

NIKOLA TESLA, CROATIA

For Tesla's unrecognized discoveries awarded ten Nobel Prizes

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"Nikola Tesla was a brilliant, but unrecognized physicist whose unrecognized discoveries was awarded by ten Nobel prizes", said academician Vladimir Paar at the formal session of Croatian Academy of Science and Art



(CASA) held on the occasion of celebration of 150th anniversary of that great scientist's birthday and the honourable member of CASA. "Our Academy is one of the rare who can be proud of the fact that it's three members – Tesla, Mohorovičić and Milanović – got its hills on the moon", reminded academician Paar. "However, although the world recognized Tesla-the inventor, it has not recognized yet the fact that he was also a brilliant physicist who stood out with his vast knowledge of physics theory", emphasized Paar, having expressed hope that it would change soon. Furthermore, Paar reminded that in the Academy Annual Tesla was mentioned as an 'inventor and physicist', but his scientific results in physics were still unrecognized and unsolved. Giving examples of Tesla's unrecognising, Paar said, among other things, that as early as in 1891 Tesla had published first the article on electron, a discovery Thompson was recognized for by the Nobel Prize in 1897. "Also, Tesla discovered X-rays in 1894, and a year later the Nobel Prize for that discovery was given to Roentgen, what was the first 'Nobel' for physics. Tesla had discovered the working principle of radar in 1903, more than three decades before it was discovered", said Paar adding that Tesla gave evidence on existing the cosmic rays as early as in 1897.



These rays were experimentally discovered in 1912. He mentioned that there were documents which could prove that as early as in 1893, or almost six decades before laser construction, Tesla had had an apparatus similar to laser. The president of CASA academician Milan Moguš spoke about Tesla's life path having reminded that the Academy had elected Nikola Tesla by secret vote to be its honourable member. He added that the University of Zagreb awarded Tesla an honourable doctorate, while the whole scientific world praised him on his hundredth birthday naming the new international unit for magnetic induction after him. Ivan Ilić, Emeritus Professor of Zagreb University, talked about Tesla's alternating electromagnetic system, saying that it was just a piece of Tesla's enormous opus. "Tesla was not only an inventor, he was also the creator of new principles. Sometimes, he looked like a wizard discovering a part of nature principle, so safely hidden, and just revealed to few people", add Ilić.

Nikola Tesla

Serbian-American Scientist and Inventor, Nikola Tesla, one of the greatest inventors of all time, was born on July 10, 1856, in the village of Smiljan, in the province of Lika within Vojna Krajina region in Austria, the area that later became the part

of the Austro-Hungarian Empire, Kingdom of Serbs, Croats & Slovenes, Yugoslavia and nowadays Croatia. His father was a Serbian Orthodox priest, a gifted writer and poet. In his library young Tesla spent countless hours. Nikola's mother, in his own words was an inventor of the first order. Tesla himself inherited a mix of his parents characteristics. He was a poetic dreamer, highly intelligent, altruistic, and strongly self-disciplined with desire for invention.

After studies at universities in Graz and Prague and spending several years working in Hungary and France, Tesla migrated to America in 1884. He arrived in New York with few material possessions and little money but his creative mind and capacity to invent would lead him to make his mark in his new country and indeed in history. Initially, Tesla worked very closely with Thomas Edison. However, the two inventors were far apart in scientific approach and methods and it was soon clear that they would take divergent paths.

In 1882 Tesla made the discovery that changed the world by harnessing the power of Alternating Current. The patent rights were soon bought by George Westinghouse precipitating thus a power struggle between the Edison's direct current and Tesla-Westinghouse AC system. In 1888 Tesla obtained US patents covering an entire system of polyphase AC that remains unchanged in principle today. Tesla soon established his own laboratory where he experimented with shadowgraphs similar to those later used by Wilhelm Rontgen, who discovered X-rays in 1895. Countless experiments conducted by Tesla included work on carbon button lamp, the power of electric resonance, and various types of lighting resulting in the invention of both neon and fluorescent lights.

Tesla's system was used to light up the World's Columbian Exposition in Chicago in 1893. This success was a key factor in winning him the contract to install the first power machinery at Niagara Falls, that bore Tesla's name and patent numbers. In 1898 Tesla performed the very first demonstration of wireless remote control by navigating the teleguided boat

before a crowd in Madison Square Garden. Also, Tesla's basic radio patent was granted in 1900.

In his laboratory in Colorado Springs, Tesla made what he regarded as his most important discovery - terrestrial stationary waves. This discovery proved that the Earth could be used as a conductor and would be responsive, like a tuning fork, to electrical vibrations of a certain frequency. He staged the first demonstration of a wireless power transmission by lighting up 200 lamps without wires from a distance of 40 kilometres and creating artificial lightening that produced flashes measuring 41 meters. Back in New York, Tesla the visionary began construction of a wireless world-broadcasting tower on Long Island. He was convinced that this would allow worldwide communication by furnishing facilities for sending pictures, messages, and stock reports. The project was abandoned because of an economic crisis, labour troubles, and investors withdrawal of support. Tesla's focus then shifted to turbines and other projects. Once again, due to lack of funds, his many ideas remained in his notebooks that are even today often examined by engineers for unexploited clues.

Nikola Tesla died on January 7, 1943 in a New York hotel room, alone, rather poor and almost forgotten. Nevertheless, he remains one of the main founders of modern radio communications through invention of inductively coupled resonant electric circuits and patents for Tesla coil and radio tuning device. Most of his estate including many of his notes, calculations and letters are housed in the Nikola Tesla Museum in Belgrade, Serbia.

So who is this genius?

Little Nicky Tesla was born in Smiljan, Croatia way back in 1856. He had an extraordinary memory and spoke six languages. He spent four years at the Polytechnic Institute at Gratz studying math, physics, and mechanics.

What made Tesla great, however, was his amazing understanding of electricity. Remember that this was a time when electricity was still in its infancy. The lightbulb hadn't even been invented yet.

When Tesla first came to the United States in 1884, he worked for Thomas Edison. Edison had just patented the lightbulb, so he needed a system to distribute electricity.

Edison had all sorts of problems with his DC system of electricity. He promised Tesla big bucks in bonuses if he could get the bugs out of the system. Tesla ended up saving Edison over \$100,000 (millions of \$\$\$ by today's standards), but Edison refused to live up to his end of the bargain.

Tesla quit and Edison spent the rest of his life trying to squash Tesla's genius (and the main reason Tesla is unknown today).

Tesla devised a better system for electrical transmission - the AC (alternating current) system that we use in our homes today. AC offered great advantages over the DC system. By using Tesla's newly developed transformers, AC voltages could be stepped up and transmitted over long distances through thin wires. DC could not (requiring a large power plant every square mile while transmitting through very thick cables).

Of course, a system of transmission would be incomplete without devices to run on them. So, he invented the motors that are used in every appliance in your house. This was no simple achievement - scientists of the late 1800's were convinced that no motor could be devised for an alternating current system, making the use of AC a waste of time. After all, if the current reverses direction 60 times a second, the motor will rock back and forth and never get anywhere. Tesla solved this problem easily and proved everyone wrong.

He was using fluorescent bulbs in his lab some forty years before industry "invented" them. At World's Fairs and similar exhibitions, he took glass tubes and molded them into the shapes of famous scientists' names - the first neon signs that we see all around us today. I almost forgot - Tesla designed the

world's first hydroelectric plant, located in Niagara Falls. He also patented the first speedometer for cars.

Word began to spread about his AC system and it eventually reached the ears of one George Westinghouse.

Tesla signed a contract with Westinghouse under which he would receive \$2.50 for each kilowatt of AC electricity sold.

Suddenly, Tesla had the cash to start conducting all the experiments he ever dreamed of.

But Edison had too much money invested in his DC system, so Tommy did his best to discredit Tesla around every turn. Edison constantly tried to show that AC electricity was far more dangerous than his DC power.

Tesla counteracted by staging his own marketing campaign. At the 1893 World Exposition in Chicago (attended by 21 million people), he demonstrated how safe AC electricity was by passing high frequency AC power through his body to power light bulbs. He then was able to shoot large lightning bolts from his Tesla coils to the crowd without harm. Nice trick!

When the royalties owed to Tesla started to exceed \$1 million, Westinghouse ran into financial trouble. Tesla realized that if his contract remained in effect, Westinghouse would be out of business and he had no desire to deal with the creditors. His dream was to have cheap AC electric available to all people. Tesla took his contract and ripped it up! Instead of becoming the world's first billionaire, he was paid \$216,600 outright for his patents.

In 1898, he demonstrated to the world the first remote controlled model boat at Madison Square Garden. So you can thank Tesla for the invention of those remote controlled planes, cars, and boats (and televisions!), also.

Tesla had a dream of providing free energy to the world. In 1900, backed by \$150,000 from financier J.P. Morgan, Tesla began construction of his so called "Wireless Broadcasting System" tower on Long Island, New York. This broadcasting tower was intended to link the world's telephone and telegraph

services, as well as transmit pictures, stock reports, and weather information worldwide. Unfortunately, Morgan cut funding when he realized that it meant FREE energy for the world.

Many stories claim that the U. S. government destroyed the tower during World War One for fear that the German u-boat spies would use the tower as a landmark to navigate by. In reality, Tesla ran into financial trouble after Morgan cut funding for the project and the tower was sold for scrap to pay off creditors.

The world thought he was nuts - after all, transmission of voice, picture, and electricity was unheard of at this time.

What they didn't know was that Tesla had already demonstrated the principles behind radio nearly ten years before Marconi's supposed invention. In fact, in 1943 (the year Tesla died), the Supreme Court ruled that Marconi's patents were invalid due to Tesla's previous descriptions. Still, most references do not credit Tesla with the invention of radio. (Sidenote: Marconi's radio did not transmit voices - it transmitted a signal - something Tesla had demonstrated years before.)

At this point, the press started to exaggerate Tesla's claims.

Tesla reported that he had received radio signals from Mars and Venus. Today we know that he was actually receiving the signals from distant stars, but too little was known about the universe at that time. Instead, the press had a field day with his "outrageous" claims.

In his Manhattan lab, Tesla made the earth into an electric tuning fork. He managed to get a steam-driven oscillator to vibrate at the same frequency as the ground beneath him (like Ella Fitzgerald breaking the glass with her voice in those old Memorex commercials).

The result? An earthquake on all the surrounding city blocks. The buildings trembled, the windows broke, and the plaster fell off the walls.

Tesla contended that, in theory, the same principle could be used to destroy the Empire State Building or even possibly split the Earth in two. Tesla had accurately determined the resonant frequencies of the Earth almost 60 years before science could confirm his results.

Don't think he didn't attempt something like splitting the Earth open (well, sort of).

In his Colorado Springs lab in 1899, he sent waves of energy all the way through the Earth, causing them to bounce back to the source (providing the theory for today's accurate earthquake seismic stations). When the waves came back, he added more electricity to it.

The result? The largest man-made lightning bolt ever recorded - 130 feet! - a world's record still unbroken!

The accompanying thunder was heard 22 miles away. The entire meadow surrounding his lab had a strange blue glow, similar to that of St. Elmo's Fire.

But, this was only a warm-up for his real experiment! Unfortunately, he blew out the local power plant's equipment and he was never able to repeat the experiment.

At the beginning of World War I, the government desperately searched for a way to detect German submarines. The government put Thomas Edison in charge of the search for a good method. Tesla proposed the use of energy waves - what we know today as radar - to detect these ships. Edison rejected Tesla's idea as ludicrous and the world had to wait another 25 years until it was invented.

His reward for a lifetime of creativity? The prized (to everyone but Tesla) Edison Medal! A real slap in the face after all the verbal abuse Tesla took from Edison.

The stories go on and on.

Industry's attempt (obviously very successful) to purge him from the scientific literature had driven him into exile for

nearly twenty years. Lacking capital, he was forced to place his untested theories into countless notebooks.

The man who invented the modern world died nearly penniless at age 86 on January 7, 1943. More than two thousand people attended his funeral.

In his lifetime, Tesla received over 800 different patents. He probably would have exceeded Edison's record number if he wasn't always broke - he could afford very few patent applications during the last thirty years of his life.

Unlike Edison, Tesla was an original thinker whose ideas typically had no precedent in science. Unfortunately, the world does not financially reward people of Tesla's originality. We only award those that take these concepts and turn them into a refined, useful product.

Scientists today continue to scour through his notes. Many of his far flung theories are just now being proven by our top scientists. For example, the Tesla bladeless disk turbine engine that he designed, when coupled with modern materials, is proving to be among the most efficient motors ever designed. His 1901 patented experiments with cryogenic liquids and electricity provide the foundation for modern superconductors. He talked about experiments that suggested particles with fractional charges of an electron - something that scientists in 1977 finally discovered - quarks!

Tesla's Biography

July 10, 1856. born in Smiljan, a village near Gospić

1862. started primary school

1862. - 1863. The Milutin Tesla's family moved to Gospić; Nikola finished his primary school as well as first three grades of so-called "lower Real-Gymnasium"

1870. - 1873. Finished last three grades of "higher Real-Gymnasium"

	in Rakovac, near Karlovac; professor Martin Sekulić, who taught maths and physics, had a decisive influence on Nikola
1873. - 1874.	Suffered from cholera for nine months; his father agreed that he can enrol polytechnic school
1874. - 1875.	One-year recovery in Tominčaj, near Gračac
1875. - 1878.	Studied at Polytechnic School in Graz ; spent twelve hours in reading and learning; excellent marks ; pointed out to professor Poeschl that the Gramme's engine was not perfect without a commutator and brushes
December 1878.	Went to Maribor, unemployed
March 1879.	As unemployed sent to Gospić
1879.	As a student, taught for some time at "Real-Gymnasium" in Gospić
January 1880.	Continued his studies, but only as an auditor (could not enrol the university because he did not learn Greek)
1881.	Got a position in the Central Telegraph Office in Budapest
1882.	While walking with a friend the idea of a rotating magnetic field came to his mind
April 1882.	Went to Paris and took up a position in Edison's company
1883.	In Strasbourg, set automatic lighting regulators and constructed the first motor without a commutator
June 10, 1883.	Demonstrated the first motor of alternating current without a commutator
1884.	Returned to Paris ; asked for financial support, but did not get it

June 1884.	With a letter of recommendation of Edison's manager in Paris, Mr Charles Batchellor, arrived to New York and started working in The Machine Works company
1885	Deserted Edison and founded his own company for manufacturing arc lamps
March 25, 1885.	Applied for his first patent on improving arc lamps, a great number of patents relating to arc lamp, to regulation of direct current generator as well as to a commutator
May 18, 1885.	Obtained the patent on regulator for Dynamo-Electric Machines
1886.	During the economic crisis, his company went bankrupt; he was a sewer worker in New York
January - March 1886.	Patents on dynamo-electric machine and thermo magnetic motor
April 1887.	With A.K. Brown's help, Western Union Telegraph Company gave financial means and he established Tesla Electric Company; built a laboratory in New York; worked on motors and generators
May 26, 1887.	Patent on Pyromagneto-Electric Generator
October 12, 1887.	Applies his first patent on Alternating-Electric-Current Motor and on Electrical Power Transmission
May 16, 1888.	Gives a lecture on new system of alternating current motors and transformers in the American Institute of Electrical Engineers; George Westinghouse purchases his patents
1889.	Became a United States citizen
February - June 1889.	Patents on Method of Operating Electro-Magnetic Motors, Method of Obtaining Direct from Alternating Current

	and on Armature for Electric Machines
1889/1890.	Visited his homeland
May 20, 1890.	Gave a lecture on "Experiments with Alternate Currents of Very High Frequency and Their Application to Methods of Artificial Illumination" in the American Institute of Electrical Engineers
October 1890. - January 1892.	Extremely productive period; applied the patents on Alternating-Current Generator, on Method of and apparatus for Electrical Conversion and Distribution, on Electrical Meter, on System of Electric Lighting, on Electric Incandescent Lamp, on Electrical Condenser, on Electrical Conductor, on Incandescent Electric Light and on Electric Railway System. In 1891 he invented the Coil
February 1892.	Lectures in London and Paris
April 1892.	For the second time back to homeland; buried his mother in Gospić
July - August 1893.	Patents on Coil for Electro-Magnets, on Means for Generating Electric Currents, on Electric Generator and on Reciprocating Engine
1894.	Became a corresponding member of the Serbian Royal Academy of Belgrade
March 13, 1895.	Burnt down his laboratory in New York; the manager of Morgan's Bank, E. D. Adams gave financial means for new laboratory
April 15, 1895.	The first generating unit of the Niagara Falls Power Plant was put into operation
1896.	Experiments with X-rays. Tesla's researches started the day when he took pictures of Mark twain under the Geissler tube . Although he

expected to get the picture of Twain, he got an extraordinary picture of the screw for tuning the camera lens instead. It was the very first X-ray ever made. Pupin, Tesla, Edison and Roentgen were researching X-rays at the same time. In December 1895 Roentgen was the first to publish his discovery of X-rays. Immediately after the discovery, Tesla sent him his pictures of shadows he had got in his laboratory. Roentgen replied: "The pictures are very interesting. If only you were so kind and show me the way you've come to them!" Tesla's researches were interrupted when his laboratory burnt down.

**April - June
1896.**

Patents on Apparatus for Producing Electric Currents of High Frequency and Potential, on Apparatus for Producing Ozone, on Methods of regulating apparatus for Producing Currents of High Frequency

**November
1896.**

The entire Niagara Power Plant put into operation; the first power transmission line to Buffalo

**December 17,
1896.**

Member of honour of the Yugoslav Academy of Science and Art of Zagreb

**February -
June 1897.**

Patents on Electrical Igniter for Gas-Engines, on Electrical Transformer and on Electrical-Circuit Controller

July 1, 1898.

Applied the patent on Remote Control of Vessels and Vehicles

1899.

Experiments on wireless plant of 200kW in Colorado; signals reached New York

**March 21,
1900.**

Patent on Means for Increasing the Intensity of Electrical Oscillations

June 15, 1900.	Patent on Insulating Electric Conductors
July 19, 1900.	Patent on Method of Signalling, on System of Signalling
1901.	Construction of the Long Island tower for world telegraphy in Wardencliff started; In 1906 the works on the construction stopped because of lack of money;
1915.	The plant was sold out in order to paid off the debts
March 21, 1901.	Patents on Apparatus for the Utilization of Radiant Energy and on Methods of Utilization of Radiant Energy
1909. - 1916.	Patents on Fluid Propulsion, Turbine, Speed Indicator, Lightning Protector, Flow Meter, Frequency Meter, Ship's Log, Valvular Conduit
1913.	George Westinghouse died
1915.	The New York Times wrote that the Nobel Prize should be shared between Edison and Tesla. However, the prize was not shared between them (it is still unclear why). The rumours said that Tesla refused to share it. Marconi received the Prize.
May 18, 1917.	Received Edison's medal that had been ordained to him in 1916.
June 15, 1926.	Doctor of honour of the Zagreb University
July 3, 1926.	Doctor of honour of the Faculty of Technical Engineering of Belgrade
1931.	Thomas Alva Edison died; Tesla appeared on the Time's front page; among many greetings for his 75th birthday was one from Albert Einstein, as well
1937.	Guglielmo Marconi, alleged wireless inventor, died
February 16, 1937.	The first member of the Academy of Science of Belgrade
October 1941.	Message against Nazism and fascism to Soviet

	academicians
April 1942.	Message "To My Brothers in the USA"
1942.	Messages to Serbian antifascist congress and Whole Slavic congress in the USA, as well as to Whole Slavic congress in Moscow
January 7, 1943.	died in the apartment 3327 on the 33 floor of the New Yorker. Tesla's body was cremated
1944.	Military division "Nikola Tesla" was founded
1956.	The urn with his ash was brought to Belgrade
1960.	Symbol for Magnetic induction got Tesla's name
1975.	entered the American House of Famous Inventors
1976.	The American Institute of Electro-Engineering establishes a prize after Tesla's name
1978.	Margaret Cheney published the best ever written biography of Tesla "Tesla-Man Out of Time"
1981.	A monument to Tesla was erected in Gospić, the work of Frane Krišnić. Ten years later the monument was destroyed
1983.	The USA Post Office printed stamp with Tesla's picture on it
1984.	A Hard-rock band "Tesla" formed in Sacramento
1997.	In special issue of The Life magazine he was put on 57th place out of 100 most influenced people of the last 100 years
2005.	Selected among 100 most deserving Americans within the public poll in organisation of the American TV Discovery channel