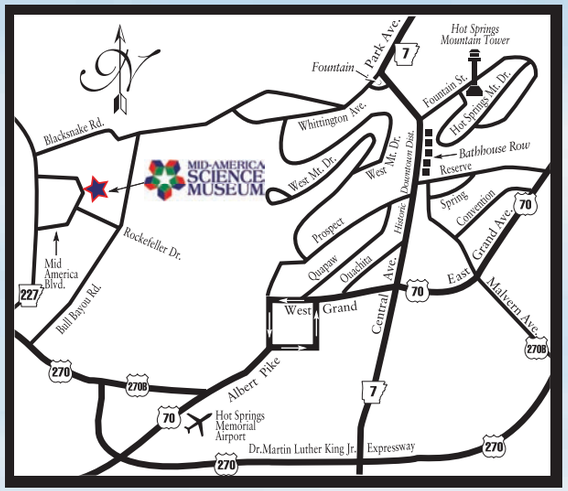
Nikola Tesla was exploring the nature of tuned circuits resonating at high frequency and high voltage. He discovered early in his research that while using a coil of a given wavelength, other coils tuned to this same wavelength or one of its harmonics, would respond in sympathy by spouting its own crown of sparks, even though not physically connected in any way to the operating coil. Here is an example of transmission of radio frequency electrical energy over distance without wires.

The Mid-America Science Museum's conical Tesla Coil exhibit (most powerful on earth at 1.5 million-volts) consists of two coils wound in a different manner than that of a traditional transformer. However, the Tesla Coil's air-core design does not utilize the traditional transformer's iron-core. The Tesla Coil's primary coil resonates with the secondary coil because they are tuned to be in step with each other electrically. This is accomplished by adjusting the number of turns in the primary coil winding and the total capacitance in the capacitor bank.

The massive 2 1/2 ton steel Faraday cage is utilized to protect the public from high-voltage discharges, greatly reduces high frequency emissions and to protect against any possible communication disruptions. It also provides an excellent ground point to which high voltage discharges can leap.

This "Caged Lightning" Tesla Coil exhibit is a replica of the conical coil at the world famous Griffith Park Observatory in the Hollywood Hills of Southern California. Since it's initial operation in 1937, over 25 million visitors have marveled at the unusual and exciting display of lightning-like discharges.

Griffith Park Observatory, California



500 Mid-America Boulevard, Hot Springs, AR 71913
(Hwy. 270 West to Hwy. 227 to Mid-America Boulevard)

HOURS OF OPERATION

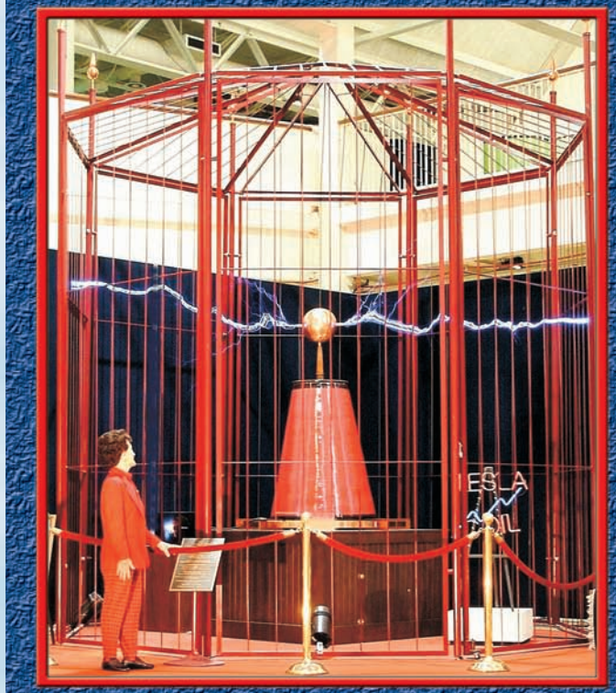
May 1 until Labor Day
9:30 a.m. to 6:00 p.m. daily

Labor Day until Memorial Day
10:00 a.m. to 5:00 p.m.
Tuesday - Sunday

800-632-0583 or 501-767-3461

midamericamuseum.org
SermonFromScience.com

Caged Lightning Tesla Coil



MID-AMERICA SCIENCE MUSEUM
HOT SPRINGS, ARKANSAS
IN ASSOCIATION WITH THE SMITHSONIAN INSTITUTION

Tesla Coil

SPECIFICATIONS

Copper Electrode

Copper Electrode 12" Sphere
Corona Discharge:
1,500,000 volts A.C.
8 to 16 feet to Faraday Cage
Frequency: 85,000 Hertz

Secondary Coil

Secondary Coil
Height: 48"
Top: 18" dia. Base: 38" dia.
360 turns of #14AWG
Copper stranded wire
Vinyl insulated

Primary Coil
16,000 volts @ 500 amperes
6 turns of 2" wide
Copper ribbon

Rotary Spark Gap
1,800 R.P.M., salient pole
Synchronous motor driven
Pulse repetition rate:
240 pulses per second

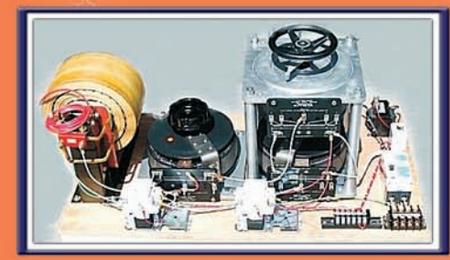
Primary Coil

Capacitor Bank
Extended-foil
Polypropylene non-PCB
0.0625 mfd. @ 80,000 volts

Primary Power Supply
High Voltage Transformer
16,000 Volts 5000 Watt
Input: 480 volts AC
Single phase, 60 Hertz
Power Supply/Controller
(located in pedestal base)

Rotary Spark Gap

Capacitor Bank



Power Supply/Controller

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Nikola Tesla

"…..The present is theirs. The future, for which I really worked, is mine."

Champion of Electricity
"Master of Lightning"

Nikola Tesla was born July 9, 1856, in Yugoslavia and was educated in Eastern European schools and universities. He came to America in 1884 with top educational honors, fluency in eight languages, and a photographic memory. Upon arriving in America, by letter of introduction he went to the New York laboratory of Thomas Alva Edison, who immediately hired him. After working for Edison for a short while, Tesla became disinterested in Edison's ongoing work with direct current and left his employment to pursue his own experiments with alternating current. Edison was staunchly opposed to alternating current, considering it too dangerous. He made many attempts to discredit Tesla's research.

In 1892, Tesla patented his system of wireless transmission and reception, three years before Guglielmo Marconi. Even today, many textbooks give Marconi credit for inventing the radio even though the Supreme Court of Review overturned his patents in 1943 to recognize Tesla as the predominant pioneer in the art.

In 1893, the Chicago World's Fair utilized the Tesla/Westinghouse system of alternating current to light 250,000 incandescent lightbulbs. Using a Tesla Coil, Tesla passed 1,000,000 volts of high frequency electricity through his body to prove to the World's Fair audience that this form of alternating current was safe and to demonstrate its unique properties. Alternating current was here to stay and many credit Tesla as "father of alternating current."

Two years later, in 1895, Westinghouse was awarded the contract to develop and install the first power plant at Niagara Falls, utilizing the Tesla system of polyphase alternating current generators, to deliver electricity to Buffalo and later to New York City. This was acclaimed to be "the supreme electrical engineering feat of all time." Of the thirteen patents on these generators, nine were Tesla's. An impressive statue of Tesla stands in tribute to his achievements on Goat Island overlooking Niagara Falls.

In 1899, Tesla moved his laboratory to Colorado Springs, Colorado, where he concentrated on the development of his famous coil. From May through December of that year, Tesla developed and experimented with his largest coil. It generated millions of volts and consumed 50,000 watts of power, producing electrical arcs many feet in length. Tesla was researching methods of transmitting electricity without the use of traditional wires. Tesla succeeded in lighting two-hundred, 50-watt incandescent lamps twenty six miles away by generating an electric field with the Tesla Coil.

Other life-changing and enriching inventions attributed to Tesla include - turbines, x-rays, radar, alternating current motors, fluorescent lamps and many other outstanding inventions. However, the transmission of electrical power by radio waves was Tesla's greatest dream. With more than 250 patents to his credit, Tesla died at age 86, literally penniless, in a New York hotel room on January 7, 1943. It is rather ironic that a man who gave the world so much, received so very little for his efforts. He spent the last years of his life in solitude. Tesla remarked, "The mind is sharper and keener in seclusion and solitude. It does not cost a million dollars to think, and by thinking, the idea is created."

Tesla is a riveting journey into the mind and life of the eccentric wizard who was Edison's enemy, Mark Twain's friend, J. P. Morgan's client, hero and mentor to many of the 20th century's most famous scientists.

In final tribute, the Institute of Radio Engineers said, "He lived in a land of brilliant concepts and dreams so lofty as to be foredoomed -- a catalyst in the realm of technology. His passing seems, in a sense, to be the end of an epoch."

Tesla monument @ Niagara Falls

Acknowledgements

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Mary Ellen Mathias
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Founder and President
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Monrovia, California

Exhibit Designed by

Niles Ellis
Mid-America Science Museum

Faraday Cage Built by

Ken Ewing and Gil Frahm
Hot Springs Village, Arkansas

MID-AMERICA SCIENCE MUSEUM
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