ŽIVOT I DJELO NIKOLE TESLE
THE LIFE AND WORK OF NIKOLA TESLA

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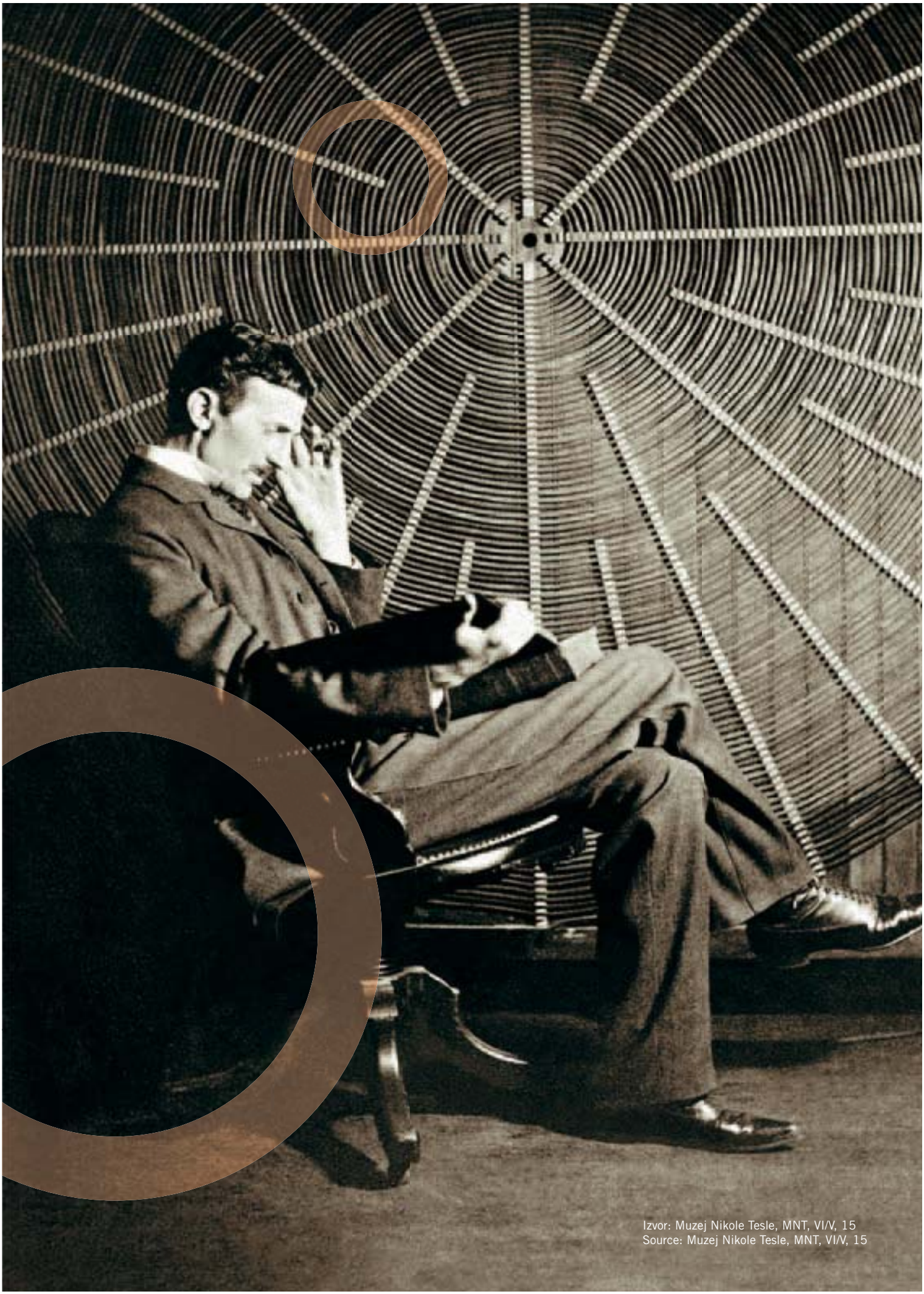
Članak ukratko opisuje život Nikole Tesle, od sela Smiljana do New Yorka, od snalažljivog dječaka, ljubitelja životinja do znanstvenika svjetskog glasa. Počevši od opisa stanovništva Like razmatra se porijeklo obitelji Tesla. Nastavlja se s Teslinim školovanjem u Hrvatskoj: pučka škola u Smiljanu i Gospiću, gimnazija u Gospiću i Rakovcu. Slijedi školovanje na Tehničkoj visokoj školi u Grazu te boravak i dopuna obrazovanja u Pragu. Prikazan je Teslin rad u Budimpešti i Francuskoj, odlazak iz Europe i nastavak rada u SAD-u te osnivanje vlastitog laboratorija. Ukratko su prikazani Teslini patenti u području električnih strojeva i uređaja koje je patentirao u Patentnom uredu SAD. Na kraju su iznesena mišljenja znanstvenika o Nikoli Tesli i priznanja koja je zaslužio svojim radom.

The article briefly describes the life of Nikola Tesla, from the village of Smiljan to New York, from a resourceful boy and animal lover to a world famous scientist. The ancestry of the Tesla family is discussed, starting with a description of the ethnic background of the inhabitants of Lika. Tesla's education in Croatia consisted of elementary school in Smiljan and Gospić, and secondary school in Gospić and Rakovac. This was followed by the polytechnic school in Graz and further education in Prague. Tesla's work in Budapest and France, his departure from Europe and the continuation of his work in the USA are discussed, as well as the establishment of his own laboratory. Tesla's patents in the field of electrical machinery and equipment that he patented at the United States Patent Office are briefly presented. There are also comments by distinguished figures about Nikola Tesla and the recognition he merited.

Ključne riječi: bežični sustav, električni stroj, lučna svjetiljka, mehanički oscilator, Nikola Tesla, Tesline struje, višefazni sustav

Key words: arc light, electrical device, mechanical oscillator, Nikola Tesla, polyphase system, Tesla currents, wireless system



Izvor: Muzej Nikole Tesle, MNT, VI/V, 15
Source: Muzej Nikole Tesle, MNT, VI/V, 15

1 UVOD

Kada se o Nikoli Tesli govori i piše, uvijek se počinje od sela Smiljana, nedaleko od Gospića. Njegovo podrijetlo, odnosno podrijetlo njegove obitelji nije međutim ondje, nego u drugom dijelu Like, pa i dalje.

Razmotreni su podaci o svim obiteljima koje su prije više stotina godina živjele u raznim dijelovima Like, ali nigdje se nije naišlo na prezime Tesla, jer to je bio samo nadimak koji je dobio jedan od Nikolinih predaka, koji se zapravo zvao Draganić, a bio je doseljenik vjerojatno iz okolice Ledenica. Priženio se u obitelj prote Mandića, pa je tako nastala lička obitelj Tesla.

I Nikolin je otac bio svećenik, pa je nakon službovanja u Senju došao u Smiljan, gdje se rodio Nikola i ondje pošao u pučku školu, koju je nastavio u Gospiću. Dobra krajiška gimnazija u Gospiću i njegovo školovanje ondje bili su solidna osnova za njegovu daljnju izobrazbu. Nikolina prirodna sklonost tehnici bila je u znatnoj mjeri pojačana i obogaćena njegovim školovanjem u Velikoj realnoj gimnaziji u Rakovcu (pokraj Karlovca). Nedvojbeno je da je školovanje Nikole Tesle u Velikoj realnoj gimnaziji u Rakovcu imalo presudnu ulogu za njegov odabir struke kojoj je posvetio cijeli svoj život - elektrotehnike.

Tehnička visoka škola (Teschnische Hochschule) u Grazu svojom je relativnom blizinom, a i tradicijom bila cilj mladome Tesli u stjecanju znanja na polju elektrotehnike.

Bujna mašta mladog Tesle dovela ga je u Budimpešti do osnovnog njegova otkrića na području izmjeničnih struja. Odlazak u Pariz, rad u Strabourgu te konačno prijelaz u New York ubrzali su Teslin stručni, a uskoro i znanstveni rad na sve širem polju elektrotehnike.

Nizala su se otkrića, izumi, nove konstrukcije i patenti zadivljujućom kvalitetom i brzinom. Vlastito poduzeće, vlastiti laboratorij, mnogi suradnici te predavanja, članci i putovanja postali su svakidašnjica Teslina života u Americi.

Međutim požar u laboratoriju, Teslina nezainteresiranost za novac te opsežni planovi i projekti doveli su ga u velike poteškoće. Godine su prolazile, mijenjao je donekle i područje svojih istraživanja, materijalno mu se stanje pogoršalo, a i zdravlje je popuštalo, pa je tako došao i kraj tom našem i svjetskom velikanu elektrotehnike i znanosti, koji je svojim djelima ovjekovječio svoje ime i ime svoje domovine.

1 INTRODUCTION

Any discussion of Nikola Tesla always begins with the village of Smiljan, not far from Gospić. The origins of his family were not from that place but from another part of Lika and beyond.

Data on all the families who lived in the various parts of Lika several centuries ago have been studied but the name Tesla is nowhere to be found. It was merely the nickname given to one of Nikola's ancestors, actually named Draganić, who most likely came to Lika from the surroundings of Ledenice. He married into the family of the Orthodox priest Mandić and thus began the Lika family of Tesla.

Nikola's father was also a priest. After serving in Senj, he came to Smiljan, where Nikola was born and then attended elementary school, which he continued in Gospić. The fine secondary school in the Croatian Military Border town of Gospić and the education Nikola obtained there provided a solid foundation for his further studies. Nikola's natural affinity for technology was significantly fostered and enriched by his schooling at the secondary school in Rakovac (near Karlovac). Undoubtedly, Nikola's education at the secondary school in Rakovac had a crucial role in the selection of the profession to which he devoted his life - electrical engineering.

The polytechnic school (Teschnische Hochschule) in Graz, by virtue of its relative vicinity and tradition, was the place the young Tesla aspired to attend in order to acquire knowledge in the field of electrical engineering.

While in Budapest, Tesla's fertile imagination led to his fundamental discovery in the area of alternating current. His departure to Paris, work in Strasbourg and final transition to New York accelerated Tesla's professional and scientific activity in the growing field of electrical engineering.

There followed discoveries, inventions, new constructions and patents of enviable quality and frequency. His own company, his own laboratory, many associates and lectures, articles and travels became the daily events of Tesla's life in America.

However, a fire in his laboratory, Tesla's disinterest in money, and extensive plans and projects caused him grave difficulties. The years passed, he somewhat changed his area of investigation, his financial situation worsened and his health failed. Thus ended the life of our world famous figure in electrical engineering and science, whose works have immortalized his name and are a credit to his homeland.

2 STANOVNIŠTVO LIKE I PODRIJETLO OBITELJI TESLA

U doba prodiranja Turaka na područje Like, Podgorja i Senjskoga primorja oko 1520. godine mnogi su stanovnici izbjegli u druge krajeve, sigurnije od turske najezde. U Dalmatinskoj zagori i Lici ostali su Hrvati i dio starobalkanskog stanovništva Morlaci, Lahi i Olahi. Dio tog stanovništva prihvatio je pravoslavnu, a dio muslimansku vjeru. Ti su se pomuslimanjeni starodjedioci poslije pomiješali s doseljenim muslimanima koji su u Liku dolazili iz zapadne Bosne, gdje je starosjedilačko katoličko i bogumilsko stanovništvo većinom prešlo na islam. Opustjele krajeve, nakon što su iz njih izbjegli katolički starosjedioci, naseljavali su Turci pravoslavnim stanovništvom koje su dovodili iz Podrinja, Poibarja i Polimlja.

U dijelovima Like koje Turci nisu mogli osvojiti ostalo je do danas jedino čisto potomstvo pred-turskoga stanovništva tih krajeva. Tako su se starosjedioci održali u staroj Gackoj i Brinjskoj županiji, u Senju te u senjskoj okolici, nedaleko od Ledenica.

Kada su Turci, nakon mira sklopljenoga 1699. godine u Sremskim Karlovcima, otišli iz Like, ondje osim katoličkih ostaju naselja pravoslavaca. Stanovnici Like nazivali su "ljude grčkog zakona", odnosno pravoslavce, Vlasima, a Srpska pravoslavna crkva im je odredila srpsku nacionalnu pripadnost.

Do danas nije dovoljno istraženo, niti se pouzdano zna podrijetlo obitelji Tesla. Poznato je da su neki preci imali prezime Draganić. To se prezime nalazilo u srednjoj Dalmaciji, pa su ga u 16. stoljeću nosili i dijelovi obitelji Vrančić koja je živjela u Šibeniku.

Prema obiteljskoj predaji jedan je od predaka imao istaknute prednje zube slično tesli, alatu za obrađivanje drva. Riječ tesla - sjekira nalazi se u poznatom rječniku "Dictionarium Quinque nobilissimarum Europae lingvarum, Latinae, Italicae, Germanicae, Dalmaticae, et Ungaricae", objavljenu 1595. godine u Veneciji, koji je sastavio hrvatski polihistor Faust Vrančić (Šibenik, 1552.-Venecija, 1617.). Po tom je alatu dotična grana Draganića dobila nadimak, koji je kasnije prešao u prezime Tesla.

Draganići su u Liku, na područje Divosela došli vjerojatno u 17. stoljeću iz sela Ledenice kraj Novoga Vinodolskoga, kamo su se doselili iz srednje Dalmacije. Jeli i neki drugi Draganić već u Ledenicama dobio nadimak Tesla, nije poznato.

2 THE INHABITANTS OF LIKA AND THE ORIGINS OF THE TESLA FAMILY

During the time of the Turkish penetration into the region of Lika, Podgorje and the Senj littoral, in approximately the year 1520, many of the local inhabitants fled the Turkish invaders to safer regions. Croats and some of the old Balkan inhabitants, the Morlachs, Lachs and Olachs, remained in Dalmatinska Zagora and Lika. Part of this population accepted Orthodoxy and part the Islamic faith. These indigenous converts to Islam later intermarried with the Muslims who arrived in Lika from western Bosnia, where the majority of the indigenous Catholic and Bogomil inhabitants had converted to Islam. The Turks brought in Orthodox settlers from Podrinje, Poibarje and Polimlje to settle the regions that the indigenous Catholic population had fled.

In the parts of Lika that the Turks could not conquer, there dwell what are today the only direct descendents of the pre-Turkish population in these regions. These indigenous inhabitants remained in the old Gacka and Brinj County, Senj and the surroundings of Senj, not far from Ledenice.

When the Turks left Lika, following the peace accord of 1699 in Sremski Karlovci, in addition to the remaining Catholic settlements there were also some Orthodox settlements. The inhabitants of Lika called them "the people of the Greek rite," i.e. Orthodox, Vlachs, and the Serbian Orthodox Church conferred Serbian nationality on them.

The origin of the Tesla family has neither been sufficiently investigated nor is there reliable information. It is known that some of Nikola Tesla's ancestors had the surname of Draganić. This is a surname that is found in central Dalmatia, and in the 16th century was also the name of parts of the Vrančić family who lived in Šibenik.

According to family lore, one of the ancestors had prominent front teeth that resembled tesli, tools for processing wood. The word tesla, or ax, is found in a famous dictionary entitled Dictionarium Quinque nobilissimarum Europae lingvarum, Latinae, Italicae, Germanicae, Dalmaticae, et Ungaricae, compiled by the Croatian polyhistor Faust Vrančić (Šibenik, 1552 - Venice, 1617) and published in Venice in the year 1595. It was after this tool that a branch of the Draganić family received its nickname, which later became the surname of Tesla.

In the 17th century, the Draganić family probably arrived in the Divoselo region of Lika from the

U doba kada su Francuzi osnovali Ilirske provincije (1809.-1813.) Nikola Tesla stariji, otac Milutina Tesle (1819.-1879.) služio je neko vrijeme kao seržan, tj. dočasnik pješačke vojske u Napoleonovoj vojsci, gdje je bio odlikovan za hrabrost. Vjerojatno je da je on i prije bio vojnik u austrijskoj vojsci, odnosno u Vojnoj Krajini u Hrvatskoj. Prema obiteljskoj predaji seržanov otac živio je 129 godina. Živio je u Raduću i vjerojatno je imao mnogo djece. Njegovi potomci su današnje Tesle iz Raduća.

Žena Nikole Tesle st. Ana bila je iz graničarske obitelji Kalinić, divoselske skupine pravoslavnih stanovnika Like. Iz toga braka potječe i Milutin rođen u selu Raduću. On je u Gospiću polazio njemačku pučku, a poslije i vojnu školu. Nije mu, međutim, odgovarao život u vojsci pa je u Plaškome učio bogosloviju, koju je završio 1845. godine. Zatim se oženio Đukom Mandić (1821.-1892.) iz Tomingrada kraj Gračaca.

Milutin Tesla je kao mladi svećenik službovao u Senju, odakle je bio premješten za upravitelja parohije u Smiljan, selo nedaleko od Gospića. U Smiljanu se 10. srpnja 1856., u kući prikazanoj na slici 1, rodio Nikola Tesla, a zatim i njegova sestra Mandica.

village of Ledenice near Novi Vinodol, to which they had emigrated from central Dalmatia. It is not known whether some other Draganić received the nickname of Tesla while still in Ledenice.

During the period when the French established the Illyrian Provinces (1809-1813), the senior Nikola Tesla, the father of Milutin Tesla (1819-1879), served for a time as a sergeant, i.e. a noncommissioned officer in the infantry of Napoleon's army, where he was decorated for bravery. It is likely that he had previously been a soldier in the Austrian army, i.e. in the Military Border Territory in Croatia. According to family lore, the sergeant's father lived for 129 years. He made his home in Raduć and probably had many children. His descendents are today's Teslas of Raduć.

The wife of the senior Nikola Tesla, Ana, came from a family from the Military Border Territory, a group of Orthodox inhabitants of Divoselo in Lika. Their son Milutin was born in the village of Raduć. Milutin attended German elementary school in Gospić, followed by military school. However, life in the army did not suit him so in Plaškome he studied theology, which he completed in 1845. He then married Đuka Mandić (1821-1892) of Tomingrad near Gračac.

As a young priest, Milutin Tesla served in Senj, from which he was transferred to administer the parish in Smiljan, a village not far from Gospić. On July 10, 1856, Nikola Tesla was born in Smiljan in the house shown in Figure 1, and was later followed by a sister, Mandica.

Slika 1
Rodna kuća Nikole Tesle u Smiljanu
Figure 1
The birthplace of Nikola Tesla in Smiljan

Izvor
Muzej Nikole Tesle, MNT, VI/VIII,112
Source
Muzej Nikole Tesle, MNT, VI/VIII,112

3 TESLINO ŠKOLOVANJE U HRVATSKOJ

Nikola je prvi razred trivijalke polazio i završio u Smiljanu. Tu su školu tada polazila djeca smiljanskih obitelji Milković, Kovačević, Rudelić, Tomljenović i ostalih. Moja baka Marija Milković, rođena Kovačević, išla je u prvi razred s Nikolom Teslom, koji je već kao dječak volio igračke tehničkog sadržaja.

Milutin Tesla je nakon šest godina službovanja u Smiljanu na vlastitu želju bio premješten 1862. u Gospić. Nikola je ondje polazio tzv. Pripremnu osnovnu školu koju je završio 1866. godine. Već kao dijete volio je životinje. Hranio je i pripitomljavao golubove, a to je radio i u New Yorku do kraja života.

Svoju snalažljivost pokazao je u Gospiću kada je prigodom svečanog puštanja u rad nove vatrogasne štrcaljke ova zatajila. Mali je Tesla brzo shvatio da se dovodna cijev u rijeci začepila. Izuo se, zagazio u vodu i odčepio cijev, nakon čega je štrcaljka proradila.

Nakon završetka pučke škole u Gospiću pošao je u Nižu realnu gimnaziju, gdje je stekao dobro znanje iz prirodnih znanosti i naučio njemački jezik.

Konstruirao je vodenu turbinu i izvodio pokuse na području elektriciteta s pomoću uređaja iz školskog fizikalnoga kabineta. Zanimala ga je matematika, ali prostoručno crtanje nije mu išlo od ruke. Bio je ljevak, "šuvak". Mnogo je čitao, služio se očevim knjigama. Bio je osrednji đak, volio je računanje, pa je i napamet izračunavao složenije račune.

Kada je u ljeto 1870. godine završio treći razred Niže realne gimnazije u Gospiću, zbog bolesti je morao odležati dva mjeseca. Nakon toga bio je na oporavku kod ujaka Tome Mandića u Tomingradu.

Velika realna gimnazija nedaleko Karlovca, prikazana na slici 2, osnovana je za potrebe Vojne Krajine i za pripremanje đaka za studij tehnike. Od školske godine 1869./70. Vlada je u realnu gimnaziju u Rakovcu uvela maturu, pa pri upisu na studij tehnike đaci nisu trebali polagati prijamni ispit (Aufnahmeprufung).

3 TESLA'S SCHOOLING IN CROATIA

Nikola completed the first grade of elementary school in Smiljan. At the time, the school was attended by the Smiljan families of Milković, Kovačević, Rudelić, Tomljenović and others. My grandmother, Marija Milković, née Kovačević, was in the same first grade class as Nikola Tesla, who was already a boy who liked toys of a technical nature.

In 1862, following six years of service in Smiljan, Milutin Tesla was transferred at his own request to Gospić. Thereafter, Nikola attended the preparatory elementary school in Gospić, which he completed in the year 1866. Even as child, Nikola loved animals. He cared for tame pigeons, as he did in New York until the end of his life.

Nikola demonstrated his resourcefulness in Gospić when a new firefighting hose malfunctioned on the occasion of its official trial. Little Tesla quickly understood that the pipe conveying water from the river was blocked. He felt for the suction hose in the water and found that it had collapsed. When he waded into the river and opened the hose, water rushed forth.

After completing elementary school in Gospić, Nikola attended the lower secondary school where he acquired a good foundation in the natural sciences and learned the German language.

Tesla constructed a water turbine and performed experiments in the field of electricity with the help of equipment from the school's physics laboratory. He was interested in mathematics but freehand drawing was not an easy subject for him. He read a lot, borrowing his father's books. He was an average student but enjoyed calculation so that he was able to compute complex bills in his head.

In the summer of 1870, when he had completed the third year of the lower secondary school in Gospić, he had to remain in bed for two months due to illness. After that, he was sent to recover at the home of his uncle, Toma Mandić, in Tomingrad.

The upper secondary school not far from Karlovac, shown in Figure 2, had been established for the needs of the Military Border Territory and for preparing students for the study of technology. Starting in the academic year 1869/70, the government introduced a final examination at the secondary school in Rakovac, so that it was no longer necessary to take an entrance examination (Aufnahmeprufung) in order to enroll in further technical studies.

Slika 2
Velika realna gimnazija u Rakovcu
Figure 2
Secondary School in Rakovac

Ratno ministarstvo u Beču imenovalo je 1863. godine devet učitelja Velike realne gimnazije u Rakovcu, među njima i Martina Sekulića (Lovinac, 1833.- Zagreb, 1905.), dotadašnjeg učitelja Niže realne gimnazije u Rakovcu, za matematiku i fiziku. Martin Sekulić bio je tada kustos školske knjižnice.

Nastavnici Velike realne gimnazije u Rakovcu dobivali su od 1866. godine naslov profesor. Školske godine 1871./72. profesor Sekulić predavao je predmete "Maschinenlehre" (strojarstvo) i Aritmetik. Nastavni jezik bio je njemački, a iz njega je Tesla dobivao uvijek najbolju ocjenu.

Nakon što je 1870. godine završio treći razred Niže realne gimnazije u Gospiću, roditelji su Nikolu poslali u Višu, poslije Veliku realnu gimnaziju u Rakovcu. Ondje je stanovao kod svoje tetke Stanke, udane za umirovljenoga majora austrijske vojske, Danila Brankovića. Tetka je pazila na njegovu prehranu, te je pokušavala u njemu probuditi zanimanje za umjetnost i povijest umjetnosti, ali to Nikolu nije zanimalo. Iako je imao osjetljivo uho, odnosno dobar sluh nije pokazivao zanimanje za glazbu.

Nikola je neprestano razmišljao o nekim izumima. Tako je jednom na putovanju kolima iz Gospića u Karlovac pripovijedao svojem prijatelju, da se bavi izumom koji će omogućiti prenošenje govora između Europe i Amerike bez ikakve materijalne veze, tj. bez žica ili kabela.

Tijekom školovanja u Realnoj gimnaziji u Rakovcu nije bio osobito dobar đak. Premda je uvijek uspješno prolazio, iz nacrtne geometrije i prostornog crtanja obično je dobivao ocjenu dovoljan. Bio je osjetljiva zdravlja, pa je u školskoj

In 1863, the Ministry of War in Vienna appointed nine teachers to the higher secondary school in Rakovac, including Martin Sekulić (Lovinac, 1833 - Zagreb, 1905), until then a teacher at the lower secondary school in Rakovac, who taught mathematics and physics. Martin Sekulić was the custodian of the school library at the time.

In 1866, the teachers at the secondary school in Rakovac were given the title of professor. During the 1871/72 academic year, Prof. Sekulić taught the subjects of mechanical engineering and arithmetic. The language used in the classroom was German. Tesla always received the highest grade.

After Nikola completed the third year of the lower secondary school in Gospić in 1870, his parents sent him to the higher secondary school, and afterwards to the secondary school in Rakovac. Here he lived with his aunt, Stanka, who was married to a retired major in the Austrian army, Danilo Branković. His aunt was careful about his nutrition and attempted to kindle Nikola's interest in art and history, without success. Although he had a sensitive and good ear, he never showed an interest in music.

Nikola was constantly thinking about some invention. On a wagon trip from Gospić to Karlovac, he told a friend that he was working on an invention that would make it possible to transmit speech between Europe and America without any material connection, i.e. without wires or cables.

At the secondary school in Rakovac, he was not a particularly good student. Although he always passed his courses, he usually received barely passing grades in drawing. He was of delicate health and was absent for two months due to illness during the 1872/73 academic year in the first semester of his seventh year of studies.

godini 1872./73. u prvom polugodištu sedmog razreda izostao dva mjeseca zbog bolesti.

Školske godine 1870./71. pohađao je četvrti razred. Sljedeće godine pohađao je peti i šesti razred. Imao je prosječnu ocjenu dobar. U prvom polugodištu te školske godine dobio je iz matematike ocjenu nedovoljan, koju je poslije ispravio. Slaba ocjena iz matematike bila je vjerojatno posljedica njegove dvomjesečne bolesti.

Maturu je Nikola polagao 24. srpnja 1873. godine, a inspektor na maturi bio je prirodoslovac i zoolog Živko Vukasović (1829.-1874.).

Nakon mature vratio se roditeljima u Gospić, iako se tome njegov otac Milun protivio, jer je tada u Lici vladala velika zaraza kolere. Nikola se ondje doista zarazio kolerom, pa je gotovo devet mjeseci bio vezan uz krevet. Nakon ozdravljenja očekivalo ga je služenje vojnog roka u austrijskoj vojsci u trajanju od tri godine. Kako je tada promijenio boravište te je boravio kod ujaka Tome Mandića u Tomingradu kraj Gračaca, bio je zapravo vojni bjegunac.

Nikola se nije posvetio svećeničkom zvanju, po želji svojega oca, nego tehnici, odnosno elektrotehnici. Pritom je presudnu ulogu imao njegov profesor u gimnaziji u Rakovcu, Martin Sekulić, koji je bio izvrstan eksperimentator, pa i konstruktor fizikalnih aparata. Sam je Nikola o tome napisao: "Veoma sam se zanimao za elektricitet potaknut utjecajem svog profesora fizike koji je bio genijalan čovjek, a često je demonstrirao osnovne zakone aparaturama koje je sam izumio. Sjećam se jedne sprave u obliku staklenog balona obavijenog staniolom, koji se brzo okretao kad bi bio spojen s električnom strujom. Ne mogu vam izraziti ni približno objasniti svoje uzbuđenje dok sam prisustvovao njegovim pokusima s ovim tajanstvenim fenomenom. Svaki dojam proizveo je tisuće odjeka u mom mozgu. Želio sam o toj izvanrednoj snazi saznati više. Žudio sam za pokusom, za istraživanjem, ali predao sam se teška srca sudbini". Tesla ne spominje izričito o kojem je profesoru riječ, ali se sa sigurnošću može zaključiti da je to bio Sekulić.

In 1870/71, he attended the fourth year of studies. The next year he completed the fifth and sixth years of studies. He had an average grade of good. During the first semester of that academic year, he received the grade of unsatisfactory in mathematics, which he later corrected. This poor grade in mathematics was most likely due to his two months of illness.

Nikola passed his final graduation examination on July 24, 1873. The inspector at the examination was the natural scientist and zoologist Živko Vukasović (1829-1874).

After his final examination, he returned to live with his parents in Gospić, disregarding the wishes of his father, Milutin, who wanted him to stay away from the cholera epidemic raging in Lika at the time. Nikola caught cholera and was bedridden for nearly nine months. After he recovered, he faced three years of military service in the Austrian army. Since he had changed his place of residence and was registered as living with his uncle, Toma Mandić, in Tomingrad near Gračac, he was technically an army deserter.

Nikola did not pursue a priestly vocation, as his father would have liked, but electrical engineering. A crucial role was played by his secondary school professor in Rakovac, Martin Sekulić, who was an excellent experimenter and constructor of physics devices. Nikola wrote the following about this: "I was very interested in electricity, under the influence of a physics' professor who was an ingenious man and often demonstrated the basic laws with devices he had invented himself. I remember one device in the shape of a freely rotatable bulb with tinfoil coating, which was made to spin rapidly when connected to a static machine. It is impossible for me to convey an adequate idea of the intensity of feeling I experienced in witnessing his exhibitions of these mysterious phenomena. Every impression produced a thousand echoes in my mind. I wanted to know more of this wonderful force; I longed for experiment and investigation and resigned myself to the inevitable with an aching heart." Tesla does not specifically mention which professor he was writing about but it can be inferred with certainty that it was Sekulić.

4 TESLIN STUDIJ NA TEHNIČKOJ VISOKOJ ŠKOLI (JOHANNEUM) U GRAZU I BORAVAK U PRAGU

Dvije godine nakon mature i oporavka od bolesti, u svojoj devetnaestoj godini upisao se školske godine 1875./76. na K.u.K. Technische Hochschule u Grazu. Imao je najprije stipendiju Vojne Krajine. Određenu novčanu pomoć slali su mu otac Milutin i ujak Toma Mandić.

Dekan Tehničke visoke škole pisao je tada Nikolinu ocu: "Vaš je sin zvijezda prvog stupnja." Nikolin napor u studiju utjecao je na njegovo zdravlje, pa je profesor ocu preporučio da ga ispiše iz škole, jer postoji opasnost da će Nikola upropastiti zdravlje pretjeranim radom.

Drugu godinu studija Tesla je upisao uvjetno jer je stipendija izostala pa nije mogao platiti školarinu. Istaknuvši se radom i rezultatima, približio se i svojim profesorima, među kojima je bio i profesor teorijske i eksperimentalne fizike Jakob Pöschel.

Kada je bio na drugoj godini studija, Tehnička visoka škola u Grazu dobila je Grammeov dinamo. O tome je Tesla zabilježio: "Dok je profesor J. Pöschel demonstrirao vrteću mašinu kao motor, četkice su zadavale probleme, jer su iskrile, a ja sam primijetio da bi možda rad s motorom bio moguć i bez četkica. Ali profesor se izjasnio da je to nemoguće, pa je čitavo predavanje posvetio tom problemu, da bi na kraju naglasio: 'Gospodin će Tesla možda učiniti velike stvari, ali je sigurno da ovo neće unaprijediti.'" Tesla zatim nastavlja: "Neko sam se vrijeme kolebao impresioniran profesorovim autoritetom, ali sam se uvjerio da sam bio u pravu i preuzeo sam zadatak da ga riješim, sa svim žarom i bezgraničnim mladenačkim samopouzdanjem. Počeo sam zamišljati stroj istosmjerne struje, vrteći ga i prateći promjenljive struje u armaturi. Tada bih zamislio alternator i istraživao procese koji se odvijaju na sličan način. Nakon toga bih sebi dočarao sistem s motorima i generatorima i radio s njima na različite načine. Zamisli su mi se činile savršeno stvarne i opipljive. Čitav boravak u Grazu prošao je u stalnom ali neplodnom naporu i gotovo sam zaključio da je problem nerješiv".

Na kraju druge godine studija (1877.) Tesla marljivo polaže ispite, no na trećoj godini (1878.) popušta u radu. Tomu je možda bio razlog što svoj problem konstrukcije električnog stroja nije uspio privesti kraju.

4 TESLA'S STUDIES AT THE POLYTECHNIC SCHOOL (JOHANNEUM) IN GRAZ AND PERIOD IN PRAGUE

Two years after passing his final secondary school examination and recovery from illness, at the age of nineteen he enrolled during the 1875/76 academic year at the polytechnic school (Technische Hochschule) in Graz, Austria, with a scholarship from the Military Border Territory. His father, Milutin, and uncle, Toma Mandić, also sent him some money.

The dean of the polytechnic school wrote the following to Nikola's father: "Your son is a star of the first magnitude." Nikola's efforts in his studies affected his health, so the professor recommended that his father remove him from the school because there was danger that Nikola would ruin his health with excessive work.

Tesla enrolled conditionally in the second year of his studies because there was no scholarship and he was not able to pay tuition. Distinguishing himself by his work and results, he became closer to some of his professors, including his professor in theoretical and experimental physics, Jakob Pöschel.

During the second year of his studies, the polytechnic school in Graz obtained a Gramme dynamo. Tesla wrote the following about it: "While Prof. J. Pöschel was making demonstrations, running the machine as a motor, the brushes gave trouble, sparking badly. I observed that it might be possible to operate a motor without these appliances. But he declared that it could not be done and did me the honor of delivering a lecture on the subject, at the conclusion of which he remarked: 'Mr. Tesla may accomplish great things but he certainly will never do this.'" Tesla continued: "For a time I wavered, impressed by the professor's authority, but soon became convinced I was right and undertook the task with all the fire and boundless confidence of my youth. I started by first picturing in my mind a direct-current machine, running it and following the changing flow of the currents in the armature. Then I would imagine an alternator and investigate the processes taking place in a similar manner. Next I would visualize systems comprising motors and generators and operate them in various ways. The images I saw were to me perfectly real and tangible. All my remaining term in Graz was passed in intense but fruitless efforts of this kind, and I almost came to the conclusion that the problem could not be solved."

At the end of the second year of his studies, (1877), Tesla diligently passed his examinations but in the third year, (1878), he became slack in his work. This may be due to the fact that he was unable to bring

Nakon što je u svojoj 23 godini života izgubio godišnju stipendiju od 420 forinti od Komande Vojne Krajine, u dva je navrata zamolio stipendiju od Matice srpske u Novom Sadu, ali je odbijen 1876. i 1878. godine. Stoga prekida studij i nestaje iz Graza te prekida vezu s rodbinom.

Neko je vrijeme boravio u Mariboru, gdje ga je slučajno, u jednoj gostionici pri kartanju, sreo neki njegov znanac. Nikola je u Mariboru navodno radio kod nekog inženjera kao pomoćnik i dobivao plaću od 60 forinti. Ipak su ga kao nezaposlenoga mjesne vlasti prisilno vratile u Gospić, mjesto njegovog stalnog boravka. Sve se to teško dojmilo njegovog oca Milutina pa je on uskoro, 29. travnja 1879. godine i umro. Nikola je zatim kratko vrijeme radio kao nastavnik u gimnaziji u Gospiću koju je i sam prije pohađao.

Početkom siječnja 1880. godine Nikola Tesla je kao 24-godišnjak otišao u Prag. U svojoj biografiji napisao je na engleskom jeziku, da je otišao u Prag, u Češku kako bi ispunio očevu želju, da upotpuni svoje školovanje na tamošnjem Sveučilištu. Nema, međutim, dokumenata o tome je li bio upisan na koji od dvaju fakulteta, odnosno Tehničke visoke škole, tj. na njemačku ili češku. Moguće je da je posjećivao predavanja pojedinih profesora, ali o tome nema podataka. O svojem boravku u Pragu Tesla kaže da je "u tom gradu znatno napredovao, odvojio sam komutator od stroja i proučio fenomen s ovog novog stajališta, ali još uvijek bez rezultata."

5 BORAVAK I RAD NIKOLE TESLE U BUDIMPEŠTI I FRANCUSKOJ

Tesla je 1881. godine započeo raditi u Telefonskoj centrali u Budimpešti. U tom je gradu došao do izuma elektromotora s okretnim magnetskim poljem. Do tog je izuma slučajno došao za vrijeme jedne nedjeljne šetnje u veljači 1882. s prijateljem Antalom Szigetyjem u Gradskom parku, gdje je u pijesku štapom nacrtao dijagram svojega motora temeljenoga na okretnom magnetskom polju. Svoj je izum priopćio šefu Tivadaru Puskašu, koji ga je nakon toga poslao u Pariz nadajući se da će ondje moći ostvariti svoj izum. Za to, međutim, nije bilo zanimanja u tvornici američkog izumitelja Thomasa Alve Edisona (1847.-1931.), u kojoj su se tada projektirali i konstruirali elektromotori za istosmjernu struju, po Edisonovom patentu, za Francusku i Njemačku. Tesla je tada izveo neke izmjene na postojećim električnim strojevima.

his problem regarding the construction of an electrical motor to conclusion.

After he lost his scholarship of 420 forints from the Command of the Military Border Territory at the age of 23, on two occasions he sought a scholarship from the Serbian Cultural Society in Novi Sad but was refused in 1876 and 1878. Therefore, he interrupted his studies and left Graz, also breaking ties with his family.

For a time, he lived in Maribor, where by chance, in an inn during a game of cards, he met an acquaintance. Allegedly, Nikola worked in Maribor for an engineer as an assistant and received a wage of 60 forints. Nonetheless, he was forced by the local authorities to return to Gospić, the place of his permanent residence, as an unemployed person. All of this was difficult for his father, Milutin, to accept and he died soon after, on April 29, 1879. Nikola then worked for a short time as a teacher at the Gospić secondary school that he had previously attended.

In early January of the year 1880, Nikola Tesla went to Prague at the age of 24. In his autobiography, written in the English language, he wrote that he went to Prague to carry out his father's wishes for him to complete his education at the university. However, there is no document showing that he was enrolled at either of the two colleges there or either of the polytechnic schools, German or Czech. It is possible that he attended lectures given by individual professors but there is no information on this. Regarding his sojourn in Prague, Tesla wrote that "it was in that city that I made a decided advance, which consisted of detaching the commutator from the machine and studying the phenomena in this new aspect, but still without result."

5 NIKOLA TESLA IN BUDAPEST AND FRANCE

In 1881, Tesla began working at the Central Telegraph Office in Budapest. It was in this city that devised an electrical motor operating on the rotating magnetic field principle. Tesla had arrived at this invention by chance in February 1882, during a Sunday walk in the municipal park with his friend Antal Szigety, when he drew a diagram of this device in the sand with a stick. He showed his invention to the inspector-in-chief, Tivadar Puskás, who subsequently sent him to Paris, where he hoped to build his invention. However, there was no interest in the factory of the American inventor Thomas Alva Edison (1847-1931), that was then designing and constructing direct current electric motors, under Edison's patent, for France and Germany. Instead, Tesla made several changes in the existing electrical machinery.

Muljević, V., Život i djelo Nikole Tesle, Energija, god. 55 (2006), br. 2., str 218-235
Muljević, V., The life and work of Nikola Tesla, Energija, vol. 55 (2006), No. 2, p.p. 218-235

Edisonovo poduzeće poslalo ga je u Strasbourg radi popravka novoizgrađene električne centrale. Ondje je Tesla konstruirao svoj prvi jednofazni asinkroni motor.

Edison's company sent him to Strasbourg in order to make repairs on a newly built power plant. It was there that Tesla constructed his first single-phase electromagnetic (asynchronous) motor.

6 TESLIN ŽIVOT I RAD U SJEDINJENIM AMERIČKIM DRŽAVAMA

Iz Francuske 1884. odlazi u Edisonovu tvornicu u New Yorku, gdje radi godinu dana i usavršava 24 različita tipa električnih strojeva. Budući da za svoj rad nije dobivao odgovarajuću nagradu, napušta Edisonovu kompaniju i po savjetu nekih tehničara i financijera osniva vlastito poduzeće Tesla Arc Light Company.

Slika 3 je iz 1884. godine i prikazuje Nikolu Teslu u dobi od 28 godina.

6 TESLA'S LIFE AND WORK IN THE UNITED STATES OF AMERICA

In 1884, Tesla left France to work in Edison's factory in New York, where he stayed for one year and perfected twenty-four different types of electrical devices. Since he did not receive suitable compensation for his work, he left Edison's company and, at the advice of several technicians and financiers, opened his own firm, the Tesla Arc Light Company.

The figure shows Nikola Tesla at 28 years of age (1884).

Slika 3
Nikola Tesla u dobi od 28 godina (1884.)
Figure 3
Nikola Tesla at 28 years of age (1884

Izvor
Muzej Nikole Tesle, MNT, VI/V, 3
Source
Muzej Nikole Tesle, MNT, VI/V, 3

Namjeravao je ondje s kapitalom društva konstruirati nove motore na izmjeničnu struju, ali mu financijeri to nisu odobrili, budući da su se bavili konstrukcijom i montažom lučnih svjetiljaka. Tesla je 1886. usavršio lučnu svjetiljku i načinio praktični sustav tvorničke i ulične rasvjete. Za svoj rad dobio je od društva samo dionice, koje nisu imale nikakvu vrijednost.

At the time, he intended to construct new alternating current motors using company capital. However, the financiers did not approve because they were engaged in the construction and installation of arc lamps. In 1886, Tesla perfected the arc lamp and made a practical system for factory and street lighting. For his efforts, the company merely gave him some worthless stocks.

Godine 1887. osniva Tesla Electric Company te u laboratorijima toga poduzeća, prema svojim idejama, konstruira motore izmjenične struje. Te je godine prijavio svoja četiri patenta:

- iz područja okretnog magnetskog polja,
- o višefaznim strojevima,
- o sinkronim motorima,
- o daljinskom prijenosu električne energije.

In the year 1887, he founded the Tesla Electric Company. In the laboratory of this enterprise, he constructed alternating current motors based upon his own ideas. That year, he filed four patents:

- in connection with the rotating magnetic field,
- polyphase devices,
- induction motors,
- a long-distance electrical transmission system.

Radi uspješnog razvođenja svojih višefaznih struja Tesla je konstruirao višefazne generatore i transformatore te pronašao sustav "trokut-zvijezda". Time je omogućio proizvodnju električne energije na mjestima njezinih prirodnih izvora te njezino prenošenje na velike udaljenosti, do mjesta potrošnje.

Tesla je 1888. godine prodao svoje patente tvrtki Westinghouse Electric and Manufacturing Company. Po želji te tvrtke usavršio je tijekom 1888. i 1889. godine jednofazni indukcijski motor i preuredio cjelokupni sustav za znatno više frekvencije od 133 periode u sekundi, jer je tvrtka do tada za tu frekvenciju izrađivala transformatore za rasvjetu.

Teslin sustav prijenosa električne energije prikazan je prvi put na Svjetskoj izložbi u Chicagu 1893. godine, a po njegovu je sustavu 1896. godine izgrađena hidroelektrana na Niagari. Pločica tvrtke Westinghouse Co u HE na Niagari s popisom primijenjenih Teslinih patenata prikazana je na slici 4.

For the distribution of polyphase currents, Tesla constructed polyphase generators and transformers, and discovered the "star delta" system. This made it possible to produce electricity at the sites of its natural sources and then transmit it great distances to the places of consumption.

In the year 1888, Tesla sold his patents to the Westinghouse Electric and Manufacturing Company. At the request of this company, during 1888 and 1889 he perfected a single-phase induction motor and adapted his entire system to the significantly higher frequency of 133 cycles because the company had been making lighting transformers for that frequency.

Tesla's system for the transmission of electricity was presented for the first time at the Chicago World's Fair of 1893, and in 1896 a hydroelectric power plant was built at Niagara Falls according to his system. The plaque of the Westinghouse Company at the Niagara Falls Power Plant is shown in Figure 4.

Slika 4
Pločica tvrtke Westinghouse Co. u HE na Niagari s popisom primijenjenih Teslinih patenata
Figure 4
Plaque of the Westinghouse Company at the Niagara Falls Power Plant with a List of Tesla's Applied Patents

Godine 1889. konstruirao je stroj visoke frekvencije od 15 tisuća perioda u sekundi. Nakon toga posebnom je konstrukcijom s pomoću iskrenja u strujnom krugu sastavljenom od izvora izmjenične struje niske frekvencije, indukcijskog svitka, kondenzatora i iskrišta dobio slabo prigušene oscilacije. Iskre brzo slijede, a nizovi oscilacija kontinuirano se obnavljaju. Time se dobivaju struje od nekoliko stotina tisuća perioda u sekundi. Te struje Tesla transformira preko svojega transformatora u struje iste frekvencije, ali višega napona. To su tzv. Tesline struje, a djeluju fiziološki i mogu se prenositi jednom žicom. Tesline struje visoke frekvencije upotrebljavaju se u medicini kod dijatermije i darsonvalizacije, a u

In the year 1889, he constructed an apparatus for producing high frequency electrical currents of 15,000 cycles per second. After that, using a special arcing construction in an electrical circuit, consisting of a low-frequency alternating current source, induction coil, condenser and spark gap, he obtained weakly damped oscillations. Sparks quickly ensued and continuous oscillations were generated. Thus, current of several hundred thousand cycles was obtained. Tesla transformed this current via his transformer into current of the same frequency but higher voltage. These are the so-called Tesla currents, which act physiologically and can be transmitted via a single wire. Tesla's high frequency currents are used in medicine in

kemiji za dobivanje ozona. Tim se strujama postižu svjetlosni efekti koji se osnivaju na luminiscenciji, a daju znatno ekonomičnije svjetlo od električne žarulje s užarenim vlaknom. Te su struje dobile i najveću primjenu u radiotehnici.

Tesla je 1892. izvodio pokuse s bežičnim prijenosom, a 1896. započeo je prenositi signale na udaljenosti od 32 kilometra. Svoj radio-telegrafski odašiljač i prijemnik prikazao je 1897. godine. Iz tog je vremena fotografija na slici 5 kada je Tesla imao 39 godina.

Godine 1898. sagradio je brod i pustio ga u more kraj New Yorka te je njime upravljao s obale. Iste je godine istaknuo potrebu rezonancije između primarnog i sekundarnoga kruga odašiljača i prijamnika. U državi je Colorado 1899. godine prenosio znakove bežičnim putem na udaljenosti od 1 000 kilometara, te podignuo prijamno-odašiljačku postaju. Tom postajom Tesla je tvorac radiotehnike.

diathermy and darsonvalization, and in chemistry for obtaining ozone. These currents achieve light effects based upon luminescence, and provide more economical illumination than incandescent light bulbs. However, their most important applications are in radio technology.

In 1892, Tesla conducted experiments in wireless transmission and in 1896 began to transmit signals at distances of 32 kilometers. He presented his radio-telegraph transmitter and receiver in 1897. Figure 5 shows Tesla from this period, at 39 years of age.

In the year 1898, he built a teleautomatic boat operated by remote control, that he demonstrated before a crowd at Madison Square Garden in New York City. That year, he demonstrated the need for resonance between the primary and secondary circuits of a transmitter and receiver. In 1899 in the state of Colorado, he transmitted signals wirelessly at a distance of 1,000 kilometers, and built a primary transmitter station. With this station, Tesla became the creator of radio technology.

Slika 5
Nikola Tesla u dobi od 39 godina (1895.)
Figure 5
Nikola Tesla at 39 years of age (1895)

Izvor
Muzej Nikole Tesle, MNT, VI/V,10
Source
Muzej Nikole Tesle, MNT, VI/V,10

Uvidjevši već nakon prvih pokusa da i slabo prigušeni oscilatori stvaraju poremećaje u eteru, on je s prigušenih valova prešao na održavanje neprigušenih elektromagnetskih oscilacija. Time je preduhitrio Guglielma Marconija (1873.-1937.), koji je tada ostvario domet signala od 16 kilometara.

Nakon ispitivanja u kolovozu 1899. i 1900. godine Tesla obavlja prenošenje električne energije s pomoću elektromagnetskih valova, pod naponom od 12 milijuna volti na udaljenosti od 30 kilometara. U Long Islandu podiže toranj visine 57 metara i bavi se problemima prenošenja velike količine električne energije za potrebe domaćinstava i industrije. Godine 1917. taj su toranj uništili dinamitom

Realizing after his first attempts that weakly damped oscillators were creating signal interference, he abandoned damped waves in favor of undamped electromagnetic oscillations. In this he surpassed Guglielmo Marconi (1873-1937), who had achieved a signal range of 16 kilometers.

After testing in August 1899 and 1900, Tesla transmitted electricity by means of electromagnetic waves 30 kilometers from a 12 million volt source. In Long Island, he erected a 57-meter tower and engaged in the problems of the transmission of large quantities of electricity for household and industrial use. In 1917, an unknown perpetrator destroyed the tower with dynamite, perhaps at the orders of the general headquarters of the US Army.

nepoznati počinitelji. Možda je to uništeno po nalogu Generalnog štaba vojske SAD-a.

Tesla je završio svoje radove na više od 100 patenata, a mnogi su od njih čekali primjenu.

U pokusima 1891./92. godine upotrebljavao je sklopove sa sekundarnim krugovima, Teslinim transformatorom i zemljom, dakle sve bitne dijelove odašiljača, koji su se pojavili desetak godine poslije.

Talijanski inženjer G. Marconi upotrebljavao je bežičnu telegrafiju nakon Tesle i to 1897. godine.

Tesla je 1892. godine održao predavanje u Londonu i Parizu o elektromagnetskim valovima. Sljedeće godine, 1893. imao je vlastiti sustav za bežični prijenos.

7 TESLINI PATENTI I STRUČNI ČLANCI

Pravu i potpunu sliku o Teslinim otkrićima, izumima i konstrukcijama nije doista moguće dobiti bez uvida u sve ono što je on zapisao, pribilježio i nacrtao.

Nikola Tesla je u Patentnom uredu SAD-a patentirao 99 svojih izuma. Ti se patenti mogu podijeliti na sljedeće skupine:

- motori i generatori - 36 patenata,
- transformacija električne snage - 9 patenata,
- rasvjeta - 6 patenata,
- visokofrekventni uređaji i regulatori - 17 patenata,
- radio - 12 patenata,
- telemehanika - 1 patent,
- turbine i slične naprave - 7 patenata,
- različiti izumi - 11 patenata.

Patentni spisi dvaju Teslinih glavnih patenata: asinkroni motor i električni prijenos energije, koje je prijavio 12. listopada 1887. godine, prikazani su na slikama 6 i 7.

Nadalje, objavio je 17 znanstvenih i stručnih članaka u časopisima:

- The Electrical World - 1 članak,
- The Electrical Engineer - 4 članka,
- The Electrical Review - 11 članaka,
- Electrical Experimenter - 1 članak.

Objavio je sedam članaka o nekim općim problemima u raznim časopisima, u razdoblju od 1897. do 1917. godine.

Tesla completed work on over 100 patents, many of which are still awaiting practical application.

In experiments conducted during 1891/92, he used units with secondary circuits, a Tesla transformer and earth, i.e. all the essential parts of the transmitter that appeared ten years later.

The Italian engineer G. Marconi was using a wireless telegraph later than Tesla, in the year 1897.

In 1892, Tesla held lectures in London and Paris on electromagnetic waves. The following year, 1893, he had developed his own system for wireless transmission.

7 TESLA'S PATENTS AND PROFESSIONAL ARTICLES

It is not possible to obtain an accurate or complete picture of Tesla's discoveries, inventions and constructions without inspection of his writings, notes and drawings.

Nikola Tesla patented ninety-nine of his inventions at the US Patent Office. These patents can be divided into the following groups:

- motors and generators - 36 patents,
- transformation of electrical power - 9 patents,
- lighting - 6 patents,
- high frequency equipment and regulators - 17 patents,
- radio - 12 patents,
- telemechanics - 1 patent,
- turbines and similar devices - 7 patents,
- miscellaneous inventions - 11 patents.

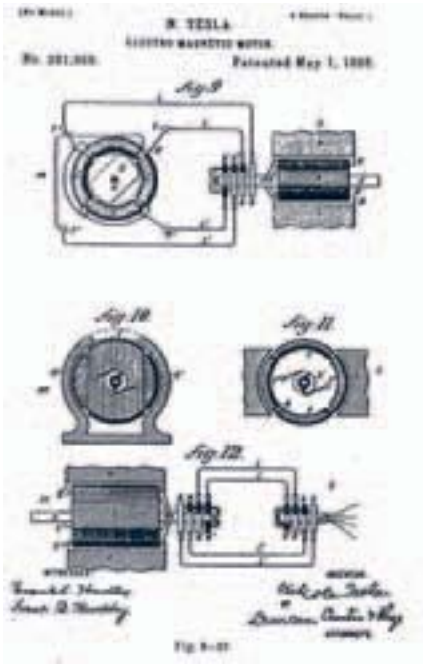
Patent certificates for Tesla's main patents: the electromagnetic (asynchronous) motor and the electrical transmission of power, which he patented on October 12, 1887, are shown in Figures 6 and 7.

He also published seventeen scientific and professional articles in journals:

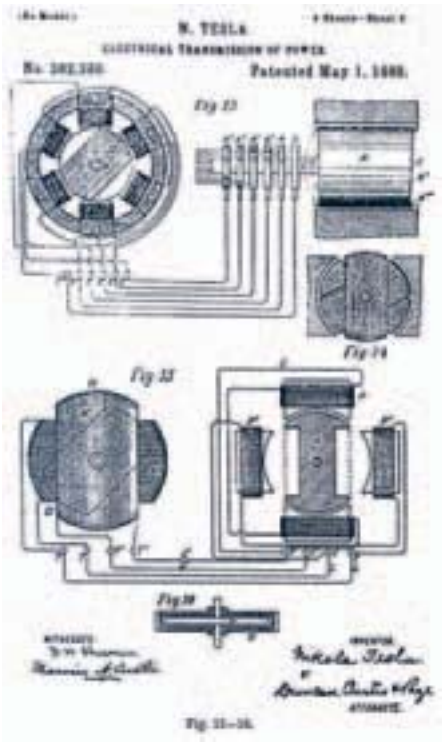
- The Electrical World - 1 article,
- The Electrical Engineer - 4 articles,
- The Electrical Review - 11 articles,
- Electrical Experimenter - 1 article.

He published seven articles on general subjects in various journals during the period from 1897 to 1917.

Slika 6
Patentni spis: Asinkroni motor
Figure 6
Patent document: Electromagnetic (Asyncronous) Motor



Slika7
Patentni spis: Električni prijenos energije
Figure 7
Patent document: The Electrical Transmission of Power



Sačuvana fotografija, nastala 1938. godine, prikazuje Teslu u njegovoj starijoj životnoj dobi (slika 8).

A photograph taken 1938 with Tesla at his older ages is shown in Figure 8.

Autobiografski članak Some Personal Recollections (Neka osobna sjećanja) objavio je u časopisu Scientific American od 6. lipnja 1915. godine. U tu skupinu pripada i niz članaka pod naslovom My Invetions objavljenih u časopisu Electrical Experimenter iz 1919. godine. Hrvatski prijevod tog djela pod nazivom Moji pronalasci objavljen je 1977. godine u Zagrebu.

Tesla published an autobiographical article, Some Personal Recollections, in the journal Scientific American, on June 6, 1915. This group also includes a series of articles entitled My Inventions, published in the journal The Electrical Experimenter in 1919. The Croatian translation of this work was published in 1977 in Zagreb under the title Moji pronalasci.

Slika 8
Tesla u starijoj životnoj dobi (1938.)
Figure 8
Tesla at his older ages (1938)

Izvor
Muzej Nikole Tesle, MNT, VI/VIII, 50
Source
Muzej Nikole Tesle, MNT, VI/VIII, 50

8 ZNAMENITI O NIKOLI TESLI

Grof George Arco, (1869.-?) njemački izumitelj na području radiotehnike bio je veliki poštovalac Nikole Tesle, a također i njemački fizičar Adolf Slaby (1849.-1913.), koji je zajedno s G. Arcom 1897. godine gradio u Njemačkoj prve radio telegrafske uređaje.

Predsjednik američkog udruženja IRE u New Yorku rekao je 1915. godine da je rad Nikole Tesle jedan od najvećih pothvata ljudske mašte u povijesti svijeta.

Njemački profesor D. Ing. h. c. Görges objavio je 1930. godine u stručnom časopisu u Dresdenu članak pod naslovom Über die Bedeutung Nikola Tesla für die Elektrotechnik.

Prof. dr. sc. Milan Vidmar (Ljubljana, 1885.-Ljubljana, 1962.) objavio je 1930. godine u stručnom tehničkom listu članak Nikola Tesla.

Charles F. Scott, došao je u ljeto 1888. godine u Westinghouse Company te je bio Teslin asistent u prvim pokusima na njegovim motorima. Scott je nastavio rad na tom području više od dvadeset godina i aktivno sudjelovao u razvoju višefaznog sustava te je bio neposredno povezan za pionirske radove na slapovima Niagare. On je napisao članak The Contribution Of Tesla To Electrical Power Development, u povodu dodjele Edisonove medalje Nikoli Tesli 1917. godine.

A. du Bois-Reymond objavio je u časopisu ETZ 1888. godine članak pod naslovom Neues System von Wechselstrommotoren und Transformatoren von N. Tesla.

Prof. dipl. ing. Miroslav Plohl (1881.-1939.) objavio je u Tehničkom listu u Zagrebu članak pod naslovom Dr. tech. h. c. Nikola Tesla.

L. Černi je u Vjesniku u Zagrebu povodom godišnjice Tesline smrti objavio članak pod naslovom Zaboravljeni genij iz Smiljana. U njemu ističe da Tesla nije znao komercijalizirati svoje projekte, ali je bio genijalni vizionar koji je mislio da se uz pomoć elektriciteta može učiniti sve i to nebrojeno puta i dokazao.

Časopis Nature (SAD) u veljači 1943. godine piše o Tesli i njegovu radu.

Vijest o smrti Nikole Tesle pročitao je na radiju 7. siječnja 1943. gradonačelnik New Yorka La Guardia. Rekao je da je umro siromašan, ali je bio jedan od najkorisnijih ljudi koji su ikad živjeli.

8 DISTINGUISHED PERSONS ON NIKOLA TESLA

Baron George Arco, (1869-?), a German inventor in the area of radio technology, was a great admirer of Nikola Tesla, as was the German physicist Adolf Slaby (1849-1913), who together with G. Arco in the year 1897 built radiotelegraphic devices in Germany.

The president of the American society IRE in New York said in the year 1915 that the work of Nikola Tesla was one of the greatest undertakings of the human imagination in the history of the world.

The German professor D. Ing. h. c. Görges published an article in a professional journal in Dresden in 1930, entitled "Über die Bedeutung Nikola Tesla für die Elektrotechnik."

Prof. Milan Vidmar, PhD (Ljubljana, 1885 - Ljubljana, 1962) published an article in a professional technical journal about Nikola Tesla in 1930.

Charles F. Scott came to the Westinghouse Company in 1888 and was Tesla's assistant in the testing of his motors. Scott continued work in this area for over twenty years, actively participated in the development of a polyphase system and was directly involved with the pioneering work on Niagara Falls. He wrote an article entitled The Contribution of Tesla to Electrical Power Development, on the occasion of the awarding of the Edison Medal to Nikola Tesla in the year 1917.

In 1888, A. du Bois-Reymond published an article in the journal ETZ entitled Neues System von Wechselstrommotoren und Transformatoren von N. Tesla.

Prof. Miroslav Plohl (1881-1939) published an article in Technički list in Zagreb entitled "Dr. tech. h. c. Nikola Tesla."

On the occasion of the anniversary of Tesla's death, L. Černi published an article in the Zagreb newspaper Vjesnik entitled Zaboravljeni genij iz Smiljana (The Forgotten Genius from Smiljan). This article points out that Tesla did not know how to commercialize his projects but was a brilliant visionary who believed that everything was possible with electricity, as he proved countless times.

The US journal Nature wrote about Tesla and his work in the February 1943 issue.

News of the death of Nikola Tesla was announced over the radio on January 7, 1943, by Mayor Fiorello La Guardia of New York. He said that Tesla died a poor man but that he was one of the most useful people who had ever lived.

Muljević, V., Život i djelo Nikole Tesle, Energija, god. 55 (2006), br. 2., str 218-235
Muljević, V., The life and work of Nikola Tesla, Energija, vol. 55 (2006), No. 2, p.p. 218-235

Engleski fizičar Lord Kelvin (1824.-1907.), po kojemu se naziva jedinica za temperaturu, rekao je da je Tesla više pridonio znanosti o elektricitetu nego bilo tko prije njega. Taj je citat objavljen u siječnju 1943. godine.

Za svoj 75. rođendan 1931. godine Tesla je primio mnogo čestitaka, među ostalima čestitao mu je i dr. Lee de Forest (SAD, 1873.-1961.), konstruktor triode, koji je prije s njim surađivao.

Čestitao mu je i veliki fizičar Albert Einstein, začetnik teorije relativnosti (1879.-1955.), napisavši mu: "S veseljem sam saznao da slavite svoj 75. rođendan i da ste kao pionir u području struja visoke frekvencije doživjeli izvanredan razvoj tehnike. Čestitam na velikom uspjehu Vašeg životnog djela."

Knjiga Tesla Master Of Lightning autora Margaret Cheney i Roberta Utha objavljena je u SAD-u 1999. godine u izdanju Metro Books. Prevodi se na hrvatski jezik i bit će objavljena u Zagrebu 2006. godine u nakladi Zoro pod naslovom Čovjek izvan vremena.

9 UMJESTO ZAKLJUČKA

U povodu Teslina četrdesetog rođendana, bio je 17. prosinca 1896. godine izabran na glavnoj skupštini za počasnog člana JAZU u Zagrebu.

Nikola Tesla i Thomas Alva Edison bili su 1912. godine predloženi za dodjelu Nobelove nagrade za fiziku, ali im ta nagrada nikad nije dodijeljena. Tesla je pravio razliku između izumitelja korisnih izuma i otkrivača novih principa. Tvrdio je da je on otkrivač, a Edison izumitelj. Ako bi obojica bili stavljeni u istu kategoriju smatrao je da bi to uništilo smisao relativne vrijednosti njihovih dostignuća.

Vrlo je vjerojatno da je na Teslu utjecalo i to što je Nobelovu nagradu za fiziku 1909. godine dobio Guglielmo Marconi u zajednici s Karlom Ferdinandom Braunom (1850.-1918.). Bio je time razočaran, jer dodijeliti nagradu najprije Marconiju, a zatim tražiti od Tesle da nagradu dijeli s Edisonom, bilo je preveliko podcjenjivanje vrijednosti Teslina rada. Stoga je Nikola Tesla bio prvi znanstvenik koji je odbio da bude predložen za nagradu.

Sveučilište u Zagrebu dodijelilo mu je 3. lipnja 1926. godine naslov Doctor honoris causa, a 15. lipnja 1926. godine Tehnički fakultet Univerziteta u Beogradu dodijelio mu je naslov počasnog doktora tehničkih znanosti.

The English physicist Lord Kelvin (1824-1907), the namesake of the unit of temperature, said that Tesla contributed more to the knowledge of electricity than anyone before him. This quotation was published in the year 1943.

For Tesla's 75th birthday in the year 1931, he received many congratulations, including one from Dr. Lee de Forest (USA 1873-1961), the constructor of the triode, who had worked with him previously.

He was also congratulated by the great physicist Albert Einstein, author of the theory of relativity (1879-1955), who wrote him: "I was pleased to learn that you are celebrating your 75th birthday and that you, as a pioneer in the area of high frequency electricity, have lived to see the exceptional development of the technique. I congratulate the great success of your life's work."

A book entitled Tesla, Master Of Lightning, by the Margaret Cheney and Roberta Utah, was published in the United States in 1999 by Metro Books. The translation in the Croatian language will be published in Zagreb in the year 2006 by Zoro under the title Čovjek izvan vremena.

9 CONCLUDING REMARKS

On the occasion of Tesla's fortieth birthday, on December 17, 1896, he was chosen by the general assembly as an honorary member of the Yugoslav Academy of Arts and Sciences in Zagreb.

In the year 1912, Nikola Tesla and Thomas Alva Edison were nominated for the Nobel Prize in physics. However, this prize was never awarded. Tesla differentiated between the inventor of useful inventions and the discoverer of new principles. He maintained that he was a discoverer and Edison was an inventor. He felt that if both of them were placed in the same category, it would destroy the relative value of their achievements.

It is highly likely that the awarding of the Nobel Prize in physics for the year 1909 to Guglielmo Marconi together with Karl Ferdinand Braun (1850-1918) upset Tesla. He was disappointed because to award the prize first to Marconi and then ask Tesla to share his with Edison belittled Tesla's work. Therefore, Nikola Tesla was the first scientist who refused to be nominated for the prize.

On June 3, 1926, the University of Zagreb awarded him the title of Doctor honoris causa, and on June 15, 1926 the Technical College of the University of Belgrade awarded him an honorary doctorate of technical sciences.

Da bi se na međunarodnom planu iskazalo priznanje Nikoli Tesli kao velikanu suvremene elektrotehnike, studijski je odbor IEC-a (Međunarodna elektrotehnička komisija) preporučio da se međunarodna jedinica magnetske indukcije nazove tesla. Tu je odluku prihvatila i potvrdila 11. generalna konferencija za mjere i utege (Conference General des Poids et Measures), održana 10. listopada 1960. godine u Parizu.

In order for Nikola Tesla to be recognized at the international level as a great figure in modern electrical engineering, a study group of the the International Electrotechnical Commission (IEC) recommended that the international unit of magnetic induction should be called a tesla. This decision was adopted and confirmed at the Eleventh General Conference on Weights and Measures, held on October 10, 1960 in Paris.

LITERATURA / REFERENCES

[1] BOKŠAN, S., Nikola Tesla und sein Werk, Deutscher Verlag, Wien, 1932.
[2] NJEGOVAN, V., Nikola Tesla 1856.-1956., Prosvjeta, Zagreb
[3] O'NEILL, J., Nenadmašeni genij, Život Nikole Tesle, Jugoslavensko društvo za unapređenje nauke i tehnike, Nikola Tesla Beograd, 1956.
[4] TESLA, N., Dnevnik istraživanja Colorado Springs, 1899.-1900., Nolit, Beograd, 1976.
[5] PERDUE, L., Teslina ostavština, Znanje, Zagreb, 1988.
[6] MULJEVIĆ, V., Nikola Tesla - od Smiljana do Patentnog ureda SAD, Hrvatski patentni glasnik, Zagreb, vol. 15, 1996.
[7] MULJEVIĆ, V., Nikola Tesla slavni izumitelj, Hrvatska zajednica tehničke kulture, Zagreb, 2000.

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