

BIG EYE

ON PALOMAR

by
Hubert A. Lowman

THE WORLD'S LARGEST telescope at last is nearly ready to probe the ancient history of the sky from atop Palomar Mountain in Southern California!

Perhaps the science of astronomy is not usually connected with history, but the unbelievable power of this amazing instrument to penetrate infinite space suggests such a parallel. Its eye, the huge 200-inch mirror, can reflect onto a sensitized photographic plate a pinpoint of light which started earthward with the tale of its existence up to one *billion* years ago. Ancient history, indeed!

Remembering that the nearly instantaneous movement of light has been measured at a speed of over 186,000 miles per second, not-so-simple mathematics indicates the ultra-distance to such a remote heavenly body to be 5,876,068,880,000,000,000 miles.

Not many people can even read that number—let alone comprehend the magnitude of the distance involved. It is 5 sextillion, 876 quintillion, 68 quadrillion, 880 trillion miles (said the man whom we asked).

Perhaps astronomers at last will see to the end of space—a possibility according to Einstein's

Theory of Relativity. Only time will tell!

The casting of the 200-inch pyrex mirror at Corning, N. Y., and its shipment to the West Coast for grinding to a perfect parabolic curve at the California Institute of Technology in Pasadena received national attention, as did its post-war journey by truck up the steep mountainside to Palomar. There it replaced the "concrete eye" which was a stand-in for the genuine article during construction of the bulky framework of the giant 'scope.

Although work on the grinding and polishing of the great reflector was halted for four years during the war, contrary to some reports it was not spirited away by night and buried in the mountains for safekeeping.

Final step before installation was the transformation of the 17-ton disc into a mirror. Inside a specially-built vacuum chamber under the telescope, small drops of aluminum were boiled off electrical heating elements and condensed in a microscopically thin layer on the surface of the glass. Previously, the glass had been washed with alcohol, then high tension sparks were shot across its surface to guarantee absolute freedom from even the tiniest dust particles. This process must be re-

peated to renew the mirror's reflecting surface every eight to ten years.

One of the last obstacles to be overcome by Caltech scientists developed after the 200-inch mirror was finally in place. Far from rigid, the great, ribbed piece of glass is actually quite flexible, and intricate supports had to be devised to prevent the optically perfect surface from literally sagging out of shape at different angles of use.

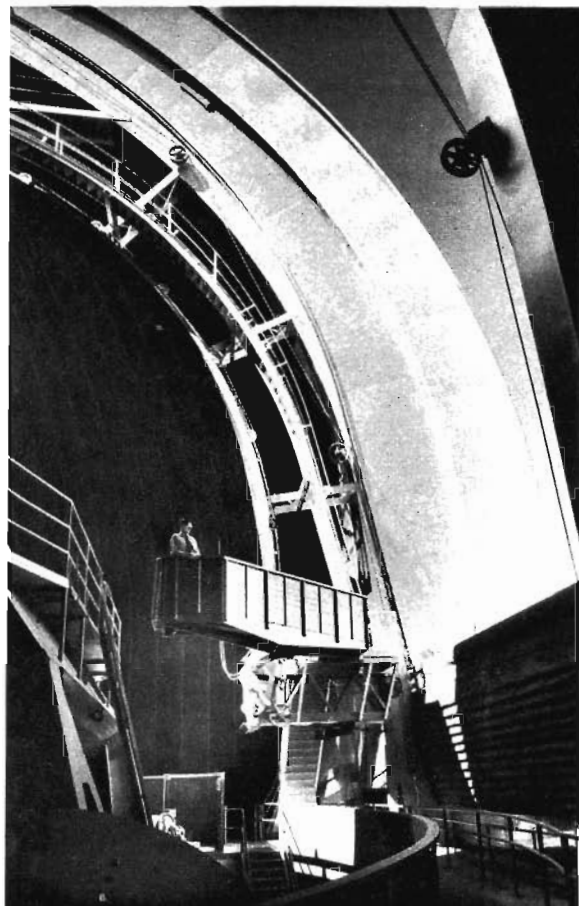
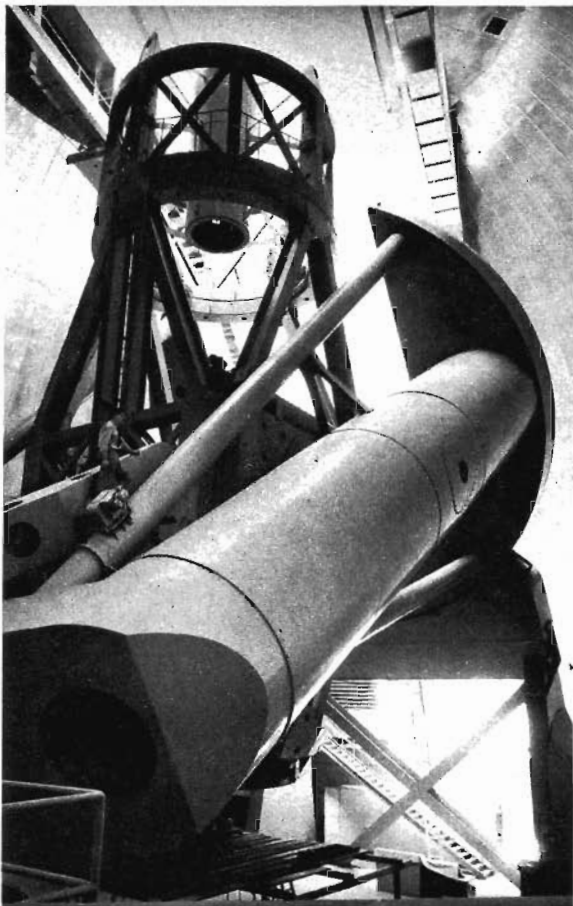
The towering dome at Palomar is 137 feet in diameter and rotates a full 360 degrees; the sliding shutter opening is 30 feet wide at maximum aperture. The dome weighs two million pounds and the instrument itself weighs a million more—yet the balance of the whole is so delicate and precise that movements are made with an ease and quietness which is truly amazing. After the telescope is pointed toward the desired portion of the sky most laymen do not realize that due to the motion of the earth, adjustments in the 'scope's position must be made continuously during the time of observation and the making of photographic and spectrographic plates. The earth whirls on its axis at tremendous speed, and, since its axis is pointed almost directly

toward the North Star, the heavens seem to revolve around the North Star. This means the telescope, in order to remain focussed on a certain spot in the sky, must rotate slowly on an axis parallel with the axis of the earth in direct proportion, and opposite, to the speed of the earth—or about one degree every four minutes. That this movement of the 'scope must be timed with absolute accuracy and must be entirely free of jerks or bumps during a 15-minute photographic exposure is readily understandable. With these facts in mind the mechanical genius which designed and built the Palomar monster seems all the more sheer wizardry.

Correctly called the Hale Telescope in honor of the late and noted astronomer George Ellery Hale, who sparkplugged the project from its inception, its purpose surprises many visitors. In reality this is the world's largest camera with such a long focal length lens that it can cover only a quarter of the full moon in one exposure. Observers will scan the night sky only for the purpose of focussing. All studies will be made from the finished photographic prints and spectrographs. In technical photographic language the instrument has a speed rating

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**Sky secrets a billion years on their way to the earth
may be photographed by the new 200-inch Hale Telescope**



Left: The 200-inch Hale Telescope atop Palomar Mountain. For comparison, note figure of Byron Hill, construction superintendent, standing on the huge instrument just to the left of center

Right: Elevator platform that lifts observers on a curving track to the top of the tube. At that eerie height is located the f3.3 prime focus of the world's largest telescope.

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"Concrete eye" which doubled for the famous 200-inch mirror during construction

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(Continued from page 15)

of f3.3 at the prime focus, which is at the top of the tube. The supposedly conventional observation point at the bottom of the tube, the Cassegrain focus, is rated much slower at f16 but provides an enlarged image, as does the f30 Conde focus on the side.

Another surprise is that the new telescope will probably shed no new light on the possibility of life on Mars. It is not even designed for the purpose of studying comparatively nearby objects, but rather to probe the amazing distances mentioned above in search of galaxies too faint to be observed on other existing instruments and to explore a volume of space eight times greater than heretofore possible.

Palomar Mountain was chosen for the site of the greatest of telescopes for several reasons. One hundred-twenty-five miles from Caltech headquarters at Pasadena, this location was found to be most free from the smog, haze and distracting night lights of southern California's famous coastal area. The cool summer and mild winter weather, plus the limited amount of yearly precipitation, combine to offer more nights of skies crystal-perfect for observation than at any other spot studied. Then, too, there is room enough at Palomar. The domes of the 200-inch 'scope and the smaller 18-inch and 48-inch Schmidt wide angle telescopic cameras are sprawled over a bald shoulder of the mountain along with power plant, machine shop, residences of the staff and other related buildings.

The Addison White Greenway Jr. Astronomical Museum is open every day and free to the public, as is the visitors' gallery at the 200-inch telescope. The beautiful evergreen and oak-covered hillsides of the Cleveland National Forest and Palomar Mountain State Park offer restful vistas and the five to six thousand foot elevation is ideal.

Along the route through the picturesque San Diego County backcountry, at the foot of Palomar Mountain, is old Mission San Antonio de Pala and a sleepy little Indian reservation. Here only a few miles from the newest of the scientific wonders of the world stands the whitewashed adobe of the only mission in the historic Spanish Franciscan chain which still realizes its original purpose of ministering to the California Indians.

Southeast of Palomar lies Lake Henshaw, long favored by sportsmen, and beautiful little Doane Valley Lake in the state park is well stocked with trout. All of which adds up to make Palomar a side trip well worth the while of all visitors to southern California.

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