

# Biographical Encyclopedia of Astronomers

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Winlock, Joseph

Born Shelby County, Kentucky, USA, February 6, 1826

Died Cambridge, Massachusetts, USA, June 11, 1875

Joseph Winlock, a mathematical astronomer, was twice superintendent of the *American Ephemeris* before becoming the third director of the Harvard College Observatory. There he upgraded the observatory's equipment, expanded its research programs into the New Astronomy of astrophysics, and invented the photoheliograph.

Winlock's grandfather, a surveyor, participated in the convention that framed Kentucky's constitution, and both his grandfather and father had distinguished military careers during the War of 1812. Winlock was educated in his home state. His mathematical prowess was so evident that immediately upon his graduation from Shelby College in 1845, he was offered an appointment there as professor of mathematics and astronomy. Winlock spent his first savings on a set of the *Astronomische Nachrichten*, then the world's foremost astronomical journal; to gain enough fluency to read it, he arose daily before dawn to speak German with a laborer on his father's farm.

By all accounts, Winlock was rescued from frontier obscurity by attending the fifth meeting of the American Association for the Advancement of Science, held in Cincinnati, Ohio, in 1851, where he met Harvard astronomer and mathematician Benjamin Peirce. That contact led in 1852 to Winlock's joining the corps of calculators for the *American Ephemeris and Nautical Almanac*, which was then headquartered in Cambridge, Massachusetts. He remained there for five years, meeting and marrying Isabel Lane (1856), with whom he eventually had six children

In 1857, Winlock was appointed professor of mathematics at the US Naval Observatory in Washington. The following year, however, he was made superintendent of the *Ephemeris and Almanac* and returned to Cambridge. In 1859, he became head of the mathematics department of the US Naval Academy in Annapolis, Maryland. But when the Civil War moved the academy to Newport, Rhode Island, in 1861, Winlock returned to Cambridge and his old superintendent's position. During his intermittent 11-year service with the ephemeris office, he became known for his meticulously prepared tables of Mercury and was one of the original founding members of the National Academy of Sciences (1863). In 1866, Winlock made his last move this time within Cambridge—to become director of the Harvard College Observatory and Philips Professor of Astronomy; two years later, he concurrently became professor of geodesy at Harvard's Lawrence and Mining Schools

Winlock inherited an institution with aging equipment, a small endowment, inadequate staff, and a huge backlog of unpublished raw observations from his two predecessors, father and son astronomers William Bond and George Bond. As director, Winlock made it his priorities to modernize the instrumentation, get the massive research of the Bonds into print, and turn the

observatory into an efficient research center with a secure financial base. In so doing, Winlock revealed significant talent as an inventor, fundraiser, and administrator.

Because the observatory's original meridian circle had suffered damage during its transportation from Europe, the main 15-inch Merz and Mahler refractor was often pressed into service as a substitute. To free the great telescope for more suitable research, Winlock solicited more than \$12,000 in donations to purchase a brand new meridian circle; The new circle, mounted in 1870, was customized to his own specifications (among them shortening the piers and sealing the bearings from dust under glass) – improvements adopted by later observatories. Under his nine-year directorship, the observatory also acquired an auxiliary 7-foot Clark equatorial telescope, several clocks and chronometers, a Russian "broken" transit telescope, self-recording meteorological instruments, and several spectroscopes. These last items Winlock acquired to expand Harvard College Observatory's research beyond traditional positional astronomy and into the fledgling field of astrophysics; he himself used the spectroscopes during total solar eclipses to study the solar corona.

Winlock also proved to be an optical innovator. In 1869, Winlock led an expedition to Kentucky to observe the total solar eclipse of August 7. Determined to photograph the Sun's something not yet captured on film, Winlock rejected the corona

the then-standard method of eyepiece projection, instead placing the photographic plates at his telescope lens's prime focus. Although his images were thus very small—the Sun's disk was only 0.75 inches in diameter—Winlock's photographs not only revealed the corona but also showed that it extended farther from the Sun than astronomers had realized. To attain larger images at the total solar eclipse on December 22, 1870, in Spain, Winlock invented a horizontal telescope using a lens 4 inches in diameter having a focal length of 40 feet. The telescope lens, a heliostat (an unsilvered plane mirror for reflecting the Sun into the lens), and camera were mounted on separate piers; daylight was excluded by a tube disconnected from them all. Winlock's design pioneered what later became known as a photoheliograph—a very long horizontal telescope that served as the centerpiece of many late-19th-century eclipse expeditions (Some later astronomers contested his priority.) From 1870 on, Winlock's 4-in. horizontal telescope was used for daily solar observations as well as for photographing the transit of Venus in 1874.

When Winlock took over the Harvard Observatory, its annual operating budget was \$200, a sum meager even in its time. For the eclipse of 1869, to stretch an additional \$500 allocated by the Harvard Corporation for his 10-man expedition, Winlock pioneered the method of requesting free rail transportation for astronomical observers and equipment. In 1871, he followed the lead of Samuel Langley, director of the Allegheny Observatory in Pittsburgh, Pennsylvania, and began charging for the accurate time signals the Harvard Observatory had been telegraphing for free to New England railroads, jewelers, hotel managers, and other customers. By 1875, the observatory's average annual income from the time service was about \$2,400 (and later peaked at about \$3,000).

Winlock died of a mysterious illness quite unexpectedly. A man unusually laconic in conversation, he also wrote unusually few papers. Both his untimely death and his emphasis

on publishing his predecessors' zone catalogs of stars, solar drawings, and aurora observations in the *Annals of the Astronomical Observatory of Harvard College* resulted in much of his own research not being printed during his lifetime. Thus today, Winlock's original early contributions to astronomical photography, photometry, and spectroscopy are less recognized than his faithful stewardship of the Harvard College Observatory.

*Trudy E. Bell*

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