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On the cover: telescopes and other instruments of navigation from a 19th century trade card.

*For an item that is almost an iconic part of the navigator's and explorer's panoply, the telescope has played a relatively limited role in the history of navigation and exploration. Indeed, despite images of Columbus and others of the era wielding the instrument, it was not invented until over a century after the discovery of the New World, at the very end of the Age of Discovery. Since then this imminently useful tool has changed surprisingly little in the last four hundred years. A common nautical scope today is little different than the ones used in the Revolution or during the founding of the Colonies.*

### **Light and Lenses**

The actual use of lenses to alter light and perception is a technique that goes back thousands of years. The oldest extant lens is from near modern day Basra, Iraq, and dates back to the 7th Century BCE,<sup>1</sup> though even the Greeks describe their use.<sup>2</sup> However, in these cases the lenses were used for either magnification or fire starting and lack the subtle precision necessary in telescopes. The actual theory of optics itself, including the mathematics necessary to actually build a scope, was created by the Iraqi polymath Ibn al-Haytham ("Alhacen" in the West) in his *Kitab al Manazir* (Book of Optics).<sup>3</sup> His research and discoveries were instrumental in later work.

While the theory was recognized, the means of actually constructing a telescope had to wait until the early 17th century. The conditions by this time were right for the invention to be more or less stumbled upon. Spectacles had been invented in the 1450s, creating a growing industry in the grinding and creation of lenses.<sup>4</sup> Additionally, the Renaissance had encouraged such invention and tinkering.

Credit for the discovery probably goes to a Dutch spectacle maker named Hans Lippershey. He was the first person to bring it before the States General at The Hague for a patent; though other men came forward soon after with their own independently developed scopes. While the Dutch generals saw the practical application of such a device, the government committee debated exactly what to do with it.<sup>5</sup> They finally ordered Lippershey to modify his invention to include a second eyepiece, in essence creating the first binoculars. However, by this point word had already gotten out and the idea had spread quickly to Italy.



**Right: a telescope from the collections on the National Park Service on display in the Derby House.**

<sup>1</sup> Henry C. King, *History of the Telescope* (Cambridge, MA, 1955), 25

<sup>2</sup> Fred Watson, *Stargazer: The Life and Times of the Telescope* (Cambridge, MA, 2004), 51

<sup>3</sup> *ibid*, 107

<sup>4</sup> King, *History of the Telescope*, 39

<sup>5</sup> Watson, *Stargazer*, 57



Above: one example of Galilean publicity. In this illustration used as a frontispiece to the 1656 edition of his scientific work, Galileo offers his telescope to three women (possibly the goddess Urania and her attendants) as he points to some of his astronomical discoveries.

Opposite: a late 17th century sketch by Sir Isaac Newton of a reflecting telescope and its components.

## Galileo "Invents" the Telescope

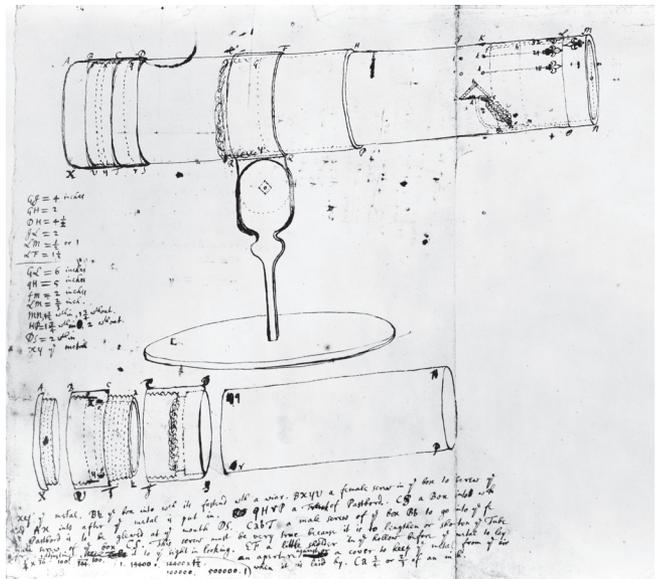
It was in Italy in 1609 that Galileo Galilei "invented" the telescope. He didn't, and even admits to this, but rather heard of the Dutch invention and was able to use the description to figure out how to build his own improved version.<sup>6</sup> However, he was responsible for launching the telescope onto the mass market, approaching military officers and nobility with a device that let them see things (like enemies) from far away (such as out of gunnery range). He was also indirectly responsible for naming the invention. Galileo had referred to it as a "perspicillum," but this name was quickly replaced by the sobriquet given to it by the poet Johann Demisiani, "telescope."<sup>7</sup> Evidently the name stuck.

Galileo's telescope is a fairly simple design the modern day would find familiar. It was an approximately one foot long tube using a concave and a convex lens at precise distances in order to magnify distant objects.<sup>8</sup> The distance between the lenses adjusts the focus, and the act of looking through a tube focuses the eye itself against glare and distractions. While there have been some alterations and perfections in technique and technology, the method of manufacture remain more or less the same. A copper or brass grinding tool is prepared and polished, and then the glass or crystal blank lens is set into place. A succession of abrasives is then employed to grind and polish the lens into the necessary shape.<sup>9</sup>

The design of the common telescope has not changed substantially in four centuries. While there have been important advances to the design of astronomical telescopes, these tend to be large, expensive, and too delicate for the kind of abuse a device is likely to receive at sea. Between their invention in 1608 and the invention of radar in 1934, the telescope (and by extension, binoculars) was the only enhancement available for the standard human eyeball.

## The Portable Telescope

At the time of Galileo's "invention" the history of telescopes split into two separate paths. Most of the progress and advancement in design and manufacture was meant for astronomy, with telescopes increasing to almost the size of buildings. At the same time, the primary business of telescope-makers was in the smaller, portable scopes meant for common usage.<sup>10</sup> Rather than looking at the stars, these affordable scopes were meant for



6 *ibid*, 69

7 King, *History of the Telescope*, 38

8 "17th Century Telescopes," *Antique Telescopes, spyglasses, telescope history, historical telescopes* (accessed August 24, 2007), available from <http://www.antiquetelescopes.org>

9 Watson, *Stargazer*, 54

10 *ibid*, 85

seeing to the horizon. Indeed, the sheer practicality and popularity of these devices meant that many 17th and 18th century opticians were wary of taking the demanding and time consuming commissions from astronomers, preferring the more profitable business of selling to the masses.<sup>11</sup>

The telescope on display in the Derby House here at Salem Maritime was probably not used at sea. While most nautical spyglasses are between six inches and two feet long, this scope is nearly the size of a man and is so unwieldy that it includes a tripod. On a rocking ship, it would be virtually impossible to deploy and keep upright. Most likely it was meant for surveying or other terrestrial observations. The greatest clue to its origins is the maker's stamp on the brass casing, "S & A Admiral."

Despite the sheer practicality of the invention, the telescope had a quite limited impact on the course of nautical history. While revolutionary for astronomy and science, at sea it was simply useful. The expansion of the Age of Discovery had already passed, and it did little to aid navigation or change the nature of sea travel. It was simply a very useful tool that quickly became a part of a naval officer's standard gear, and its use continues up to this day.

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Right: a 1779 mezzotint of John Paul Jones. Jones' telescope is positioned directly at the center of the portrait, highlighting the importance of the scope as a tool and as a symbol of command.



JOHN PAUL JONES,  
*Commander of a Squadron in the Service of*  
THE THIRTEEN UNITED STATES OF NORTH AMERICA, 1779.





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**Salem Maritime National Historic Site**

174 Derby Street

Salem, MA 01970

<http://www.nps.gov/sama>

**Author: Matthew Witzig, SCA intern**

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