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Unit IX  
Electricity & Magnetism  
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# IX

## Reading Assignment

**Directions:** *Read the selection below then answer the questions that follow.*

### Tesla, Nikola

(b. July 9/10, 1856, Smiljan, Croatia--d. Jan. 7, 1943, New York City), Serbian-American inventor and researcher who discovered the rotating magnetic field, the basis of most alternating-current machinery. He emigrated to the United States in 1884 and sold the patent rights to his system of alternating-current dynamos, transformers, and motors to George Westinghouse the following year. In 1891 he invented the Tesla coil, an induction coil widely used in radio technology.

Tesla was from a family of Serbian origin. His father was an Orthodox priest; his mother was unschooled but highly intelligent. A dreamer with a poetic touch, as he matured Tesla added to these earlier qualities those of self-discipline and a desire for precision.

Training for an engineering career, he attended the Technical University at Graz, Austria, and the University of Prague. At Graz he first saw the Gramme dynamo, which operated as a generator and, when reversed, became an electric motor, and he conceived a way to use alternating current to advantage. Later, at Budapest, he visualized the principle of the rotating magnetic field and developed plans for an induction motor that would become his first step toward the successful utilization of alternating current. In 1882 Tesla went to work in Paris for the Continental Edison Company, and, while on assignment to Strassburg in 1883, he constructed, in after-work hours, his first induction motor. Tesla sailed for America in 1884, arriving in New York, with four cents in his pocket, a few of his own poems, and calculations for a flying machine. He first found employment with Thomas Edison, but the two inventors were far apart in background and methods, and their separation was inevitable.

In May 1885, George Westinghouse, head of the Westinghouse Electric Company in Pittsburgh, bought the patent rights to Tesla's polyphase system of alternating-current dynamos, transformers, and motors. The transaction precipitated a titanic power struggle between Edison's direct-current systems and the Tesla-Westinghouse alternating-current approach, which eventually won out.

Tesla soon established his own laboratory, where his inventive mind could be given free rein. He experimented with shadowgraphs similar to those that later were to be used by Wilhelm Röntgen when he discovered X-rays in 1895. Tesla's countless experiments included work on a carbon button lamp, on the power of electrical resonance, and on various types of lighting.

Tesla gave exhibitions in his laboratory in which he lighted lamps without wires by allowing electricity to flow through his body, to allay fears of alternating current. He was often invited to lecture at home and abroad. The Tesla coil, which he invented in 1891, is widely used today in radio and television sets and other electronic equipment. That year also marked the date of Tesla's United States citizenship.

Westinghouse used Tesla's system to light the World's Columbian Exposition at Chicago in 1893. His success was a factor in winning him the contract to install the first power machinery at Niagara Falls, which bore Tesla's name and patent numbers. The project carried power to Buffalo by 1896.

In 1898 Tesla announced his invention of a teleautomatic boat guided by remote control. When skepticism was voiced, Tesla proved his claims for it before a crowd in Madison Square Garden.

In Colorado Springs, Colo., where he stayed from May 1899 until early 1900, Tesla made what he regarded as his most important discovery-- terrestrial stationary waves. By this discovery he proved that the Earth could be used as a conductor and would be as responsive as a tuning fork to electrical vibrations of a certain frequency. He also lighted 200 lamps without wires from a distance of 25 miles (40 kilometres) and created man-made lightning, producing flashes measuring 135 feet (41 metres). At one time he was certain he had received signals from another planet in his Colorado laboratory, a claim that was met with derision in some scientific journals.

Returning to New York in 1900, Tesla began construction on Long Island of a wireless world broadcasting tower, with \$150,000 capital from the American financier J. Pierpont Morgan. Tesla claimed he secured the loan by assigning 51 percent of his patent rights of telephony and telegraphy to Morgan. He expected to provide worldwide communication and to furnish facilities for sending pictures, messages, weather warnings, and stock reports. The project was abandoned because of a financial panic, labour troubles, and Morgan's withdrawal of support. It was Tesla's greatest defeat.

Tesla's work then shifted to turbines and other projects. Because of a lack of funds, his ideas remained in his notebooks, which are still examined by engineers for unexploited clues. In 1915 he was severely disappointed when a report that he and Edison were to share the Nobel Prize proved erroneous. Tesla was the recipient of the Edison Medal in 1917, the highest honour that the American Institute of Electrical Engineers could bestow.

Tesla allowed himself only a few close friends. Among them were the writers Robert Underwood Johnson, Mark Twain, and Francis Marion Crawford. He was quite impractical in financial matters and an eccentric, driven by compulsions and a progressive germ phobia. But he had a way of intuitively sensing hidden scientific secrets and employing his inventive talent to prove his hypotheses. Tesla was a godsend to reporters who sought sensational copy but a problem to editors who were uncertain how seriously his futuristic prophecies should be regarded. Caustic criticism greeted his speculations concerning communication with other planets, his assertions that he could split the Earth like an apple, and his claim of having invented a death ray capable of destroying 10,000 airplanes at a distance of 250 miles (400 kilometres).

After Tesla's death the custodian of alien property impounded his trunks, which held his papers, his diplomas and other honours, his letters, and his laboratory notes. These were eventually inherited by Tesla's nephew, Sava Kosanovich, and later housed in the Nikola Tesla Museum in Belgrade. Hundreds filed into New York City's Cathedral of St. John the Divine for his funeral services, and a flood of messages acknowledged the loss of a great genius. Three Nobel Prize recipients addressed their tribute to "one of the outstanding intellects of the world who paved the way for many of the technological developments of modern times." (I.W.H.)

## **BIBLIOGRAPHY.**

Inez Hunt and Wanetta W. Draper, *Lightning in His Hand: The Life Story of Nikola Tesla* (1964), is a complete, authoritative, nontechnical biography. Nikola Tesla Museum, *Nikola Tesla 1856-1943: Lectures, Patents, Articles* (1956), contains authentic reprints, diagrams, lectures, and considerable detailed information. Nikola Tesla, *Experiments with Alternate Currents of High Potential and High Frequency* (1904), furnishes Tesla's own story of his Colorado experiments.

## Questions

1. Where was Nikola Tesla born? \_\_\_\_\_
2. When was he born? \_\_\_\_\_ When and where did he die? \_\_\_\_\_
3. What did Tesla discover that lead to several of his inventions? \_\_\_\_\_
4. The patent rights were sold to \_\_\_\_\_.
5. Name two other things that Tesla invented or discovered.
  
6. Tesla came to the United States in what year? \_\_\_\_\_.
7. Tesla's alternating current approach eventually won out over the systems developed by this man.  
\_\_\_\_\_.
8. What did Tesla think was his greatest contribution to the study of electricity?
  
9. What venue did Westinghouse use to show off Tesla's alternating current machines?
  
10. Westinghouse then built power plants at Niagra Falls to provide power for Buffalo, New York.  
Describe what it was that persuaded Westinghouse to build his power plants at Niagra Falls.