



TESLA Life and Legacy - High Frequency

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— High Frequency —

After the success of Niagara, Tesla resumed his favorite work—experimentation. Back at his laboratory on Grand Street in New York City, Tesla engrossed himself in the exploration of high frequency electricity.

A number of scientific breakthroughs had already shed light on the high-frequency phenomenon. In 1873, James Clerk Maxwell, in England, had proven mathematically that light was electromagnetic radiation—light was electricity, vibrating at an extremely high frequency. In 1888, Heinrich Hertz of Germany confirmed experimentally that an electric spark propagates electromagnetic waves into space. These discoveries identified radio waves and prompted intense speculation about new possibilities for electricity.

Tesla began to search for a device that could transport him to this unexplored territory. He knew that higher frequencies would have many technical advantages: lamps could glow brighter, energy could be transmitted more efficiently, and this would all be less dangerous because the energy could pass harmlessly across the body.

Tesla's initial goal was to approximate the frequency of sunlight and create lamps of revolutionary brightness and configuration. This, he hoped, would eliminate Edison's incandescent lamp, which utilized only five percent of the available energy.

Tesla began his high frequency investigations by building rotary AC generators that could run at higher speeds; but as he approached twenty thousand cycles per second, the machines began to fly apart, leaving him far short of his goal. The answer came with a remarkable device still known today as a Tesla coil. Patented in 1891, this invention took ordinary sixty-cycle per second household current and stepped it up to extremely high frequencies—into the hundreds of thousands of cycles per second. In addition to high frequencies, the coil could also generate extremely high voltages.

With high frequencies, Tesla developed some of the first neon and fluorescent illumination. He also took the first x-ray photographs. But these discoveries paled when compared to his discovery of November 1890, when he illuminated a vacuum tube wirelessly—having transmitted energy through the air.

This was the beginning of Tesla's lifelong obsession—the wireless transmission of energy.

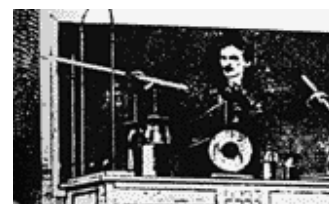
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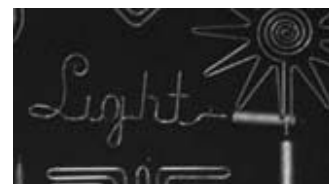
First photograph exposed by phosphorescent light, taken of Tesla in his laboratory



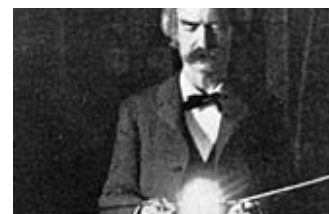
Heinrich Rudolf Hertz (Courtesy Library of Congress)



Woodcut from *Electrical World* depicting a Tesla lecture on high frequency, 1891



Neon lights first displayed at Columbian Exposition, 1893



Mark Twain in Tesla's laboratory, 1895

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