kept continually at a constant temperature in a subterranean vault.

Every day, except Sundays and holidays, interested visitors are shown around the Naval Observatory and their questions answered. On clear Thursday nights the 12-inch telescope is used to show visitors the sights of the heavens, but cards of admission must be obtained well in advance from the Superintendent of the observatory.

Not far from the Naval Observatory is the observatory of *Georgetown* University, on a hill in back of the University buildings. Founded in 1843, this is one of the oldest of American observatories, and it was here that Father J. C. Hagen, S. J., now director of the Vatican Observatory in Rome, did his classic work in preparing the *Atlas Stellarum Variabilium.* A 12-inch refracting telescope and a (*Turn to next page*)

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12-inch photographic transit instrument are two of the chief instruments. Georgetown University also possesses one of the finest seismographic observatories in existence, and is perhaps the best known American station for recording earthquakes.

Exhibits of astronomical interest are also on view at the building of the National Academy of Sciences and National Research Council, at 21st and B Streets. Usually on clear days a coelostat telescope reveals the sun and any spots that may be on its face, and a spectroscope shows the visitor the solar spectrum. When the sun is not on view, a Foucault pendulum makes visible the rotation of the earth.

Pittsburgh is also of astronomical interest, for two reasons. One is the Allegheny Observatory, situated in Riverview Park, and as one goes from the business district of the city to the observatory, he passes the other. This is the famous shop of the late John A. Brashear, maker of many of the largest telescope lenses and mirrors, as well as several large mountings.

The 30-inch Allegheny telescope, largest in the East, is a photographic one, and is used mostly for measuring star parallaxes, from which are calculated their distances. The observatory also has a reflecting telescope of the same aperture. A smaller refractor, of 13 inches aperture, is used four nights a week for visitors to see the heavens. On cloudy nights, astronomical lectures are given.

The Yerkes Observatory of the University of Chicago is in Wisconsin, at *Williams Bay,* on the shores of Lake Geneva. This is about 90 miles north of Chicago. Here is located the world's largest refracting telescope, with a lens 40 inches in diameter. It was at Yerkes that Burnham carried out his classical measurements of double stars, that Barnard made his elaborate survey of star clouds in the Milky Way, and of the dark nebulæ, and that comets have been discovered, the planets studied and the brightness and distances of stars measured. Beside the 40-inch telescope there is also the famous two-foot reflector, made by Prof. G. W. Ritchey, who later made the 60-inch Mt. Wilson telescope, as well as the optical parts of the 100-inch reflector.

Because of the pressure of time needed for research, no time is provided when the ordinary visitor can look through any of the telescopes. Every Saturday afternoon, however, visitors are admitted to see the equipment, which is explained by one of the staff members. The great telescope, with 90-foot tube, in a dome 100 feet in diameter, and a floor that rises and lowers to bring the observer to a convenient position, are well worth seeing.

Traveling to the Pacific Coast, many visitors will go on the Santa Fé and this takes them through *Flagstaff, Arizona,* home of another famous observatory. This is the Lowell Observatory, established by the late Prof. Percival Lowell. The wonderfully clear sky over this plateau, more than 7,000 feet above sea level, has proved especially advantageous for planetary studies. With the 40-inch reflecting telescope and the 24-inch refractor planetary temperatures have first been accurately measured and the strange markings on Mars carefully charted. Every Monday, Wednesday, Friday and Saturday, from 1:30 to 2:30 p. m., visitors are shown the instruments, and the museum of astronomical photographs. By appointment made in advance, different hours and days can be arranged with the director.

From Flagstaff, after probably stopping at Williams, and taking the side trip up to the Grand Canyon, the tourist will eventually reach *Los Angeles.* At nearby *Pasadena* are the headquarters of one of the world's most important observatories, the Mt. Wilson Observatory of the Carnegie Institution of Washington. The offices, physical laboratory, shops and library are located here in the group of buildings at Lake and Santa Barbara Streets. On nearby *Mt. Wilson,* a mile higher, and visible from Pasadena, are the domes and towers of the telescopes. The astronomers spend a few days a month on the mountain, taking photographs, and then come back to Pasadena to study the plates.

The observatory proper, on Mt. Wilson, can be easily reached by a regular motor coach line from either Pasadena or Los Angeles. The Mt. Wilson Hotel at the summit, and adjoining the observatory, provides sleeping accommodations, if it is desired to stay over night. Every afternoon visitors are shown the various instruments of the observatory, including the 100-inch telescope, largest in the world, and a collection of astronomical photographs illustrating the work of the observatory. On Friday evenings the 60-inch telescope is devoted to showing visitors the heavenly objects. Admission is free, but tickets must be obtained in advance at the Pasadena office of the observatory.

With perhaps the largest staff of any observatory in the world continually at work, the Mt. Wilson researches would require far more than a single brief article to mention.

Journeying northwards from Los Angeles, the astronomical tourist should stop at *San José,* where a motor coach can be obtained for *Mt. Hamilton,* location of the Lick Observatory of the University of California. Here is the world's second largest refracting telescope, with a lens 36 inches in diameter. This great instrument was the largest in the world when it was completed in the eighties, and the body of James Lick, the donor, lies buried under the pier of the great instrument. On top of the mountain is a complete community, where the astronomers live the year round.

Double star observations with the 36-inch telescope, studies with it of the spectra of stars, photographs with the 36-inch reflecting telescope, in another building, that have revealed thousands of faint nebulæ and other remarkable objects, eclipse expeditions to various parts of the world—these are some of the activities for which the Lick Observatory has gained world-wide reputation.

No hotel accommodations are provided at the summit of the mountain, but visitors are admitted to view the instruments and astronomical photographs every day from 9:00 a. m. to 5:00 p. m. Every Saturday night visitors are permitted to look through the 36-inch refracting telescope at some typical celestial objects. Usually a smaller, 12-inch, telescope is also used to show other objects.

Still further north on the Pacific Coast, at *Victoria, B. C.,* is the world's second largest telescope, and the largest of the British empire. This is the 72-inch refractor of the Dominion Astrophysical Observatory. Americans may well feel proud of this instrument, however, for the great mirror was made in Pittsburgh and the mounting in Cleveland. This instrument is used chiefly in conjunction with the spectroscope, for measuring velocities of stars, and that very close type of double stars known as spectroscopic binaries, which even the largest telescope does not reveal as other than a single body.