



# NEWS! From the NAVAL OBSERVATORY

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## **USNO Celebrates 150<sup>th</sup> Anniversary of its “Great Equatorial” Telescope**

On November 12, 1873, a small group of U.S. Naval Observatory astronomers first peered through the eyepiece of the world’s largest refractor telescope, the 26-inch (66-cm) aperture “Great Equatorial”, designed and built by the firm of Alvan Clark & Sons of Cambridge, Massachusetts. Less than four years later the great telescope revealed the two moons of Mars, Phobos and Deimos, to astronomer Asaph Hall, a discovery ranked as one of the most important astronomical events of the 19<sup>th</sup> Century. 150 years later, the telescope continues to provide state-of-the-art astronomical data for the benefit of the Navy, the Department of Defense, and the scientific community.

In 1867, USNO astronomer Simon Newcomb and Superintendent RADM Benjamin Franklin Sands began an effort to obtain a world-class telescope for the Observatory. Newcomb’s goal was to use observations of the moons of the planets Uranus and Neptune to determine those planets’ masses, which, in turn, would lead to better ephemeris tables for Jupiter and Saturn. Sands’ goal was to equip the Observatory with the largest telescope in the world as a testament to the recovery of American engineering and scientific prowess after the horror of the Civil War.

In his annual reports to his superiors in the Navy for 1867 and 1868, Sands bemoaned the fact that the USNO’s largest telescope at the time had a mere 9.6-inch aperture, and that numerous colleges and well-to-do amateur astronomers possessed larger instruments. He also pointed out that an American telescope maker, Alvan Clark and Sons of Cambridge MA, had already completed a world’s-largest 18.5-inch instrument, and were offering to build a 25-inch telescope for \$40,000. Sands’ entreaties fell on deaf ears.

In 1870, transatlantic cable magnate Cyrus Field and his young son were having lunch with a group of U.S. Senators. When asked about his trip to Washington, the son mentioned a visit to the Observatory and remarked about the small size of its largest telescope. Shocked by this statement, the Senators promised to rectify the situation. Soon, \$55,000 was appropriated for the construction of a great telescope and a building to house it at the Observatory.

By this time, a 25-inch telescope had been built for the Royal Observatory, Greenwich, so the Clarks upped the ante and proposed the construction of a 26-inch telescope. The Navy agreed to pay \$50,000 for the instrument.

After numerous setbacks, the glass disks for the telescope's lenses arrived in Cambridge in 1871. Two years later, after the arduous process of grinding, polishing, and star-testing, the lenses were ready to be mounted and delivered to the Observatory's Foggy Bottom site. With its "First Light" on November 12, 1873, the telescope began its illustrious career under the supervision of Simon Newcomb.

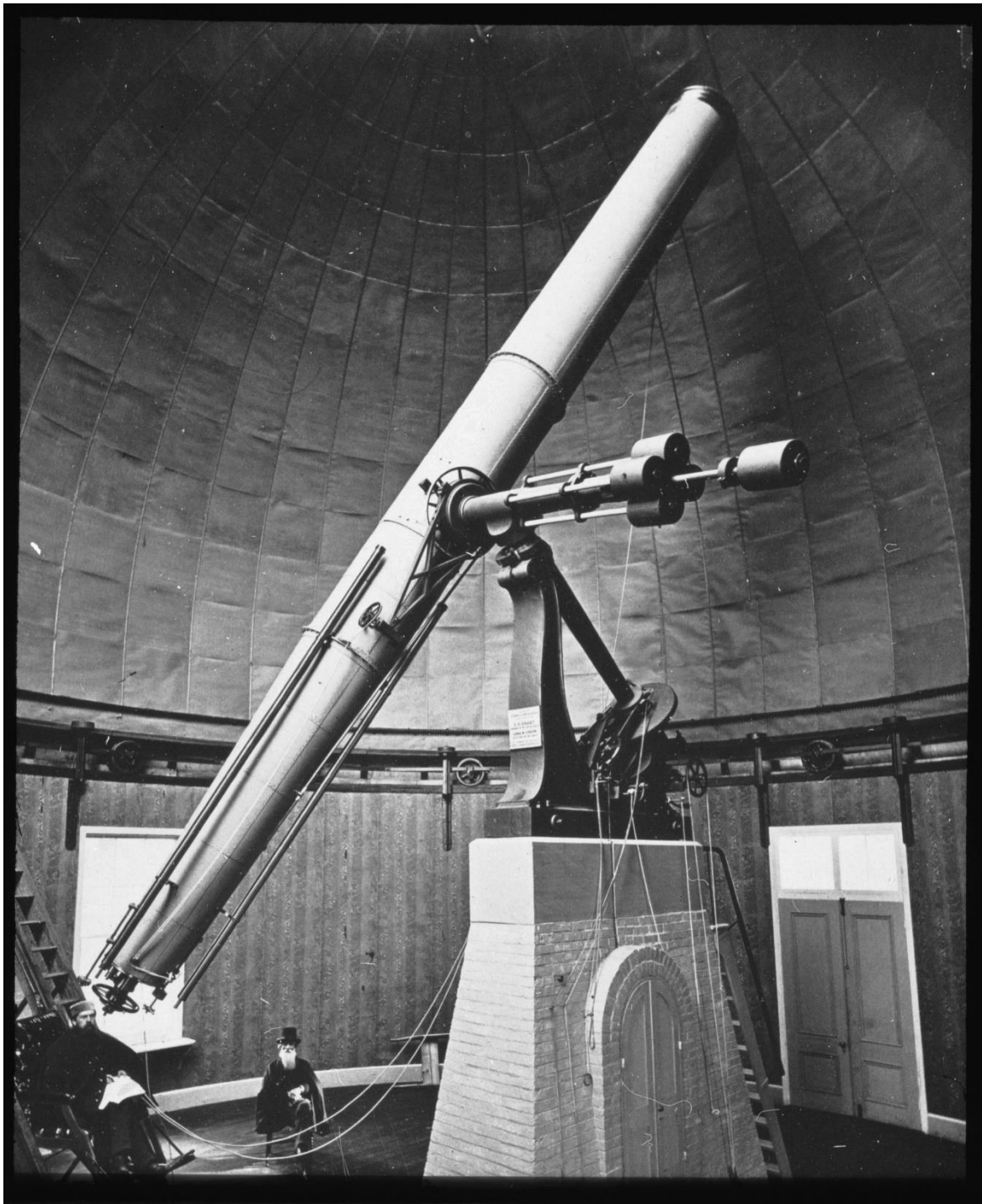
By June, 1875 Newcomb had amassed enough observations of the Moons of Uranus and Neptune to refine his ephemerides for Jupiter and Saturn. He turned the great telescope over to Asaph Hall, who soon secured one of the great astronomical discoveries of the 19<sup>th</sup> Century. Over a series of hot August nights in 1877, Hall found Phobos and Deimos, the two elusive moons of Mars.

For nearly 20 years USNO astronomers made their observations from the Observatory's site in Foggy Bottom, a location that lived up to its name. In the year 1879, the number of nights when the great telescope could exercise its best capabilities was a mere 20. This prompted Superintendent RADM John Rodgers to initiate a search for a new site with clearer skies. With the move to the Observatory's current site in Georgetown Heights in 1893, the lens of the "Great Equatorial" telescope was re-mounted by the firm of Warner and Swasey of Cleveland, Ohio.

Over the years, the telescope has been used for observations of the faint moons of the outer planets and the astrometric properties of double stars. As new observing techniques such as photography and digital imaging replaced the practiced eyes of astronomers, the great telescope evolved to adapt to the changes.

Today the 26-inch telescope, still fondly called the "Great Equatorial", operates entirely under computer control, automating almost the entire observing process. Its primary mission is determining the separations and position angles of double stars, a task for which it is ideally suited. Nearly 55,000 measurements of these stars have been secured with the telescope, more than any other telescope in the world.

In all likelihood its makers would never have imagined that their achievements in bringing the telescope to bear on the heavens would still be providing valuable observations after 150 years!



The USNO's 26-inch "Great Equatorial" telescope, photographed shortly after its installation at the Foggy Bottom site. Professor Simon Newcomb is at the eyepiece; RADM Benjamin Franklin Sands is seated next to the observing ladder.



The USNO's "Great Equatorial" telescope, as re-mounted by Warner & Swasey, at the Georgetown Heights location.