

Setting the Record Straight

by Mary Korpi

Augustin Fresnel (1788-1827) was a French physicist who developed the Fresnel lens through tedious trial and error, revolutionizing lighthouse beacons worldwide. History often paints Augustin as an unlikely innovator when, in fact, he was uniquely qualified to achieve this goal. Described as shy, socially awkward, and having a sickly constitution, at just 20 years of age, Augustin completed his training as a civil engineer. He then attended the School of Bridge and Roads, graduating in 1809. Fresnel worked as a civil engineer who developed roads and canals throughout France. Work he found tedious.

In his spare time, he pursued a scientific inquiry into the development of a cheaper way to make soda ash, a chemical used to manufacture glass. Still, he was disappointed that he received no acclaim for this development. He springboarded into studying the physics of light, eventually discarding the then-accepted understanding that light traveled in particles to an earlier theory that light travels in waves. This adoption of light wave theory led him to explore methods to concentrate candlelight to maximize brightness and increase the distance from which it is visible. He found that by refracting or bending glass, he could direct light and increase its visibility. Through ongoing experimentation, he discovered that layering glass prisms increased the distance from which the light was visible.

The first Fresnel apparatus was installed in Cordouan, France, in 1823 and was immediately hailed as a success by sailors. Augustin finally received acclaim from his peers that year. He was elected into the Academy of Sciences and then the National Order of Legion of Honour, the highest decoration in France. Still, he continued to improve his beacon - rearranging lenses and eventually using "internally reflecting" prisms bent to join together as a central beam.

Under Fresnel's guidance as the Secretary to the Commission of Lighthouses, he led France's development of a systematic placement of lighthouses along France's coast. In 1825, he released his Lighthouse Map, calling for fifty-one lighthouses where only thirteen currently operated. His system allowed sailors to spot a beacon consistently along the coastline - as one faded, the next was visible. Fresnel also devised the systematic coding of beacon sizes from first-order lenses - that can be seen approximately 20 nautical miles down to fourth, fifth, and sixth-order lenses - named harbor lights. He went on to propose variations of signals - either fixed signals or rotating signals - that are seen at various timed intervals. Fresnel's frenzy to create a lighthouse system pushed France to adopt steam power to increase glass output for lenses, bringing them into the industrial revolution.

Unfortunately, Fresnel's lighthouse obsession could only carry him so far. He succumbed to tuberculosis on July 14, 1827, before his plans were fully realized. However, his younger brother Leonor Fresnel stepped into his brother's job and continued his work. France

became the leader in lighthouse development, which increased trade. Eventually, every lighthouse in the world used Fresnel lenses. The US was the last holdout - but that is another story!

Based on the book *A Short Bright Flash - Augustin Fresnel and the Birth of the Modern Lighthouse* by Theresa Levitt, W.W. Norton & Company, 2013. Available at Southold Historical Museum Gift Shop, located in the Prince Building, 54325 Main Rd. Southold.