Biographical Encyclopedia of Astronomers

Bowditch, Nathaniel

Born Salem, Massachusetts, (USA), March 26, 1773

Died Boston, Massachusetts, USA, March 16, 1838

Nathaniel Bowditch was already well recognized for his original contributions to astronomy when he translated, corrected, and annotated the first four volumes of Pierre de Laplace's Mécha-nique céleste. His translation, published and distributed at his own expense, provided a foundation for American physical astronomy in the 19th century

The fourth of seven children of Habakkuk and Mary (née Inger-soll) Bowditch, Nathaniel's formal education stopped at the age of 10 when straitened financial conditions of the family forced him to go to work in his father's cooperage. By 1785, Bowditch had learned the rudiments of accounting and entered a nine-year contract of indentured service as a clerk with a ship's chandler. Living and working in the chandlery, he benefited from access to the owner's extensive library, from which he continued to educate himself, learning Latin and mathematics while working as a clerk. He also benefited from a peculiar set of circumstances: In 1780, the Pilgrim, a privateer based in Beverly, Massachusetts, captured a ship whose cargo included the scientific library of the Irish chemist Richard Kirwan. Among the 115 books captured were works by Isaac Newton, Daniel Bernoulli, Johann Bernoulli (III), and Jacob Bernoulli, and E. Chambers's Cyclopedia; Or, an Universal Dictionary of the Arts and Sciences. The Pilgrim arrived in Salem in 1781 and auctioned its cargo; the books were bought by a local apothecary who intended to use the pages for wrapping paper. This dreadful fate was averted when a group of citizens raised funds to buy the books and donate them to the newly founded Salem Philosophical Society. This gave Salem the best scientific library north of Philadelphia. The books were housed in the home of Reverend John Prince, who allowed the 18-year-old Bowditch access to the library in 1791. In 1793, Bowditch discovered an error in Newton's *Principia*.

After completing his contractual service at the chandlery, Bowditch assisted with a survey of Salem and taught himself the mathematics and practice of navigation. Soon thereafter, Bowditch traded sedentary life ashore for life at sea, making one voyage as a clerk and then three voyages as a supercargo between 1795 and 1799. Between his first and second voyages in March 1798, Bowditch married Elizabeth Boardman; she died seven months later while he was at sea.

On his first voyage, Bowditch was also the second mate of the crew with responsibility for navigation. As he checked through the available reference tables in the 13th English edition of John Hamilton Moore's *The Practical Navigator*, he discovered mistakes in the tables that could result in serious navigational errors. Furthermore, the tables were incomplete, and Bowditch designed additional tables that would simplify calculations and make the volume easier to use at sea It was also on this first voyage that Bowditch conceived of a simplified but more accurate procedure for determining local time from the Moon, the navigational technique known as the "method of lunars." He began using this technique and found it gave more accurate results. The method of lunars allowed mariners to determine their longitude by observing the position of the Moon to determine local time. Though accurate marine chronometers had been built by John Harrison between 1735 and 1759, they were as yet too

expensive for use by merchant sailors, who relied instead on observations of celestial phenomena (such as the position of the Moon) in order to determine local time.

At the end of his first voyage, Bowditch provided a list of these errors to Edmund M. Blunt, the distributor of Moore's Practical Navigator. He advised Blunt of his ideas to correct and supplement both the tables and the text of the Practical Navigator and provided him with a tabulation of some of the errors he had already discovered Blunt was enthusiastic, and they agreed to undertake the creation of a new practical navigator. Blunt published a new edition, titled *The American Practical Navigator,* in 1799 with Bowditch's first round of corrections. On his second voyage, Bowditch continued to find errors, and a second corrected edition of *The American Practical Navigator* was published. After his third voyage, Bowditch was ready with his completely revised edition, including the new method of lunar navigation, many supplemental tables, and other innovations, which Blunt published in 1802 as *The New American Practical Navigator*, with Bowditch as the author. In total, Bowditch had compiled a list of over 8,000 errors in the tables of Moore's *The Practical Navigator*. It is little wonder that "the Bowditch," as it came to be known, developed a reputation for its reliability and was the standard reference for navigators for more than a century.

In 1800, Bowditch married a cousin, Mary Ingersoll, who was eight years younger. They had eight children.

In 1802, Bowditch became part owner and master of a merchant ship. His fifth voyage, to Sumatra in November 1803 (during which Bowditch read the first volume of Laplace's monumental Méchanique céleste), would be Bowditch's last trip. He gave up the sea to become an insurance executive at the Essex Fire and Marine Insurance Company in Salem. His mathematical experience served Bowditch well in this new environment, in which actuarial skills were highly valued and profitable. He was elected president of the firm in 1804.

In the early morning of December 14, 1807, a meteor streaked across the skies of New England. Bowditch compiled the observations of many individuals who had seen the meteor and estimated that it had traveled at three miles per second along a path 18 miles high

Bowditch also published papers on the oblateness of the Earth, the orbits of comets, errors in solar tables, and the motion of a pendulum suspended from two points. Bowditch was the first to investigate the curves traced by such a pendulum, which are now well known as the Lissajous curves of acoustics and electronics. These papers established Bowditch as one of the preeminent figures in American science and earned him recognition by European scientific societies. In 1818, he was elected a Fellow of the Royal Society of London; in 1829, Bowditch was the first American to be elected a foreign associate of the Royal Astronomical Society.

Harvard offered Bowditch its chair of mathematics and physics in 1806; West Point made a similar offer, as did the University of Virginia (1818). Bowditch declined them all—an academic position would have necessitated too great a cut in salary. But it would have been nearly impossible for Bowditch, a prominent Federalist and scholar, to avoid a connection with Harvard, a prominent school supported by many Federalists. In 1810, he became one of the university's overseers, and in June 1826, one of its trustees.

At that point, Harvard was in dire financial straits. An internal audit ordered by Bowditch turned up a number of accounting irregularities. Bowditch forced many changes in the name of fiscal responsibility, which brought him into conflict with Harvard's president, John Kirkland. In one noteworthy encounter, Kirkland defended the competence of a mathematics professor about to be dismissed. Bowditch's assessment was that "Peirce of the sophomore class" was a better mathematician than the professor. The Peirce involved was none other than Benjamin

Peirce, who himself would become a professor at Harvard in 1833 and go on to help establish the Harvard Observatory. When Kirkland eventually resigned, the students—with whom Kirkland was very popular—lambasted Bowditch.

Bowditch's best-known work is a translation of Laplace's monumental *Méchanique céleste* into English. But Bowditch did much more than translate Laplace: He added a great deal of commentary to make the work more comprehensible, filling in details dismissed by Laplace with a glib "It is easy to see..." He corrected many mistakes in Laplace's work and provided citations to the sources that Laplace had relied upon but had failed to credit. Bowditch's effort was similar to that of Mary Somerville's *The Mechanism of the Heavens* but more comprehensive. The publication of the translation was delayed by many years due to a lack of funding. Although the American Academy of Arts and Sciences offered to pay for the publication by soliciting private donations, Bowditch refused their offer and eventually paid for publication at his own expense. This cost was nearly $12,000, a third of his personal fortune. The first four volumes would appear in 1829, 1832, 1834, and 1839. Bowditch died of cancer partway through the translation of the fifth volume.

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